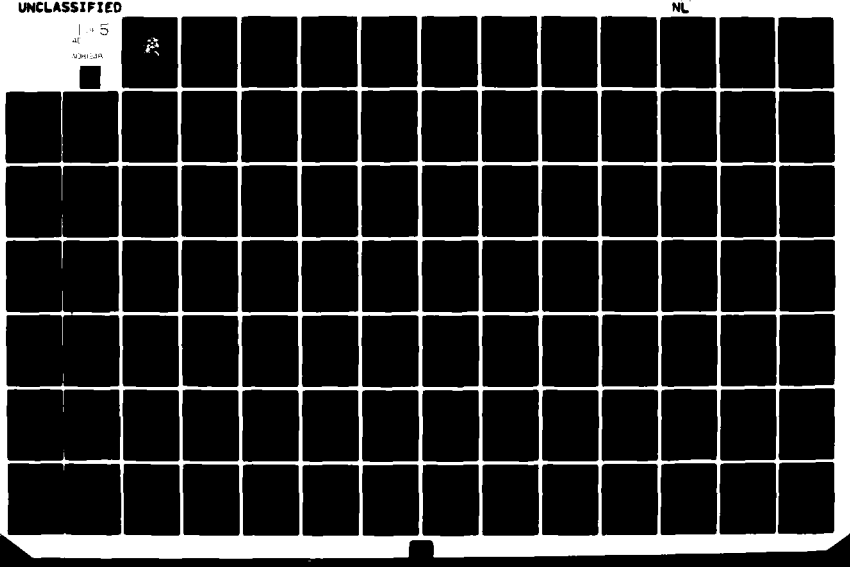
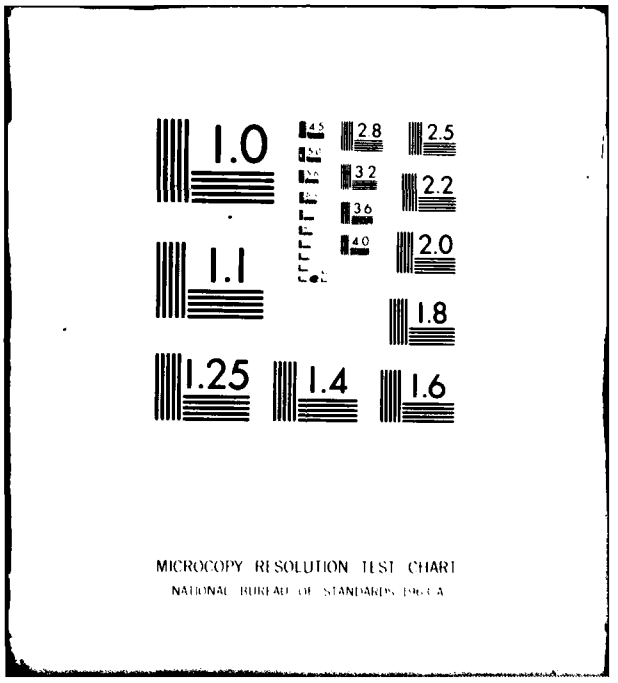
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AIR POWER AND WARFARE

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18–20 October 1978

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Edited by

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and
Robert C. Ehrhart, Major, USAF

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Preface

The co-sponsor of this symposium series, the Department of History at the U.S. Air Force Academy, has had a special commitment since its inception in 1954 to the teaching of the history of air power. For many years, however, the very limited amount of scholarly work in this field has hampered the effective teaching of the subject at the Academy and elsewhere and stymied proposals to present a symposium on the topic. Then, as the 75th Anniversary of the Wright Brothers' flight approached, scholarly efforts began to increase. Enough American and foreign scholars, both civilian and military, and some of the surviving shapers of the history of air power could now be brought together at least, as a minimum, to assess what has been done and to stimulate new work. In the event, the contributors to this volume have gone well beyond the minimum by providing herein a collection of essays, commentaries, and reminiscences that should enhance both the teaching and the public understanding of the record and potential of air power. Furthermore, future researchers and writers will appreciate the conscientious work of scholarly commentators who responded especially well to the invitation to identify the work yet to be done.

The symposium committee structured this event so as to deal with the topic within as broad a framework as a two-day meeting would permit. Thus, the sweep of the papers extends chronologically from a study of British views on air power even before 1903 through a major pioneer's perceptions of the future role of air power in the defense of the United States and its allies. Geographically, the participants on the program addressed the air power record on three continents, specifically dealing with the experiences of six nations.

To make the most of the available time, the planners began the symposium with an evening lecture and experimented with simultaneous sessions during the next two days. While there was the inevitable disappointment among our more than 250 attendees from outside the Academy, as well as among the members of the Academy community, at not being able to hear each of the speakers, the editors believe that these published proceedings will justify the experiment. In addition, they sought to round out these proceedings by inviting comments from individuals not on the program about topics a volume such as this should at least mention.

Summaries of the material in each session appear in the introductions thereto, but certain ideas appear often enough in the sessions to serve as themes for this volume.

First, the reader will be regularly reminded of the importance of the "human element" in air power. That element's significance appears not only in the papers dealing with the employment of air power, but also those on the development of doctrine, technological change, and the proper organization of air forces. Both the keynote speaker and the final commentator noted that man's central role in air power demands special attention from future historians so as to counter the perception of the public that the once glamorous heroes of air warfare have been overshadowed by technology.

A second theme, not unrelated to the first, is the intricate relationship among technology, doctrine, and the successful employment of airpower. The failure to appreciate this relationship, for example, helps to explain the defeat of the Luftwaffe and the Japanese air forces in World War II and, closer to home, may have led the United States Air Force into some questionable weapons choices in the period since World War II. Here the first theme appears again since human choices drive the results in matters of technology, doctrine, and employment of air power.

The role of human choices helps to explain the third theme in this volume: the unity of the human experience with air power. That unity appears most clearly in the papers on the European and American experiences before World War II and those on Germany, Japan, and Russia during the war itself.

A final theme, actually a combination of related ideas, occurred to the editors as they prepared these proceedings. One idea is the realization—familiar to historians but perhaps not to every reader—that the historical study of air power is most useful when examined within the overall context of time, place, and circumstances. Moreover, an accurate understanding of the air power record is more than a hobby; it is a subject vital to the future of this nation. Little imagination is required to recognize that the contents of this volume repeatedly touch on very current issues. At the same time, one must be wary of the trap of calling upon history to provide easily digestible "lessons." The reader can expect that this volume will support the proposition recently advanced by Professor Philip Crowl in a Harmon Lecture that, at least, "the study of history will help us to ask the right questions so that we can define the problem—whatever it is."[1]

* * * * *

The Military History Symposium series began in 1967 as an annual event sponsored by the USAF Academy and the Association of Grad-

[1] Philip A Crowl, *The Strategist's Short Catechism: Six Questions Without Answers*, Twentieth Harmon Memorial Lecture (U.S.A.F. Academy, CO, 1978).

uates. Since 1970, the symposia have been held biennially. The purpose of the series is to provide a forum for scholars in military history and related fields, thereby promoting an exchange of ideas and information between scholars and military professionals, and another link between thought and application in military affairs.

The USAF Academy and the Association of Graduates are indebted to the participants whose individual and collective efforts made the Eighth Military History Symposium possible. In addition to the participants, a number of other individuals and organizations were essential to the success of the symposium. The Superintendent of the Academy, Lieutenant General K. L. Tallman, and the Dean, Brigadier General William A. Orth, were steadfast in their support of the Symposium Steering Committee which was responsible for conceiving, planning and carrying out the program. The committee, chaired by Colonel Alfred F. Hurley, began plans and preparations for the symposium more than two years before the first session began. Administrative and logistical details were the responsibility of the Executive Director of the symposium, Major John F. Shiner, who made a very difficult job appear easy. Assisting Major Shiner, and the editors of these *Proceedings* was a secretarial staff of Carol Meredith, Judi Tobias, Yo Sneddon, Linda Milburn, and Deborah Smalls, whose diligence and wholehearted cooperation contributed greatly to the smooth operation of the conference and to the preparation of these contents. Acknowledgements would not be complete without mention of Mrs. Robert Jones, without whose patience and typing skill this volume could not have appeared.

THE MILITARY HISTORY SYMPOSIA OF THE USAF ACADEMY

Current Concepts in Military History. (First Military History Symposium, held in May 1967.) Proceedings were not published.

Command and Commanders in Modern Warfare, 2d, enlarged edition, edited by Lt. Col. William Geffen, Washington, GPO, 1971, $1.60, stock number 0874–0003. (The Second Military History Symposium, held in May 1968.)

Science, Technology, and Warfare: Proceedings of the Third Military History Symposium, 8–9 May 1969, edited by Lt. Col. Monte D. Wright and Lawrence J. Paszek, Washington, GPO, 1971, $1.25, stock number 0874–0002.

Soldiers and Statesmen: Proceedings of the Fourth Military History Symposium, 22–23 October 1970, edited by Lt. Col. Monte D. Wright and Lawrence J. Paszek, Washington, GPO, 1973, $1.60, stock number 0870–00335.

The Military and Society: Proceedings of the Fifth Military History Symposium, 5–6 October, 1972, edited by Major David MacIsaac, Washington, GPO, 1975, $1.90, stock number 008–070–00367–8.

Military History of the American Revolution: Proceedings of the Sixth Military History Symposium, 10–11 October 1974, edited by Major Stanley J. Underdal, Washington, GPO, 1976, $2.70, stock number 008–070–0361–9.

The American Military on the Frontier: Proceedings of the Sixth Military History Symposium, 30 September–1 October 1976, edited by Major James P. Tate, Washington, GPO, 1978, $3.25, stock number 008–070–00423–2.

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The Military History Symposium is sponsored jointly by the Department of History and the Association of Graduates, United States Air Force Academy.

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OPENING REMARKS

LIEUTENANT GENERAL K.L. TALLMAN, USAF
SUPERINTENDENT, U.S. AIR FORCE ACADEMY

It is a special pleasure for me to open the proceedings of the Eighth Military History Symposium and to welcome to the Academy such a distinguished group of scholars, students, and participants in military history.

Since the first symposium was held in 1967, the Department of History and the Association of Graduates have hosted these meetings for principally three reasons: First, to provide a forum for the presentation of original research in the field of military history; second, to contribute to the published body of this research by the preparation of edited proceedings; and third, to stimulate among our cadets a professional interest in military history. I am confident, in looking around at this particular group, that no one here tonight will dispute the proposition that only through an understanding of the origins of the military profession can we properly understand its nature and, with this understanding, best operate in the future.

The topic for this symposium, "Air Power and Warfare," seems especially appropriate and timely since this year, of course, marks the 75th anniversary of powered flight. During those seventy-five years air power has played an ever-expanding role in warfare. There was a time when the visionaries of the air arm preached with some fervor the idea that the airplane invalidated the old principles of war. After several wars and the integration of air power into the strategies of peace, we can now include the visions with the actual experience of air power.

We are particularly pleased, of course, that the Academy is hosting this symposium on this very relevant topic. It was in 1954 that the president of Michigan State University, Dr. John A. Hanna, then serving as an Assistant Secretary of Defense in the Eisenhower administration, testified before Congress on the bill proposing to establish an air force academy. Dr. Hanna confessed in his testimony at that time that he had originally believed that civilian colleges and universities could produce the necessary officer corps of the new Air Force. After his experience

at the Pentagon, however, he was persuaded that military academies were essential and necessary, and I think you will find that one of his reasons for this persuasion is especially pertinent—that an air force academy was necessary to indoctrinate its cadets with the "proud, historical traditions of American military airmen."

Air power history, therefore, has always had a major role in the curriculum of the Academy. And we are very much aware from our teaching that much remains to be done in the research, analysis, and interpretation of air power history before we can truly say that we have helped to capture those traditions for our cadets.

So we look to this symposium to help us accomplish that particular assignment. This symposium is also unique in our series of symposia because so much of it deals with events still within the memory of living men and women. We have with us men who flew in World War I and others who shared in the great struggles of World War II, Korea, and Vietnam; and during the next two days we can speak with men who knew Billy Mitchell, Air Marshall Trenchard, and "Hap" Arnold, with those who flew to Schweinfurt, Tokyo, Mig Alley, and Hanoi. I know we will benefit from the chance to hear from the participants as we debate and discuss—hopefully in a friendly manner—the events of the past.

By joining the two realms of experience and analysis and bringing together two professions—history and the arms—I believe that this symposium will prove especially worthwhile to both the student of and the participant in military events.

I trust that all of you will enjoy yourselves during the meeting, that you'll have a chance, and take advantage of the chance, to meet and talk with our young cadets, and that you'll return again and again.

Contents

		Page
Preface		iii
Opening Remarks, K. L. Tallman		ix
I.	The State of Air Power History	1
	"The Influence of Air Power Upon Historians," Noel Parrish	3
II.	Air Power and Warfare, 1903–1941	21
	"The British Dimension," R. A. Mason	22
	"The Continental Experience," Edward Homze	36
	Commentary, Charles H. Gibbs-Smith	50
	"The American Dimension," Eugene M. Emme	56
III.	World War II in the Air: Different National Experiences	83
	"The Rise and Fall of the Imperial Japanese Air Forces," Alvin D. Coox	84
	"Soviet Air Power in World War II," Kenneth R. Whiting	98
	"Higher Command and Leadership in the German Luftwaffe, 1935–1945," Horst Boog	128
	Commentary, Alfred Goldberg	159
	An Added Comment: "Ultra and the Air War in Europe and Africa," Harold Deutsch	165
IV.	World War II: American Air Leadership	167
	"The Wartime Leadership of 'Hap' Arnold," John W. Huston	168
	"The Perceptions of Three Makers of Air Power History"	186
	Curtis E. LeMay	
	O. P. Weyland	
	William I. Martin	
	Discussion	197
	Commentary, Forrest Pogue	202
V.	The Search for Maturity in American Postwar Air Doctrine and Organization, 1945–1953	211
	Introductory Remarks, Ernest R. May	213

		Page
	"The Emergence of the Postwar Strategic Air Force, 1945–1953," John T. Greenwood	215
	"American Postwar Air Doctrine and Organization: The Navy Experience," David A. Rosenberg	245
	Additional Observations, John Greenwood and David Rosenberg	279
	Commentary, David MacIsaac	283
	Added Comments: Marine and Army Air Power in the Postwar Years	290
	"A Marine's Perspective," J. E. Greenwood	290
	"The Emergence of Postwar Army Aviation," Robert L. Williams	291
	"Army Aviation, A Short Bibliography," James L. Collins	297
VI.	Air Power Limits in Limited War, 1947–1978	299
	"From the Berlin Airlift to Vietnam and Beyond: A Participant's View," T. R. Milton	300
	"Air Power in Southeast Asia: A Tentative Appraisal," Ray L. Bowers	309
	Commentary, Edward G. Lansdale	330
	Discussion	333
	An Added Comment: "Vietnam: The Perspective of a Former Vice-Director of the Joint Staff," John B. McPherson	337
VII.	A Major Pioneer Looks at Air Power	345
	Introduction, K. L. Tallman	346
	"Some Observations on Air Power," Ira C. Eaker	348
VIII.	Insights into Technology and Air Warfare: Past, Present, Future	361
	"The Impact of War Upon Aeronautical Progress: The Experience of the NACA," Alex Roland	362
	"Technology, Doctrine, and Military Requirements," Robert L. Perry	386
	Commentary by a Scholar, I. B. Holley, Jr.	402
	Commentary by a Serving Airman, Bryce Poe II	410
IX.	The Eighth Military History Symposium in Perspective	419
	Closing Commentary, Theodore Ropp	420
	Participants	423
	Index	437

AIR POWER AND WARFARE

I

THE STATE OF AIR POWER HISTORY

A Harmon Memorial Lecture served as the keynote address for this symposium. The series of which this Harmon Lecture is a part began in 1959, in honor of the late Lieutenant General Hubert R. Harmon, first Superintendent of the United States Air Force Academy. Each year, a committee of internationally known historians and USAF Academy representatives invites an outstanding military historian or a scholar from a closely allied field to present an original lecture on a subject within the field of military history. The previous twenty lecturers and their topics are listed on the reverse side of this page.

The Twenty-First Harmon Lecturer, Brigadier General Noel F. Parrish, USAF (Ret), typified the kind of individual uniquely available for this symposium. General Parrish is a first-hand source on the evolution of air power, through his career as a pilot, commander, and high-level staff officer. After his retirement from military service, he took a Ph.D. in military history and went on to another career as a university professor and perceptive analyst of defense policy.

This unusual background gave a distinctive flavor to the keynote address. General Parrish could show with considerable credibility the pertinence to national policy of the widely acknowledged shortcomings in the historical record of air power. The continuing evolution of air power is burdened, he argued, by myths that had destroyed its original appeal as a method of reducing casualties in warfare and that now made the use of air power seem to be the epitome of inhumane and impersonal action. He blamed the prevalence of those myths, in part, on historians themselves, as well as on factors such as a deleterious climate within the United States government that inhibits the full and public examination of national defense matters and prevents official historians from addressing "serious and timely" issues. After assigning top priority to the writing of biographies as a way to restore the human dimension to the story of air power, he closed with words that left no doubt as to the shortcomings in the field of air power history and the potential significance of the symposium itself: "Despite the commendable efforts of many, our traditions and the memories that made them have been neglected, our costly lessons from the recent past are in danger of being forgotten before they are really learned. That is why we are here."

PREVIOUS HARMON MEMORIAL LECTURES

I. *Why Military History*, by W. Frank Craven, 1959
II. *The Military Leadership of the North and the South*, by T. Harry Williams, 1960
III. *Pacific Command*, by Louis Morton, 1961
IV. *Operation Pointblank*, by William R. Emerson, 1962
V. *John J. Pershing and the Anatomy of Leadership*, by Frank E. Vandiver, 1963
VI. *Mr. Roosevelt's Three Wars: FDR as War Leader*, by Maurice Matloff, 1964
VII. *Problems of Coalition Warfare: The Military Alliance against Napoleon*, by Gordon A. Craig, 1965
VIII. *Innovation and Reform in Warfare*, by Peter Paret, 1966
IX. *Strategy and Policy in Twentieth-Century Warfare*, by Michael Howard, 1967
X. *George C. Marshall: Global Commander*, by Forrest C. Pogue, 1968
XI. *The War of Ideas: The United States Navy, 1870–1890*, by Elting E. Morison, 1969
XII. *The Historical Development of Contemporary Strategy*, by Theodore Ropp, 1970
XIII. *The Military in the Service of the State*, by General Sir John Winthrop Hackett, G.C.B., C.B.E., D.S.O., M.C., 1971
XIV. *The Many Faces of George S. Patton, Jr.*, by Martin Blumenson, 1972
XV. *The End of Militarism*, by Russell F. Weigley, 1973
XVI. *An Enduring Challenge: The Problem of Air Force Doctrine*, by I. B. Holley, Jr., 1974
XVII. *The American Revolution Today*, by John W. Shy, 1975
XVIII. *The Young Officer in the Old Army*, by Edward M. Coffman, 1976
XIX. *The Contribution of the Frontier to the American Military Tradition*, by Robert M. Utley, 1977
XX. *The Strategist's Short Catechism: Six Questions Without Answers*, by Philip A. Crowl, 1978

THE INFLUENCE OF AIR POWER UPON HISTORIANS

BRIGADIER GENERAL NOEL F. PARRISH, USAF (RET)

Friends, seniors, juniors, countrypersons from near and far, we come here not to praise the history of air power, nor yet to bury it, but rather to revive it if we may. We who are about to *try* salute you innocent but entangled spectators. In the arena, tomorrow and after, the lions will appear: the great lionized leaders and writers of air power who represent its teeth and its roar. As your speaker tonight, I represent the rest of us, the anonymous Christians who furnish the meat of the spectacle.

Even among Christians there must be an opening gun, a little gun, firing blanks. So, as Horatio said to Daniel at Saratoga, "Let us begin the game." At this point ahead of time I announce a footnote, hoping to create at the outset a scholarly and professional illusion.[1] Further footnotes will be provided later for any who read.

This lightweight prelude has been presented so that veterans of open cockpit aircraft, and recent victims of hard rock music, may carefully adjust their hearing aids for what is to come. Please be assured, and warned, that within half an hour this discourse will become as heavy and as tragic as any you have ever heard.

I beg your further indulgence to reminisce for a moment. Some of you may recall another gathering of historians here just eight years ago. It was my privilege then to comment on a fine paper entitled "John Foster Dulles: The Moralist Armed." My simple comment was that a moralist should, by all means, be armed. This followed Sir John Hackett's splendid lecture to the effect that a leader in arms should, above all others, be moral.[2] I hope that my minor comments established a precedent for harmony and simplicity.

Our purpose in meeting here, as I understand it, is to enjoy the living elements of air power history, to mourn for the missing, the departed, and the ill-conceived, and to speculate hopefully on those elements yet unborn. Since the influence of air power upon most historians is largely negative, I will also discuss the influence of historians on air power which, by contrast, is practically non-existent.

Before we enter into this purgatorial situation, let us adopt, like Dante, a classic guide. He could be no other than the great Alfred Thayer Mahan, who once ventured into global concepts then unknown and emerged in glory. Doubtless you noticed that the title of his classic history book resembles the title of our non-book here tonight. Since *The Influence of Sea Power Upon History, 1660–1783* was translated and published in eight other nations and was highly influential in Britain, France, Germany and Japan, he is perhaps our best known historian. Global strategists admit their debt to him. Yet most American historians, other than the small military minority, blame him for America's past expansion and strength, which they have happily helped reduce.

Since Mahan also found American strength in relative decline, he is an appropriate companion for our brief journey. Except for his original dependence on two great sponsors, Mahan made it almost entirely on his own. The two sponsors were Admiral Stephen B. Luce, founder of America's first war college, and Theodore Roosevelt.

Military history, except during and right after wars, is not a subject of wide popular appeal in our country. Military historians have seldom gained distinction without faithful sponsors and supporters, as you well know. Though lucky in some respects, Mahan suffered the wisdom pangs of most normal historians. Not only did he suffer with the past, but also in the present. The depth of his insight into the past prevented him from accepting the shallow pretensions of most political administrations. He felt it his duty to say as much, from the very beginning, yet he survived. He enjoyed the freedom of military speech that flourished in America until the early 1960s, and he took full advantage of it, as we shall see.

Let us consider, then, the slow but sure influence of sea power upon two—yes, two— persistent historians.

This is their early story. Nearly ninety years ago, Captain Mahan, Professor at the Naval War College, urged by his wife, edited and expanded his War College lectures. Mrs. Mahan bought a secondhand typewriter, taught herself to use it, and typed the five hundred and fifty pages. No publisher would accept them.

A "vanity press" offered to publish the book at a cost of two thousand dollars. Mahan invited two men of wealth to finance the book and keep all returns. Both declined, but J.P. Morgan offered to advance two hundred dollars. The Captain, tired of asking, gave up. No so his wife. Finally, Little, Brown and Company agreed to take the risk. So great was the book's success, though mostly abroad, that Mahan eventually wrote nineteen more books and many magazine articles. He had no more problems of publication.[3]

None of the later books reached the stature of the first. It was like Herman Kahn and his great book, *On Thermonuclear War.* A friend said: "We should learn from Herman's experience and never put the most important things we know all into one book." And yet, a full generation after Mahan, Secretary of War Henry Stimson could refer to the United States Navy as "a dim religious world in which Neptune was God, and Mahan his prophet, and the United States Navy the only true Church."[4] So much for the influence of sea power upon two historians, Captain and Mrs. Mahan.

For reasons we have not time to examine here, historians had traditionally included, in general history, the history of warfare on land. Yet the great general and military historians, even those most admired by Mahan—Arnold, Creasy, Mommsen, and Jomini—had tended "to slight the bearing of maritime power on events." This was due, said Mahan, to their having "neither special interest nor special knowledge" concerning the sea. This reasoning is, of course, even more applicable to air and space.

Naval historians, on the other hand, Mahan saw as having "troubled themselves little about the connection between general history and their own particular topic, limiting themselves generally to the duty of simple chroniclers of naval occurrences."[5] This is perhaps less true of air power historians. We are often accused of limiting our knowledge of other histories, but not of limiting our opinions.

It is surprising that time has changed little since Mahan's observation. Recently military historian Peter Paret has commented on the striking lack of interpretive synthesis in military history. Military historian Allan R. Millett has called for works "that would link the writings of American military history to questions of lasting historiographical significance."[6]

More important, perhaps, is Millett's opinion that American military historians can work in the mainstream of research without "abandoning the historian's skepticism about quantification and models of predictable behavior." This is very encouraging. Would that military historians could spread their distrust of these tricks to our puzzled press, our bewildered Congress, and our disarming civilian controllers.

No history before Mahan's, military, naval or general, had proposed to "estimate the effect of sea power upon the course of history and the prosperity of nations." Prosperity, in the nineteenth century, and doubtless in the future, often meant survival. Remembering that sea power is as old as civilization itself, we must regard this oversight, which Mahan rectified, as the most amazing oversight in all the history of history. We have now endured but a tiny fraction of so long a delay in convincingly relating air power to the fate of nations. Yet our failure to define and

to apply the lessons of air power history now threatens to bring our civilization to an end. Why are we so slow?

No one but a historian can understand the tardiness of historians. Sometimes no historian can understand it. Let us remember that full comprehension of the meaning of any period of history requires insight into the meaning of life itself. No wonder the honest and modest historian may often feel no rush to publish. Ideologues and formula-mongers, on the other hand, suffer no such misgivings. The mysteries of historical cause and effect are easily resolved for them. They can be prematurely and continuously prolific, for they believe they can open every door to wisdom.

Mahan had no early illusions as to the depth of his wisdom. When he wrote his book, he was almost over-qualified, with thirty-three years of naval service and an even longer period of study in European and American history. While acknowledging his debt to many historians, he gave full credit to Jomini as the inventor of military "science" and of certain principles equally appropriate to war at sea. One idea alone Mahan claimed as his own: that control of the sea as a factor in history should be "systematically appreciated and expounded."[7]

The true secrets of Mahan's success lie in the depth of his thought and the persuasive skill of his expounding. It was his ability to make naval history an indispensable and sometimes dominant feature of national histories that did the trick. Question: How many historians have tried to do as much for air power? Who has introduced air power into general history?

The question of decreasing breadth in historical research and writing is a serious one. It exists even within the special field of military history, where we find experts concentrating on just one war, one service, and even one type of weapon. Some have attributed this increasing trend to the circumstances of graduate study, government employment, and teaching duties.[8] Many of us are aware of these pressures from experience, yet there are means of resistance. Biography relates military men to other elements of society. Other studies, involving military and race relations, civil-military relations, military education, the critical interdependence of military and commerical aviation, the military in politics, air power as a political issue, and similar subjects, may help penetrate the vast domain of general history.

At a session during the 1977 meeting of the American Historical Association, a successful publisher of military magazines explained the lure of pictures displaying such renowned weapons carriers as the B–29. Two well-bearded young professors rose to challenge the usefulness of attracting readers with such objects as B–29s. In the manner of oracles,

ney announced that "history is not history unless it has social significance." It was obvious that they meant political significance. They were true believers in the great historical forces conjured up by their chosen prophet; they could never see the pilots, the designers, the commanders of B–29s, as anything but pawns in an evil charade.

Is it not strange that the ideologues are as impersonal as the technology zealots who see us only as the robot operators of their favorite machines?

Technology is an indispensable ingredient of military history. Air power historians, as well as naval historians, have recognized its importance. The Army, forever plagued with manpower problems, is more inclined to treat it as a separate subject. As a result, the technology portion of the U.S. Army's eighty volume history of World War II is seldom used at the Army War College.

In the words of Benjamin Cooling, it is possible for historians to be "captives of technology as well as captives of ignorance about technology."[9] Many of us resist the constant implications that technology is our master, and we tend to avoid the subject. Knowledge of the trends and effects of technology is valuable, but we need not accept the pretense that it is some kind of supernatural juggernaut, whose predestined machinations will destroy us, which is conceivable, or control us forever, which is inconceivable.

Air power historians now face, or refuse to face, a serious problem similar to one surprisingly solved by Mahan. A present solution, if one is achieved, must necessarily resemble his in some degree. The similarity is that we have witnessed the end of complete dependence on wings as he had witnessed the end of complete dependence on sail. Steam power had been used only sporadically in major wars, as missiles and rockets were used in World War II. If we are not to depend entirely on the artificial pre-calculations of total human and weapon behavior that most historians despise, then we must discover in past experience lessons applicable to the changing technology of the future. Mahan went about it in a surprising way.

His first great book began with an honest recognition that "steamships have as yet made no history which can be quoted as decisive in its teaching." He said, "I will not excogitate a system of my own." That would be unreliable. So he retreated two hundred years to begin his story and closed it in 1783, a full one hundred years before the time of his writing. He had determined, as he put it, "To wrest something out of the old woodensides and twenty-four pounders that will throw some light on the combinations to be used with ironclads, rifled guns and torpedoes."[10]

How did he do it? Not by ignoring current technology, for he was an ordnance officer. Instead, he bypassed technology into the past rather than into the future. His insight was that while the behavior of ships may vary, the behavior of people who direct them changes but little. As he put it: "Finally, it must be remembered that, among all changes, the nature of man remains much the same; the personal equation, though uncertain in quantity and quality in the particular instance, is sure always to be found."[11]

Not even those cool technicians the Wright Brothers were motivated entirely by the challenge of experimentation. As our colleague, Charles Gibbs-Smith is doubtless aware, they were inspired by the story of the first truly scientific martyr to the control of wings, Lilienthal. He, in turn, had been inspired to master the air by his reading the story of Count Zambeccari, a truly adventurous Italian balloonist.[12]

Mahan made yet another useful contribution when he showed us that the burden of advocacy is not so overpowering when it rests upon a broad historical base rather than a narrow one. Mahan wrote of the rise and fall of nations over periods of centuries. Yet he introduced a new factor. He said: "Writing as a naval officer in full sympathy with his profession, the author has not hesitated to digress freely on questions of naval policy, strategy and tactics."[13]

He did indeed speak his mind without hesitation, and with the results that plague all men who do so. Most American naval officers did not, at first, agree with him. The British, French, German, and Japanese navies accepted his recommendations before his own navy did. He was immediately ordered to sea by an admiral who said: "It is not the business of a naval officer to write books."[14] Another admiral placed several cages of canaries near his cabin while at sea and announced that he wanted to drown out the scratching of Mahan's pen.[15]

As sometimes happens to historians today, Mahan had much less trouble with his civilian controllers. The disturbed admirals had no thought of silencing him, but tried, instead, to close his beloved War College. Two successive Secretaries of the Navy saved it. This despite the fact that, in mid-career, young Commander Mahan had written numerous letters to influential congressmen and others concerning political corruption at the Boston Navy Yard. He recommended "a thorough investigation of the Secretary of the Navy," which he predicted would result in the Secretary's removal.

Mahan expressed his views completely and openly, regardless of their popularity. Senior officers were not then required to speak only in agreement and thus help re-elect each incumbent administration. Theodore Roosevelt wrote: "It is important for you to write just what you

think."[16] Other presidents adopted policies that were strongly criticized by Mahan, but they did not deny him the protection of the First Amendment just because he was a naval officer. Only Woodrow Wilson, in his neutralist-pacifist phase, caused any trouble, and that was an aberration. The currently touted notion that American tradition silences military opinion is, of course, quite false.

From the beginning, Mahan proposed "to draw from the lessons of history inferences applicable to one's own country." It was proper, he said, in case of national danger "to call for action on the part of the government," and that was what he did. He saw the United States as "weak in a confessed unpreparedness for war" and lacking defenses to gain time for belated preparation.[17] In less than a generation he was proven correct as far as the Army was concerned, but the Navy had prepared just in time for the Spanish-American War.

Three generations later, free speech for military leaders was still the American practice. Just before the so-called surprise of the Korean War, Air Force Chief of Staff Hoyt Vandenberg sounded very much like Mahan. He said bluntly: "I have freedom to speak in one area and that is the military point of view, while our secretaries have to take the view of both the military and economic area, insofar as they can."[18] In a prepared public speech just before the Korean War he made a statement which is again uncannily appropriate:

> It is always pleasant to be cheerful and reassuring. But I must ask you, as responsible citizens, to face some facts from which I can find no escape. I know of no military calculations which indicate that the risk we take is decreasing . . . to speculate upon whether Russia would attack us after building forces capable of defeating us is the most fateful speculation in all history . . . the time to begin our preparation is now.[19]

Nevertheless, the Truman administration continued to reduce American military forces until the Korean explosion, but Truman overruled Secretary of the Air Force Finletter to keep Vandenberg in office beyond the normal four year tour. All this was considered to be the American tradition. So was President Eisenhower's forbearance two years later in granting Vandenberg complete and uncensored freedom to make public attacks on the new Eisenhower force levels for the Air Force.[20]

These events and many others belie the current myth that American history justifies gagging its military leaders and its official historians. Distortions of history often are used to conceal present truths. The number of such distortions concerning air power and its leaders are too numerous even to mention, yet few corrections have been written. Here are a few of the still popular myths: The Douhet Myth, the Bombing of Dresden Myth, the Claude Eatherly Myth, the B–36-Was-Useless Myth, the Foulois Air Mail Disaster Myth, the Dien Bien Phu Intervention

Myth, the Bay of Pigs Myth, the Cuban Missile Crisis Myth, the "Linebacker-II" Losses Myth, the Myth of Superior Historiographical Wisdom in the Higher Grades, and finally the Myth of Ineffective Air Power in World War I.

An especially persistent myth is that of the Air Force's positions on the nuclear weapon. Far from being elated at the gift of the atomic bomb, Air Force leaders were long reluctant to accept it and even more reluctant to depend upon it. General Spaatz, who received the first order to drop the bomb, demanded a written order and even asked to be allowed to drop it near, rather than on, a city.[21] He was overruled by the scientists, who wanted a "virgin target," an unbombed city, for testing the effects of their bomb.[22] As years passed and military budgets were further reduced, it became apparent that our "shoestring" Air Force would have to depend upon our few big bombs. Even then, General Earle Partridge, in a letter here in the Academy collection, wrote General Muir Fairchild at the War College to ask why only one hour of the curriculum in an entire year was devoted to the atomic bomb.

Earlier, General Arnold had written that he hoped for United Nations control of the bomb. In any case, he said, "There is historic precedent for withholding destruction in wars. The case of gas in Europe is an example . . . other instances of non-destruction are . . . the open cities of Paris and Rome."[23]

General Vandenberg, who had to face the question repeatedly, stated many times the now traditional Air Force position. Asked whether he would bomb a city in retaliation, he said. "No." World War II experience had shown him that civilian killing tended to unite the survivors. He said, "We do not believe in indiscriminate bombing of cities."[24] On another occasion he said that after absorbing an attack, our strategic force would be deployed for defense. He said: "It must be employed to insure that air attacks against us cannot be repeated. This is more important than mere retaliation. Our principal aim is not to destroy *another* nation, but to save *this* nation. We cannot waste our forces on mere revenge."[25] General Nathan Twining, as Chief of Staff, announced that the Air Force would not bomb cities. General Thomas D. White officially adopted the term "counterforce" in contrast to counter-city.

General Curtis E. LeMay, who was once pictured as an airborne Genghis Khan, continued the Air Force tradition on targeting in October of 1964. He explained that some cities were targeted in the early days of meager forces and few bombs as a possible way to check the advance of massive Soviet ground forces into Europe. The early 1950s brought us both the means and the necessity to "place Soviet air bases and bombers at the top of the target list. This was the first step toward the Air Force's concept of strategic counterforce." General LeMay expressed

what has proved to be misplaced confidence in the nation's top-level leadership:

> Today we are not hearing as many proposals for the adoption of bargain basement alternatives to a counterforce posture. There was a time not so long ago when some people seemed to think that all we needed as a deterrent was the ability to destroy a few Russian cities. Almost everyone who has thought this problem through has rejected that proposal for a posture based on strategic advantage.[26]

The Vietnam War, engineered by Mr. McNamara's "Charles River School of Strategy," soon began to cost so much that our ability to challenge Russian military strength was abandoned. We were reduced to mutual assured destruction or the "MAD" plan. Since we did not wish to pay the price necessary to overcome Russian military power, we offered our population, undefended, as a hostage against our use of nuclear weapons. Yet nuclear weapons are necessary in our NATO defense plan. The old, desperate expedient of launching missiles against cities on warning of a Russian attack, without knowing the Russian targets, was considered briefly after the Russians launched Sputnik. This suicidal proposal was abandoned as quickly as our protective silos could be built. According to Edward Teller, inventor of the H-bomb, the mere suggestion of such a murderous plan was the most immoral idea in history. Now that our silos are vulnerable, the amazing (cheap) answer for high defense officials has been to revive such a plan again, as what they call a viable option.[27] It may be suicidal, but it is cheap.

As long as we builders and operators of air power allow ourselves to be branded with potentially self-destructive "'bargain basement" strategies, the population we offer as hostages will scarcely regard us as worthy of confidence and respect. The first requirement for the salvation of our pride is establishing clearly that a strategy of civilian slaughter, involving necessarily our own people, is not military in any sense. Until we can divest ourselves of the albatross of false blame for such a horrible evasion of human and military responsibility, we shall be regarded, increasingly, as heralds of the Apocalypse.

The only way out, of course, is up. Most of us have failed to understand the basis of the once great enthusiasm for sea power and later for air power. That enthusiasm rested on the hope that each offered an escape from the devastation and the civilian casualties of land warfare. We forget, for instance, that air warfare in World War II, by preventing a deadlock, saved more casualties than it caused. We forget that the fascination of *Star Trek*, and especially of *Star Wars*, is based on warfare far away in the sky, with no threat to anyone but the distant participants. Such a reaction is not foolish at all.

A decision in space is the only possibility now for evading a holocaust on our already polluted globe. Yet the official attitude toward space is that it is some kind of semi-religious and sacred sanctuary, while our

cities, crowded with humans, are fair game. This foolish notion, as our colleague Eugene Emme will probably testify, is the result of our lassitude in getting our heads up far enough to see where the thrust of our future effort should be. Established land, sea, and air power remain the basis for such a thrust. But up and out is the only departure from the booby-trapped cage of options our politicized, computerized, and richly vocabularied civilian controllers have built for us.

The widening gap in our history, which means the gap in our understanding of the past and our planning for the future, lies between our airborne achievements of World War II with its two sequels, and our space potential of the present and of the future. Unless we awaken and bridge this gap, we may not earn for ourselves a future. Only a bold, thorough, and uncensored treatment of history can suggest for us such a bridge.

Unfortunately, recent history is being written almost entirely by our slowly awakening journalists. Official histories are slow to appear, and most are deliberately non-controversial, with no lessons drawn or implied that might be applicable to our present crises. Other historians tend to follow the popular anti-military myths. In fact, some two decades ago, a deputy chief of military history, moving ahead of the tide, observed, "Serious dangers attend any historian who wishes to prophesy, or to get into the realm of what he thinks should not have happened."[28]

Prophecy should indeed be restrained. But as for judgments of the past, who can be so hypocritical as to deny them? Does spreading timidity have to ignore all that should *not* have happened? Where is the spirit of the great historians of the past?

A long generation ago, John Cuneo, one of the best early historians of air power, was critical of most air power histories. "Besides presenting an obviously incomplete picture," said Cuneo, "they unfortunately are written by authors who are advocates rather than historians."[29] Recently, Robin Higham, our most active editor and publisher of air power history, explained that "the history of air power has been much confused . . . by lack of historical perspective on the part of its exponents."[30]

Mahan's long labors in the salt mines of previously non-significant naval history were inspired entirely by the conviction that his effort was necessary. It was his response to a revelation of general history that, as he expressed it, "The United States in her turn may have the rude awakening of those who have abandoned their share in the common birthright of all people, the sea."[31] Indeed, before he died, another and greater sea began to become navigable.

Long ago another prophet, Sir Charles Cayley, had seen the new sea as "an uninterrupted navigable ocean, that comes to the threshold

of every man's door," and that "ought not to be neglected." To extend Mahan's basic concept into the present we need only to add the still controversial words "air" and "space" or their equivalent. It would come as no surprise to the departed admiral that his principles are expandable to infinity. To all seamen from the unrecorded beginnings to the nineteenth and into our present century, the sea *was* infinity.

The basis for sea power and air power development was the historically demonstrated requirement of all great nations for access to the sea, and later, by extension, the power to use the sky. It was seen that nations lose their chance for survival as great nations if they lose the power to use sea and air space and to prevent others from using this space effectively against them.

Concepts of warfare expand, eventually, as human activity expands. Areas of warfare often expand ahead of concepts, as new capabilities of navigation reach out, first across the seas, then into the air, and ultimately into space. The first great expansion left the narrow limits of traversable land to cross the global oceans. From there, curiously, progress extended up and down at the same time and established a peculiar commonality between aircraft and submarines. Each operates in only one medium, yet in its medium each is supreme and each operates there alone. Naval historian Theodore Roscoe has noted that in the last great war Japan was drowned in the third dimension, losing most of its vital shipping to aircraft and submarines.[32] But the third dimension is limited on the way down and has no limit on the way up. This means that whether we like it or not, the zone of war can no longer be limited.

Sea power expanded, very slowly, beyond the limits of land power. As global strategy followed the spread of warfare in the age of sail, it set the pattern for air power as the range of aircraft extended. As the age of globe-ranging air power was launched from land and sea, the age of space is now being launched from land and sea, but also through and from the air. Whether we speak of aerospace power or just air power extended makes little difference.

Since we now are long past all hope for deceptively simple answers to questions raised by our topic tonight, we should admit that we are now considering the impact of recent air power historians on air power. This is not the moment for blanket self-decoration, despite Ken Whiting's demonstrated understanding of Russian strategy which exceeds anybody's understanding of our own strategy; despite the timely social work of Alan Osur and Alan Gropman;[33] despite some useful and partially available monographs which have been said to "smack of interservice rivalry"; despite the readable and much appreciated Schweinfurt story by Thomas Coffey.[34]

It has been said that a major problem of military history is significance rather than quality or quantity, since ther are more than half a hundred dissertations annually in American military history alone, nearly a hundred academic military historians and half again as many university courses, and hundreds of military historians in defense agencies.[35] Undoubtedly, air power history comes up short in all these categories, partly because air power history is short and partly because air power leaders, with notable exceptions, are short of interest in the subject. We were off to a bad start when we were funded for just seven volumes of World War II history, which were excellent, while the Army alone was funded for ten times that number and at last report was still typing away.

Nevertheless, despite handicaps and fluctating support, some excellent products have appeared. Al Goldberg's outstanding brief history of the Air Force was readable yet sound, and appropriately embellished with nostalgic pictures.[36] I.B. Holley's unique synthesis of policy, technology, and industry is out of print and disappearing from some libraries.[37] Eugene Emme has produced NASA history that reads better than reports of its present delayed capabilities. One phrase alone is worth an anthology: "The unknown will, as always, yield up many yet-undreamed-of-rewards."[38] This principle was accepted for Mahan's sea and Mitchell's air, but for whose space? Perhaps the Russians' space.

On that sad note we may now consider our deficiencies. According to Army historians, who seem more capable of self-criticism than we have been lately, the major deficiencies are common to all types of military history: army, navy, and air. They are: a dearth of successful integration of technological factors into narrative, an area where air power historians have an edge, though not in major works. Worse is our sad lack of synthesis, or "putting it all together"; and, finally, our weakness in biography. In both the latter, air power is down, well down.

Of the digesting and interpretation of massive research into a major work we have just three examples at the moment. Most recent is David MacIsaac's definitive work on the much abused and misused strategic bombing survey report.[39] The other two are the work of the most dedicated and productive Air Force historian now living, though he is not well. Frank Futrell's history of Air Force doctrine will be indispensable long after the otherwise unused sources are forgotten and destroyed. His *United States Air Force in Korea* gained better treatment and has been used constantly.[40] No other accounts are available. It was admitted by Air University officials that the massive Vietnam history project known as "Corona Harvest" should be greatly reduced unless people capable of helping Futrell distill it and put it together could be found. No one was found, and Frank's health was failing. The massive effort now lies

overclassified and unused, while other historians, poorly informed, go on writing histories that, loaded with error, will become fixed in tradition. The military lessons of the Vietnam war, freely spoken by colonels, may not please all above them, and in any case may never be declassified and presented in usable form.

Our weakness in biography is almost equally damaging. While the Army and Navy have biographical works on some eight generals and admirals of World War II and after, we have only an interesting and somewhat underrated autobiographical work on General Hap Arnold,[41] and a well-written though discursive biography of General LeMay by distinguished novelist MacKinley Kantor.[42]

Fortunately, we are seriously rocking the cradles of elementary aviation and of military aviation. Charles Gibbs-Smith, following Fred Kelley, is doing an in-depth study of how powered flight, like powerless balloons, was born of two brothers. Colonel Al Hurley has studied Billy Mitchell's overactive mind as he stood alone against slings and arrows and got himself reduced to a half-dip retired pay, which he refused.[43] Hurley is now digging a deep trap for Air Force history, which has been almost as elusive as Air Force doctrine. We are painfully missing the impressive story of General Carl Spaatz, the George Washington of Air Force independence; of General Hoyt Vandenberg, the most spirited and determined chief; and of durable General Nate Twining, the great stabilizer and the last survivor of the period when chiefs were allowed to talk and to act like chiefs. Finally, we need an account of General Thomas White, the gentleman diplomat who formally clarified Air Force strategy and doctrine only to see it mangled by aeronautically illiterate think-tank forces from the north and west.

Lack of biography may be our most crippling weakness. It may have encouraged such aberrations as a recent dictum from a history administrator warning that "we are interested in issues, not personalities."

There was no understanding of systematic warfare until the story of Napoleon was written. Mahan recognized that he had not created an understanding of sea power until he had written a biography of Nelson.[44] It became his most difficult but in some respects his most successful effort. Not until you read Forrest Pogue's story of George Marshall's heroic struggle to avoid a drain on American manpower near the close of World War II can you understand the chronic problem of our manpower limitations in war.[45] As Emerson said: "Perhaps there is no history, only biography."

We may agree with Benjamin Cooling that we "need to spend less time administering pedantic programs and more time pondering the great

issues raised by the material they hoard."[46] It is scarcely possible to understand issues without knowledge of the men who created them.

Having painfully reviewed our deficiencies, let us note with dubious comfort that sea and land power historians, despite their achievements, share the same basic problem. As Benjamin Cooling of the Army War College put it, "Somehow, historians and particularly military historians have failed to convey the utility of their discipline to those charged with national defense today."[47] Also, uniformed historians of live issues, such as Mahan, could not survive today, and neither could the Vandenbergs, or even civilians on government sponsored payrolls. The journalists had to take over the serious and timely issues.

It was not easy to use the whip on journalists, but there were other methods, such as the golden carrot. In the early 1960's journalist Richard Fryklund was the principal historian of how we developed and debated the strategy of targeting populations, a strategy which guaranteed the sacrifice of our own. His book, *100 Million Lives,* is still the best historical account of that strange happening. On the last page he wrote: "A final obstacle to the adoption of a rational strategy was the unfortunate effort by Mr. McNamara to cut off authoritative discussion of strategy. . . . Even conversations about abstract theory of strategy were banned. . . . Fortunately for us all, his rule could not be enforced."[48]

It could, of course, be enforced on everyone or anyone paid by Mr. McNamara's Department of Defense, but not on journalists. Eventually, Fryklund and a journalist friend were appointed to Mr. McNamara's staff as the senior officials in his Directorate of Public Information. Other journalists, too numerous to mention, were influenced in a similar manner, either by accepting political appointments or suffering restrictions by publishers responding to political pressures.

With journalists alone capable of digging beneath the surface and not always succeeding, it is scarcely surprising that "those charged with national defense today" seldom seek enlightenment from historians. Nevertheless, there are ways of bringing reality to light, as General Eaker and a few others have demonstrated. One way is the writing of recent history by influential participants. Here again, air power has not fared too well. At least four army generals in recent years have written histories of the Korean and Vietnam wars, with considerable assistance, quite properly, from army historians. We have none from the air leaders except for General Momyer's recent *Air Power in Three Wars* and Admiral Sharp's *Strategy for Defeat.*[49]

Official military histories have long been denigrated, not always with sound reason. Alfred Vagts, sympathetic but critical, said, "If confession is one test of truthfulness, then there is little of reality in military

memoirs." The history of warfare, he said, is "dependent to a large extent on the writers' desire to preserve reputations, their tendency to cliches, . . ."[50] Obviously, there has been improvement in recent years, but iconoclastic historians, such as Peter Karsten, have revived the old derogatory theme. Less dogmatic historians admit that the split between "official" and "counter-official" military historians has damaged both.[51]

The introduction of oral history into military history has helped to make military history more believable. From the time Admiral Eller encouraged Navy cooperation with the Columbia program, this breeze of fresh air has produced more convincing truth than many times its weight in documents. Anyone who has attended a training course at Maxwell AFB, supervised by Dr. Hasdorff and Colonel Dick, has witnessed in these sessions a revival of the old spirit, when air power history was considered a revelation and not just an officially supervised chore. The introduction of active veterans of recent actions into all our history programs is also inspiring.

Only in recent years have air power historians begun to exploit the greatest advantage of their field: that so many important participants and their associates are still alive. Ardant du Picq, a long time ago, wrote a passage which expresses a truth that many historians have found too great a challenge: "No one is willing to acknowledge that it is necessary to understand yesterday in order to know tomorrow, for the things of yesterday are nowhere plainly written. The lessons of yesterday exist solely in the memory of those who know how to remember because they have known how to see, and those individuals have never spoken."[52]

In the air age some have spoken and spoken well, but not enough. As Frank Futrell discovered in writing his last book, "Men who believed and thought and lived in terms of air power were the makers of the modern air force." Their thinking was *not* limited by the current military policy or by the national policy of the moment. It was not even limited by the prevailing state of technology. Their perspectives, their awareness of history, taught them how these things change. Had they been awed by the national policy of isolation in the 1930's, a lack of advanced air power in Europe and the Pacific would have drained American manpower before the decisions there could be reached.[53] There are young men today, necessarily silent, who believe and work with the same dedication as the air power pioneers. They see the same need, or an even more urgent need, to be able to operate in upper space as effectively as we have in the lower space. It is this spirit that must prevail, though machines and circumstances change.

In the past our great problem was our rate of loss of leaders. General Doolittle recently named four men as leading air power thinkers: Mitchell, Arnold, Hickam and Andrews.[54] Many of us can remember the last

three, but all are gone. Mitchell and Arnold died early; Hickam and Andrews crashed in their planes before or during World War II. Spaatz, Vandenberg, White and many others of similar significance are gone. Despite the commendable efforts of many, our traditions and the memories that made them have been neglected, our costly lessons from the recent past are in danger of being forgotten before they are really learned. That is why we are here.

Notes

1. Horatio Gates and Daniel Morgan, Bemis Heights, New York, 7 Oct 1777.
2. Monte D. Wright and Lawrence J. Paszek, eds., *Soldiers and Statesmen: Proceedings of the Fourth Military History Symposium, USAF Academy, 1970,* (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 183, 167f.
3. W.D. Puleston, *Mahan* (New Haven, Conn.: Yale University Press, 1939), p. 89.
4. Henry L. Stimson and McGeorge Bundy, *On Active Service in Peace and War* (New York: Harper and Brothers, 1947), p. 506.
5. A.T. Mahan, *The Influence of Sea Power Upon History, 1660–1783* (Boston: Little, Brown and Co., 1890), p. v.
6. Alan R. Millett, "American Military History: Struggling Through the Wire," essay given at Ohio State University, 1975, pp. 6, 25.
7. Puleston, op. cit., p. 69.
8. Millett, op. cit., p. 17
9. Benjamin Franklin Cooling, "Technology and the Frontiers of Military History," paper presented to the International Commission on Military History Symposium, Washington, D.C., 18 August 1975, pp. 12, 13
10. Puleston, op. cit., p. 77.
11. Mahan, op cit., p. 89.
12. L.T.C. Rolt, *The Aeronauts* (New York: Walker and Company, 1966), p. 98.
13. Mahan, op. cit., p. vi.
14. Puleston, op. cit., p. 115.
15. Ibid., p. 151.
16. Ibid., p. 270.
17. Mahan, op. cit., pp. 34, 83.
18. General Hoyt S. Vandenberg, Briefing to Civilian Orientation Conference, Washington, D.C., 17 April 1950, author's file.
19. General Hoyt S. Vanderberg, Armed Forces Day address, Detroit, Michigan, 19 May 1950, author's file, also Office of the Chief Historian, Department of Defense.
20. Author's notes.
21. General Carl Spaatz, interview by Alfred Goldberg and Noel Parrish at the Air University Library, Alabama, 21 February 1962.
22. Brigadier General Paul W. Tibbets, interview by Noel Parrish at the Air Force Historical Documentation Center, September 1966.
23. Charles Masters and Robert Way, eds., *One World or None* (New York: McGraw-Hill Book Company, 1946), p. 31.
24. Vandenberg briefing, op cit.
25. General Hoyt S. Vandenberg, Public Briefing Questions Period, 19 April 1950, author's file.
26. Curtis E. LeMay, "Strength + Vigilance = Deterrence," *General Electric Forum,* Vol. III. No. 4, Oct-Dec, 1964, pp. 14–16.
27. Secretary of the Air Force Harold K. Brown, Remarks to the Commonwealth Club, San Francisco, 23 June 1965.
28. Stetson Conn, quoting Army Deputy Chief Historian Miller in OCMH Seminar Series, 23 June 1965.
29. John R. Cuneo, *Winged Mars* (Harrisburg, Pa: Military Science Publishing Co., 1940), p. i.
30. Robin Higham, *Air Power: A Concise History* (New York: St. Martin's Press, 1972), p. 1
31. Mahan, op. cit., p. 42.
32. Theodore Roscoe, *United States Submarine Operations in World War II* (Annapolis: United States Naval Institute Press, 1949), p. 495.
33. Alan M. Osur, *Blacks in the Army Air Forces During World War II* (Washington, D.C.: U.S. Government Printing Office, 1977). Alan L. Gropman, *The Air Force Integrates, 1945–1964* (Washington, D.C.: Government Printing Office, 1978).
34. Thomas M. Coffey, *Decision Over Schweinfurt* (New York: David McKay Co., Inc., 1977).
35. Millett, op. cit., p. 19.
36. Alfred Goldberg, ed., *A History of the United States Air Force 1907–1957* (Princeton: D. Van Nostrand, 1957).

37. Irving B. Holley, *Ideas and Weapons* (New Haven, Conn.: Yale University Press, 1953).

38. Monte D. Wright, ed., *Documents in the History of NASA* (Washington, D.C.: NASA, 1975), p. 117.

39. David MacIsaac, *Strategic Bombing in World War Two* (New York: Garland Publishing Inc., 1976).

40. Robert F. Futrell, *The United States Air Force in Korea, 1950–1953* (New York: Duell, Sloan and Pearce, 1961). Robert F. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964*, 2 vols. (Montgomery, Ala.: Air University, 1971).

41. Henry H. Arnold, *Global Mission* (New York: Harper and Brothers, Publishers, 1949).

42. Curtis E. LeMay with MacKinlay Kantor, *Mission with LeMay* (Garden City, N.Y.: Doubleday and Co., Inc., 1965).

43. Alfred F. Hurley, *Billy Mitchell: Crusader for Air Power*. New ed. (Bloomington, Ind.: Indiana University Press, 1975).

44. A.T. Mahan, *The Life of Nelson: The Embodiment of the Sea Power of Great Britain* (Boston: Little, Brown and Co., 1900).

45. Forrest C. Pogue, *George C. Marshall: Organizer of Victory, 1943–1945* (New York: The Viking Press, 1973), Chap. XXV passim.

46. Cooling, op. cit., p. 20

47. Ibid., p. 13.

48. Richard Fryklund, *100 Million Lives: Maximum Survival in a Nuclear War* (New York: The Macmillan Co., 1962), pp. 169–170.

49. William W. Momyer, *Air Power in Three Wars* (Washington, D.C.: U.S. Government Printing Office, 1978).

50. Alfred Vagts, *A History of Militarism* (New York: W.W. Norton and Co., Inc., 1937) pp. 23, 25, 26.

51. Millet, op. cit., pp. 4, 5.

52. Charles Ardant du Picq, *Battle Studies*, trans. Colonel John N. Greely and Major Robert C. Cotton (Harrisburg, Pa.: Military Service Publishing Co., 1947), p. 5.

53. Futrell, *Ideas, Concepts, Doctrine*, op. cit., Vol. 2, p. 808.

54. James H. Doolittle, interview at the USAF Historical Documentation Center, 1965.

II

AIR POWER AND WARFARE, 1903–1941

Of all the subjects in the symposium, historians were best prepared to deal with the topic of this session. An energetic figure in air power history, Professor Robin Higham of Kansas State University, was in the chair while several scholars collectively laid the basis for a comparative analysis of the experiences of several nations with military aviation.

Previous scholars already had examined individual national experiences in isolation; the planners of this session saw an opportunity for the speakers to piece together the international story. Group Captain R.A. Mason, the Director of Defence Studies for the Royal Air Force, persuasively identified the distinctive elements in the British contribution to the international story. A scholar who has done important work on the German experience, Professor Edward Homze of the University of Nebraska, presented what might well be the best short survey yet to appear of the early experiences of the major nations on the European continent. Doctor Eugene Emme, a veteran aviation historian, worked around the gaps in the scholarship on the American experience and identified factors that would be important in any future analysis of this country's contribution to international development.

All three of these speakers and the session commentator gave a prominent place to the influence of World War I. Homze explicitly and Mason by implication saw that war as "*the* turning point" for military aviation in Europe because the requirements of the conflict changed it "from an oddity to a military necessity." Charles Gibbs-Smith, the English-speaking world's most famous historian of the invention of the airplane, commented about the even greater significance World War I could have had for international military aviation if the Wright Brothers' achievement had been publicized earlier than it was. For the United States, Emme suggested, the war was important as the setting for a vision of the reality that would not occur until the nation entered World War II.

The session ended before questions and observations from the floor could have highlighted the full value of the work of the speakers. For example, some observer might well have noted the suggestions in the papers of the importance of timing in technological advance and also its non-partisan and international character. The continental powers knew the potential of the strategic bomber, but its development usually seemed too far off for their war planners or had to give way to pressing tactical needs. Both England and the United States, on the other hand, had the time to take advantage of a technological advance available to any country able to wait for it.

THE BRITISH DIMENSION

GROUP CAPTAIN R.A. MASON, RAF

For over eighty years now, close co-operation and mutual respect have marked the relationship between air power exponents in Britain and the United States. It is, therefore, a very great honour for me, as a serving Royal Air Force officer, to be invited to address such a distinguished audience on the subject of "The British Dimension" before World War II in the broader theme of the impact of air power on twentieth century warfare.

I should like to identify three features in this British dimension which, I believe, have made a major contribution to that evolution. They are, first, the presence in Britain even before 1914 of a clearly recognisable body of fundamental air power doctrine; second, the example of the first independent, unified air force; and, third, the formulation of concepts of tactical and strategic offensive air power.

The First Ideas

The first feature is the presence in Britain before 1914 of ideas about the application of air power. I would distinguish between speculative ideas, which these were, and systematic theories based on observed facts, which they could not yet be.

The early British aeronautical enthusiasts, civilian and military, were a relatively small group. They exchanged ideas verbally at meetings at the Aero Club, at the Aeronautical Society, at increasing numbers of flying exhibitions and, less frequently, at the Royal United Services Institution.

I am indebted to Colonel Hurley for the information that as early as 1893, Major J.D. Fullerton of the Royal Engineers had presented a paper at a meeting of military engineers in Chicago in which he prophesied that the impact of aeronautics foreshadowed "as great a revolution in the art of war as the discovery of gunpowder," that future wars may well start with a great air battle, that "the arrival of the aerial fleet over the enemy capital will probably conclude the campaign," and that "command of the air" would be an essential pre-requisite for all land and air warfare.[1]

Although Major Fullerton does not seem to have included such prophetic statements in his addresses to British audiences during the next twenty years, his engineering friend, F.W. Lanchester, expressed a similar view in the *Aeronautical Journal:*

> Under the conditions of the near future, the command of the air must become at least as essential to the safety of the empire as will be our continued supremacy of the high seas.[2]

In 1909 *Flight* became the official journal of the Aero Club, "Devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport."[3] On 27 February, *Flight* published the first international survey of military aviation, by Major George O. Squier of the Signal Corps of the United States Army.[4] In 1911 the magazine *Aeroplane* under the dynamic editorship of Charles Grey began its stern monitoring of developments in British military aviation. These journals, together with occasional contributions in the *Journal of the Royal United Services Institution,* were the primary breeding ground for British ideas about air power.

On 15 May 1909, the editorial in *Flight* was titled "Britain and the Command of the Air" and expressed concern at the nation's vulnerability to hostile aircraft even at their current stage of development, quite apart from the advent of "all-weather aircraft."[5] In May 1911, Captain C.J. Burke wrote the first article on air power to be published by the *Journal of the Royal United Services Institution,* initially concentrating on the airplane as a reconnaissance vehicle, but then reaching the same conclusion as his civilian friends: "May not the command of the air be as important to us in the future as the command of the sea is at the present moment?"[6] Yet this idea was not the prerogative of English theorists.

At the same time as he wrote that article, Captain Burke had reviewed a book for the *Aeronautical Journal* by the French General Frey, who had posed the question: "May not the command of the air be of such importance that the power who loses it may be forced to sue for peace?"[7] But then Captain Burke concluded his review with a very different idea: "No one can question the need for the fourth arm at the present minute, and if aviation continues to advance at its present rate, a new service will be a necessity."[8]

During this period, the *Aeronautical Journal* quarterly surveyed the French and German, but not the Italian, aviation press. So there is no evidence that the British coterie heard about Douhet's first thoughts in 1910 on *Problems of Air Navigation,* which included his proposals for a separate service.

Then, in 1913, Colonel Fullerton addressed the Royal United Services Institution on the theme of aeronautical progress. After examining the concept of the command of the air, he concluded that:

> A separate organization, with its own commander-in-chief, is essential for success and it is to be hoped that this will be realized before it is too late to take action in the matter.[9]

Not surprisingly, his view prompted stern disagreement from the major general who was chairing the meeting and from several members present.

The following year Lanchester, now a member of the Aeronautical Society and a regular contributor to the other journals, began his well-known series of articles in the magazine *Engineering*. He foresaw the employment of aircraft well behind the conventional battlelines, both on land and at sea, and stressed the further implication of offensive air power:

> It is safe to say that if during a battle it is found practicable to conduct air-raids and air attacks systematically over a considerable belt of territory in the rear of an enemy's lines, this belt will require to be defended.[10]

So, by 1914, five fundamental ideas of air power had been formulated within the UK. First, air power could contribute enormously to land and naval operations; second, command of the air was as essential to Britain as was command of the sea; third, to achieve command of the air an independent service needed to be established; fourth, air power could reach out far beyond the lines of battle and strike at targets in the enemy's homeland; and, fifth, by such offensive action we could force the enemy to divert essential resources to his own air defence.

Moreover, one can trace the personal connection between those who formulated the ideas and those who in World War I attempted to put them into practice. For example, Captain Burke, then a pilot in the Air Battalion of the Royal Engineers, became the commander of No. 2 Squadron, Royal Flying Corps, in 1914, and later commander of No. 2 Wing in France, working for Colonel Frederick Sykes and alongside Lieutenant Colonel Hugh Trenchard. But, as so often in the history of warfare, from the formulation of ideas to their successful application in battle was to be a long and arduous passage. The visionaries simply did not wield sufficient military, economic, or political influence in 1914 to procure the equipment necessary to implement their ideas.

In 1912 a technical Sub-Committee of the Committee of Imperial Defence had emphasized that the contribution of both military and naval aircraft in future wars would primarily be reconnaissance.[11] No attention was paid to the likely needs of home defence or to offensive action by aircraft. Consequently, the Royal Aircraft Factory at Farnborough was directed to produce slow and stable aircraft with an engine maximum of

100 hp, ideal for reconnaissance in peacetime but wholly unsuited to hostile battlefield conditions. Nor was enthusiasm stimulated by the alleged attitude of General Haig:

> I hope none of you gentlemen is so foolish as to think that aeroplanes will be able to be usefully employed for reconnaissance purposes in war. There is only one way for a commander to get information by reconnaissance, and that is by the use of cavalry.[12]

Fortunately for the future development of British air power, naval aviation enjoyed the vigorous support of Winston Churchill as First Lord of the Admiralty from 1911 to 1915. From the outset, the Naval Wing of the Royal Flying Corps regarded aircraft as an extension of the offensive and defensive power of a fleet: for attacks on naval units at sea, dockyards and other shore installations, and for the protection of British units afloat and ashore. Navigational instruments and bombsights were developed, and, because of the envisaged range and payload required, more powerful engines and airframes were commissioned from a variety of civilian companies. But much depended on the support of Churchill and the enthusiasm of relatively junior officers; between them stood many admirals whose interests were far more traditional and who were suspicious of what Captain Neumann of the German airship battalion in 1908 had called "excessively optimistic expectations, fantastic conclusions and impossible schemes. . . ."[13]

Somehow a climate and an organization had to be created which would permit the implementation of air power ideas despite the presence of an unsympathetic military and naval hierarchy.

The Third Service

The Royal Flying Corps (RFC) was constituted in 1912 with a Naval Wing, Military Wing, and a Central Flying School for the training of both army and naval pilots. An Air Committee was established to co-ordinate the contribution of the two parent services, but within a very short time the wings began to develop more in isolation than in harmony. The separation of the Royal Naval Air Service (RNAS) was officially recognized on 1 July 1914. So, on the outbreak of war there were two British air forces: one despatched to France intended to provide long range reconnaissance for the army; the other located in Britain and in Belgium with a very new responsibility for the air defence of the United Kingdom but with imprecise ideas about its potential contribution to naval operations.

Many cogent and coherent explanations have been offered for the momentous decision by the British Government in 1917 to create a unified Royal Air Force.[14] The RAF historian has stressed the wasteful competition for resources, the duplication of effort in some cases, and the

mutual neglect in others, all of which almost inevitably accompanied the presence of two autonomous agencies frantically seeking to meet the ever-expanding demands of commanders for more aircraft, more crews, more technicians, and more supporting equipment.[15]

A series of boards and committees were established in an attempt to resolve these problems, but they were not invested with executive authority and were dependent on the goodwill of the individual service and civilian members. However, a further board, under Lord Cowdray, was established in April 1917 with greatly increased powers. It could organize and maintain a supply of aircraft; it could appoint and draft its own staff; and it did have its own building at the Hotel Cecil on the Thames Embankment.[16] RFC and RNAS staffs worked side by side under their respective directors, and it was seen at the time as a natural step towards an independent Air Ministry.[17]

But the Cowdray Board remained absolutely dependent on the War Office and the Admiralty for such things as non-technical stores, armaments, and airfields. Its advice was given by soldiers and sailors back to their own services, and it had no power to allocate men and airplanes and certainly none to provide for home defence or independent operations. And, sadly, as in earlier days, co-operation and provision were constantly bedevilled by the personal rivalries and jealousies of senior commanders, politicians, presslords, and industrialists—so much so that it became cynically known as the "Hotel Bolo," after a well-known enemy agent who had done a great deal of harm to the allied cause. In short, the Cowdray Board could only provide the equipment; it could not say how or where it should be employed. Internal evolution alone could not produce that kind of authority, and without it the potential of air power remained stultified.

Another view of the creation of a unified RAF holds that the British Government's decision in 1917 was taken as an act of panic in the wake of the German bombing of that summer and autumn.[18] Certainly, airship and later four-engine Gotha raids had disproportionately affected British morale, perhaps only locally in initial impact, but spread nationwide by the press and thrust into politics by Members of Parliament who had been vociferous critics of aerial policies for a considerable period.[19] One airship raid on Hull in 1915, for example, caused widespread panic and prompted the local MP to write to Mr. Arthur Balfour:

> Citizens of all classes are in a state of great alarm; the night after the raid a further warning was given and tens of thousands of people trooped out of the city. The screams of the women were distressing to hear. Could you let us have half a dozen aeroplanes?[20]

Then, on 2 April 1916 Scottish morale was severely impaired when a Scotch Whisky bonded store was destroyed near Edinburgh.

It was, of course, the Gotha airplane attacks in 1917 which produced the heaviest casualties, the greatest panic, and the strongest criticism of the aerial defences of the United Kingdom. But they also provoked the greatest indignation and the most vociferous demands for reprisals. It was certainly in response to widespread public dissatisfaction that General Jan Smuts was directed on 11 July 1917 to examine "the defence arrangements for home defence against air-raids and the existing general organization for the study and higher direction of aerial operations."[21] His recommendations on UK defence were presented to the government eight days later and immediately implemented.

His second report, presented to the government on 17 August, has been called the "Magna Carta of British Airpower." Smuts traced the previous attempts at co-ordination of army and naval air services and stressed the inability of the existing Air Board to embark on a policy of its own. He then continued:

> The time is however rapidly approaching when that subordination of the Air Board and the Air Service can no longer be justified. Essentially, the postion of an Air Service is quite different from that of the Artillery Arm . . .. [it] can be used as an independent means of war operations. Nobody who witnessed the attack on London on 7 July could have any doubt on that point. Unlike artillery, an air fleet can conduct extensive operations far from, and independently of, both Army and Navy. As far as at present can be foreseen, there is absolutely no limit to the scale of its future independent war use. And the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and populace centres on a vast scale may become the principle operations of war, to which the older forms of military and naval operations may become secondary and subordinate.[22]

Smuts had been advised that aircraft production in the next twelve months would far surpass the joint requirements of the Army and Navy, and, therefore, an Air Staff to plan and direct independent operations would soon be necessary. Moreover, he warned, "The enemy is no doubt making vast plans to deal with us in London if we do not succeed in beating him in the air and carrying the war into the heart of his country."[23]

To realize the full potential of air power, he recommended the creation of a separate Air Ministry, Air Staff, and Air Service.[24] He then concluded his report with a sentence almost identical to one used by Lanchester ten years before:

> It is important for the winning of the war that we should not only secure air predominance, but secure it on a very large scale; and having secured it in this war we should make every effort and sacrifice to maintain it for the future. Air supremacy may in the long run become as important a factor in the defense of the Empire as sea supremacy.[25]

I have no evidence that Smuts ever thought about air power before 1917. We know that he was misled into expecting a large surplus of

aircraft; we know that he was convinced by exaggerated estimates of German intentions; and we know that some of the enthusiasts he consulted looked far beyond the immediate capability of strategic bombing. His closest confidante was General G. F. R. Henderson, who, in turn, had moved steadily closer to the views of men like Lanchester. The latter, in the 1916 reprint of his articles from the journal *Engineering*, argued strongly that the aeronautical arm was a national affair, because not only would it tax national resources to the uttermost but "because it is the arm which will have to be ever ready, ever mobilized, both in time of peace and war: it is the arm which in the warfare of the future may act with decisive effect within a few hours of the outbreak of hostilities."[26]

So, in 1917 air power was freed from the constraints of army and navy priorities partly by the force of unique circumstances, partly by mistaken interpretations, partly even by the self-seeking of opportunists, but above all because in Britain ideas were maturing into theories and visions into forecasts. Air power was given the chance to become a living, self-developing organism endowed with a voice, a brain, and a limb.

If I might digress for just a moment, there are several other features of the British experience before World War II which you may wish to touch upon in discussion. For example, the use of air power to control under-developed areas, or the struggle over naval aviation which had such a debilitating effect on the evolution of British naval air power, or the constant fight to persuade a democratic government in peacetime that its defensive insurance policy should keep pace with the growth of the external threat. None of these could be adequately surveyed in the remaining time at my disposal.

The influence of imperial responsibilities on the RAF between the wars still awaits comprehensive analysis. Sufficient here to say that from 1919 until the beginning of the armament programme in the 1930s, more than half the RAF's squadrons were based overseas and of those remaining in the "metropolitan" area, approximately one-third were allocated to naval duties, one-third to army co-operation, and one-third to home defence, which itself was a misleading title.

The internecine struggles between the Royal Navy and the Royal Air Force for control of naval aviation have, on the other hand, been well documented in several official histories and biographies.[27] The Air Council feared, with some justification, that the creation of a Fleet Air Arm would be the first step towards the disintegration of an independent Royal Air Force. They were, therefore, opposed in principle to the establishment of strong naval air institutions because of fears that their own authority would be undermined. Resources dedicated to naval aviation varied, but were always a small percentage of the whole, reflecting the overall allocation of effort summarized above. Meanwhile, no naval staff

was responsible for long-term studies of naval aviation, and no naval air lobby existed either to fight the political, technical, and economic pressures which tended to restrict progress or to challenge "the Admiralty's habit of associating the battleship's well-being with their own."[28] Consequently, it is hardly an oversimplification to state that British naval aviation between the wars fell between the Scylla of a sorely-pressed Air Council and the Charybdis of an Admiralty denied the power of air-minded admirals. Rather than pursuing any of these themes, I should like instead to comment briefly on the British application of offensive tactical and strategic air power.

Offensive Air Power

Trenchard, while working for General Douglas Haig as GOC Royal Flying Corps in France, consistently demanded offensive tactical action by his aircrews. His attitude is best summarized in a memorandum which he addressed to General Haig in September 1916:

> . . . An aeroplane is an offensive and not a defensive weapon. Owing to the unlimited space in the air, the difficulty one machine has in seeing another, the accidents of wind and cloud, it is impossible for aeroplanes, however skilful and vigilant their pilots, however numerous their formations, to prevent hostile aircraft from crossing the line if they have the initiative and determination to do so. . . . British aviation has been guided by a policy of relentless and incessant offensive. Our machines have continually attacked the enemy on his side of the line, bombed his aerodromes, and carried out attacks on places of importance far behind the lines. It would seem probable that this has had the effect so far on the enemy of compelling him to keep back or to detail portions of his forces in the air for defensive purposes . . . the sound policy, then, which should guide all warfare in the air would seem to be this: to exploit the moral effect of the aeroplane on the enemy, but not let him exploit it on ourselves. Now this can only be done by attacking and by *continuing to attack*.[29]

Note, however, that this was not an argument for air operations independent of land fighting, but simply a proposal for the best way of giving air support to it, by forcing the enemy air on to the defensive and keeping it there. Trenchard, in 1916, was strongly opposed to the use of air power independently of other military operations.

Inevitably, losses of men and materiel seemed heavy, but as Lanchester commented, "The defence of modern arms is indirect: tersely the enemy is prevented from killing you by your killing him first."[30] During the German spring offensive of 1917, for example, when the enemy enjoyed temporary air predominance, the RFC lost slightly less than eight men a day, against a daily average for the British Army as a whole of ten thousand killed or missing.[31]

The impact of the RFC on the enemy ground troops in return for these losses was carefully recorded at Headquarters.[32] Except when obscured by fog, gas, or very low cloud, modifications to German defences

were photographed daily, prompting regular German concern. German troops were reluctant to dig trenches by day and frequently assumed that very low flying air attack was directed against their own dugouts. The association of spotter aircraft and highly accurate artillery bombardment was particularly resented when accompanied by the belief that German aircrew were reluctant to give battle. "The RFC pilots," on the other hand, "seem to seek air combat whether it is necessary or not."[33] Nevertheless, Trenchard's RFC was discovering an inherent paradox of offensive air power. Attacks on enemy targets, either tactical or strategic, will undoubtedly force him to divert more resources to air defence. But the more successful the policy in forcing the enemy on to the defensive, the more difficult and costly it becomes to inflict proportional damage on the original targets.

Meanwhile, the Royal Naval Air Service had conducted long range bombing operations intermittently since the early days of the war, first against airship sheds and then, in 1916, against industrial targets in Alsace, Lorraine, and the Rhineland. The strategic activities of No. 3 Wing RNAS from October 1916 to April 1917 were curtailed by bad weather and by constant pressure from the RFC for assistance. Nevertheless, contemporary reports of German attempts to organize air defences against them clearly indicate that they also were forcing the diversion of resources away from offence to defence, although with little effect. RNAS staff realized that their bombers' immunity would inevitably be threatened as the German air defences improved, and, therefore, even before the end of 1916 they were planning the development of long range escort *fighters and modified fighter bombers.*[34]

The RNAS anticipated what the Independent Force and Royal Air Force were later to discover: that a second paradox of offensive air power is that concentration of force is required for maximum offensive effect, but concentration of force in that age could only be achieved by large numbers of aircraft and repeated attacks, which in turn provided the opportunity for the defending air force to concentrate its own fighter squadrons to maximum defensive effect.

Hard thinking about air power employment was not confined to tactics. Under the direction of Lieutenant Commander Tiverton, experiments were carried out with bombsights, ballistic trajectories, and a variety of long range navigation aids.[35] The activities of the RNAS staff in this period clearly illustrate that, contrary to the views of the official history of World War II, the problems of long range aerial navigation were fully appreciated and were being addressed.[36] Moreover, special attention was paid to practical training and target acquisition, because

> experience has shown that it is quite easy for five squadrons to set out to bomb a particular target and for only one of those five ever to reach the objective, while

the other four, in the honest belief that they had done so, have bombed four different villages which bore little, if any, resemblance to the one they desired to attack.[37]

Later that year, Tiverton presented a second paper to the Air Board which appears to contain the first analysis of strategic targets based on the scientific principles which are usually associated with the operational analysis of World War II. He identified chemical plants as the key industrial targets because of the dependence of the German war industry on them and their vulnerability to air attack. Further, he studied individual factories to identify the departments whose destruction would have the greatest effect and studied their areas to assess the bombloads required to achieve the necessary amount of destruction. Not surprisingly, he concluded that success could only be achieved by concentrated and repeated attacks.[38] These ideas were incorporated in the policies of the infant Royal Air Force and relayed to Trenchard, now Commander in Chief of the Independent Force in France, in May 1918.

There was, however, one problem. The Air Board believed that in 1918 they would have a strategic bombing force of 2,000 aircraft, of which 1,000 would be serviceable at any one time, each carrying nine bombs or approximately 1,000 lbs. In fact, Trenchard never had more than 100 aircraft under his command from June to November 1918. Rarely were twelve aircraft serviceable in a squadron, and combined operations by more than one squadron were seldom undertaken because of difficulties of inter-unit coordination and lack of preparation and training time.[39]

Trenchard identified his problems in his first report to the Secretary of State for Air on 2 July 1918:

> I took over the tactical command of this Force on the sixth of June, and the plan on which I decided to work was to attack a large number of objectives in Germany so as to force the enemy to disperse if possible his defensive forces at various points, and then to concentrate for two or three days and nights on the same objective.
>
> This plan, however, was unable to be carried out in its entirety. Wind, together with the necessity for training new squadrons and new pilots . . . [and] the few squadrons at my disposal, prevented the plan being entirely carried out.[40]

Nor did matters improve. From June to November the entire force was grounded completely by weather for almost 50 percent of the time, quite apart from the numerous occasions when the aircraft sought secondary targets because of weather over the primary targets.

At the third session of the Inter Allied Aviation Committee held at Versailles on 21 and 22 July 1918, the French delegate asked what weight of projectiles each of the Allied Aviation Services could drop in twenty-four hours between July and December 1918.[41] Trenchard prepared a set of notes for Sykes, who was the British delegate at this session, stating that he could give such figures but that they would not mean very much.

He attached a table which included the theoretical weight in tons which the aircraft of the Independent Force could drop daily for each of the specified months. The nearest the Force ever got to the estimate was 3.5 percent.[42] No one at headquarters was surprised because the table had carried the following note: "These figures are purely theoretical and can in no way expect to be borne out by fact."[43]

It has been frequently pointed out that Trenchard was less than enthusiastic about his role,[44] but contemporary evidence clearly illustrates that he discharged his duties with a clear eye to the practical difficulties which faced him: in this case, numbers, serviceability, weather, distance, the need for French goodwill, and frequent allied requests for shorter range support. When GOC of the Royal Flying Corps, he maintained a meticulous collection of intelligence reports on the effects of his Force's raids under the headings of "British Official Report," "German Official Report," "Materiel Results," and "Moral Effects."[45] The fundamentals of his strategy were spelled out on the first page:

> Though materiel damage is as yet slight when compared with moral effect, it is certain that the destruction of 'moral' [morale] will start before the destruction of factories and, consequently, loss of production will precede materiel damage.[46]

It is, therefore, not surprising to find that when Trenchard was directed by the military representatives of the Supreme War Council at Versailles in the autumn of 1918 to produce a "methodical plan" for the proposed allied strategic bombing force, it began as follows:

> There are two factors—moral effect and materiel effect—the object being to obtain the maximum of each. The best means to this end is to attack the industrial centres where you:
>
> a. Do military and vital damage by striking at the centres of supply of war material.
>
> b. Achieve the maximum of effect on the moral by striking at the most sensitive part of the whole of the German population—namely, the working class.[47]

Here was a definition of the Third Dimension of Warfare. Some roots lay partly in the ideas formulated before 1914, others in the use of air power in indirect deeper support of the land battle, others in the angry demand for reprisals for German attacks on Britain, others in the need to find employment for the expected thousands of additional aircraft. Other roots perhaps lay in the technological fact of life of 1918 that morale seemed much easier to damage than material, or even in the inexorable implication of democratic warfare that all who contribute to a war effort, military and civilian alike, may be said to be justifiable millitary targets.

Wherever we choose to place our emphasis, we can recognize that even by 1919 the British had contributed conceptual ideas, organizational example, and offensive operational experience which were to have a

strong influence on the evolution of air power later in our century. These, I suggest, are the three major permanent features of the "British Dimension."

Notes

1. Quoted by Colonel A. F. Hurley in his appendix "Additional Insights" to *Billy Mitchell: Crusader for Air Power* (Bloomington: Indiana University Press, 1975), p. 142.
2. F. W. Lanchester, "Aerial Flight," *Aerodynamics*, vol. 1 (London: Constable, 1908), p. vi.
3. *Flight*, 2 January 1909, p. 1.
4. George O. Squier, "The Present Status of Military Aeronautics," ibid, 27 February 1909, pp. 121 ff. (This paper was previously presented in December 1908 to a New York meeting of the American Society of Mechanical Engineers.)
5. *Flight*, 15 May 1909, p. 272.
6. Captain C. J. Burke, Royal Irish Regiment (Army Air Battalion), "Aeroplanes of Today and Their Use in War," *Journal of the Royal United Services Institution* (JRUSI) May 1911, Vol. LV, pp. 624–9.
7. Burke.
8. Op. cit.
9. JRUSI, Vol. LVII, 1913, p. 333.
10. Lanchester, "Engineering," 27 November 1914, later included in *Aircraft in Warfare, The Dawn of the Fourth Arm* (London: Constable, 1916).
11. An excellent comprehensive analysis of the findings and long-term influence of the Technical Sub-Committee is in Neville Jones, *The Origins of Strategic Bombing* (London: William Kimber, 1973), pp. 36 ff.
12. This comment is attributed to General Haig in July 1914 by Sir Frederick Sykes in his autobiography *From Many Angles* (London: Harrap, 1942), p. 105. While there is no reason to doubt that Haig held such sentiments, it should be remembered that Sykes' testimony was that of a man embittered by his personal rivalries with both Haig and Trenchard before, during and after World War I.
13. Captain Neumann, "The Possibility of Making Use of Balloons and Motor Airships in the Navy," *Marine-Rundschau*, July 1908, translated in JRUSI, Vol. LII, p. 1502.
14. E.g., J. M. Spaight, *The Beginnings of Organized Airpower* (London: Longmans, 1927). Among recent analyses of the events leading to the creation of the RAF, this study by a British civil servant may not have been given quite the attention it deserves. Despite a classical eulogy of independent air power in the opening chapter, largely included in Emme's compilation, the greater part of the book offers a well balanced, detailed and comprehensively documented account of the press, parliamentary and other pressures which had a powerful cumulative influence on the British government's decision in 1917.
15. Summarized in *Royal Air Force Air Publication 125*, 1936, pp. 290–295.
16. Spaight, op. cit., pp. 92 ff.
17. *Hansard*, House of Lords, 21 December 1916, Vol. 23, Col. 1070.
18. D. Divine, *The Broken Wing* (London: Hutchinson, 1966), p. 105.
19. The contribution of Messrs, Pemberton-Billing, Joynson-Hicks and other members of both Houses of Parliament to the incessant debates on the application of British air power between 1914 and 1918 is comprehensively described in B. D. Powers, *Strategy Without Slide Rule* (London: Croom Helm, 1976).
20. Quoted in Squadron Leader C. J. Mackay MC DFC, "The German Air Raids in England," RAF Staff College, Andover, 1924.
21. Appendix II to Cabinet Minutes WC233 24 August 1917.
22. Ibid.
23. Ibid.
24. Ibid.
25. Note 3 above.
26. F. W. Lanchester, *Aircraft in Warfare, The Dawn of the Fourth Arm* (London: Constable, 1916), p. 202.
27. H. Montgomery-Hyde, *British Air Policy Between the Wars 1918–1939* (London: Heinemann, 1976) is the most comprehensive and best documented account of the Royal Air Force viewpoint of the implications of the RN-RAF struggles. On the naval side, the official RN histories by Captain Stephen Roskill will receive a most valuable supplement in 1979 with the publication by MacDonald and Janes of London of *The Bomb and the Battleship*, by Geoffrey Till, Senior Lecturer at the Royal Naval College, Greenwich.
28. Till, supra, chap. 15.

29. HQ RFC Memo, 22 September 1916; quoted in full in Higham, *Military Intellectuals in Britain 1918–39* (New Brunswick: Rutgers, 1966), pp. 253–256.
30. Lanchester, op. cit., p. 40.
31. Quoted by Divine, op. cit., p. 141.
32. "What the Germans say about the RFC": typescript collection of German letters, prisoner of war reports and Army Orders retained in the Trenchard files at the RAF Staff College Bracknell; hereafter referred to as "Bracknell Papers."
33. Ibid., several similar comments.
34. Jones, op. cit., pp. 120 ff.
35. Ibid., p. 142.
36. Sir Charles Webster and Noble Frankland, *Strategic Air Offensive Against Germany 1939–45*, Vol. 1 (London: HMSQ, 1916), p. 48.
37. Report by Lieutenant Commander The Lord Tiverton, submitted to the Air Board on 3 September 1917, quoted in Jones, op. cit., p. 146.
38. Second Tiverton report, 2 November 1917. Quoted in Jones, op. cit., pp. 154 ff.
39. "Experiences of Bombing with the Independent Force," lecture by Wing Commander J. E. A. Baldwin DSO OBE to the Royal Air Force Staff College 1922; printed in AP 956 December 1923 (Bracknell Papers).
40. Trenchard to Weir. IFG/79 2 July 1918, Bracknell Papers.
41. Annexure to *Proces Verbal*, third session, International Allied Aviation Committee, p. 2, Bracknell Papers.
42. Ibid., Table A, together with monthly classified reports by Trenchard to Weir, June-November 1918, Bracknell Papers.
43. Ibid.
44. Most recently by Montgomery-Hyde, op. cit., pp. 43–44.
45. "Confidential Results of Air Raids on Germany 1 Jan–30 Sep 1918," DAI No. 5, Bracknell Papers.
46. Ibid, p. 1.
47. Undated typescript duplicate originating from IF HQ in Autumn 1918 retained by Trenchard in his own IF file, Bracknell Papers.

THE CONTINENTAL EXPERIENCE

EDWARD HOMZE

The Pre-World War I Era

The Wright brothers' initial exploits with heavier-than-air flight in 1903 were an incentive for the major military powers of Europe to discuss the application of the airplane in modern warfare. Prior to the Wrights' experiments, the Italian and Prussian armies had concentrated on balloon and airship development.[1] Both armies believed until 1911 that the airship was superior to the airplane in range, load, and speed. The Russians, too, believed in the airship's superiority, and in 1906 their War Ministry rejected an offer to purchase one of the Wrights' airplanes. The French, however, exhibited extensive interest in heavier-than-air flight. Continued successes by French flyers in 1907 spurred the Prussians to set up an aviation technical section of the General Staff. By August of 1908, the Prussian General Staff questioned the Army's policy of rejecting the airplane in favor of the airship and recommended that the Army actively support the development of the flying machine by constructing its own airplane.[2]

From 1908 to 1911 a combination of factors focused on the airplane's development. Technological improvements, the founding of a number of aircraft companies, the formation of public lobbying groups such as the German Air Fleet League and the Imperial All-Russia Aero Club (both started in 1908), and the lively interest of prominent individuals such as Prince Heinrich of Prussia and Grand Duke Alexander of Russia gave impetus to the airplane among military circles.[3] It became patently clear that the airplane had potential military value for reconnaissance and communication. By 1911, the major European continental armies had contracted for the purchase of airplanes and were actively training flyers.

The last three years of peace before World War I were characterized by the gradual assimilation of air machines into the organizational structure and doctrines of the European military establishments. Although appropriations for aviation were modest compared to total armament expenditures, the pace of aeronautical rearmament had quickened. When hostilities commenced in August of 1914, each of the major European powers had a few hundred aircraft fit for active service, and the crucial base for the aviation industry had been laid in each nation.[4]

Organizationally, aviation had been incorporated into the military structure on the basis of its intended use. Herein lay the greatest weakness of prewar military aviation. Given the generally accepted expectations of a short war and the limited role aircraft would play, the consensus among military authorities was that the aircraft would primarily be used for reconnaissance—an improved cavalry. Secondary duties such as artillery spotting and message carrying were also recognized.

The further possibility of the airplane's use as an attack weapon was considered, for there had been some experimentation with bombing before the war. The Italians had dropped some two-kilogram grenades during the Libyan War in 1911, and the Germans had ordered some of their planes equipped with five- and ten-kilogram bombs in mid-1913; but there was no systematic study of the problems involved and surprisingly little theorizing on the subject. Presumably, the load bearing factor for the flimsy airplanes of the era precluded further speculation. The airship, with its greater lifting capacity, appeared to be a much better possibility as a bomber. The appalling picture of cities destroyed by airships had long been a part of the European literary tradition of "voices prophesying war." More profitable speculation was centered on the arming of aircraft with light-weight machine guns for defense or attack. The development of the machine gun and the growing reliability and safety of aircraft meant that two of the three necessary ingredients for effective aerial combat—the armament and the gun platform—had been worked out before the war; the third ingredient—tactics—would soon follow.[5]

The War

World War I was a major turning point in military aviation on the continent, perhaps *the* turning point. In four bloody years of combat aviation evolved from an oddity to a military necessity. Very much in the manner that the military absorbed and mastered the technology of the railroad for war purposes in the nineteenth century, a process that took decades, the military absorbed and mastered aviation technology in the incredibly short period of four years. In the areas of doctrine, tactics, organization, and weapon development, the First World War established the patterns for future development.

Some idea of the quantum jump in aviation during the war can be gleaned from a few statistics. When the war began, the French had 150 to 200 pilots and 24 squadrons; when it ended, they had 320 squadrons and 4,398 aircraft. French industry produced 52,000 airframes and 92,000 motors. Germany produced approximately 44,000 airframes and 48,000 engines. Italy, which had 106 aircraft and 5 dirigibles when it went to war in May of 1915, ended the conflict with 1,778 aircraft and 22 dirigibles. The Italian air industry produced approximately 12,000 aircraft and

20,000 engines. Even the Russians, with a much smaller industrial base than the other major European countries, produced nearly 5,600 aircraft during the war.[6]

Development of supporting materials grew at the same astonishing rate. Before the war, for example, not a single European military service had an aerial bomb, bomb rack, bombsight, or release mechanism on aircraft; but four years later, their air services not only had the bombs, but the bombers to carry them considerable distances, the technical proficiency and equipment to aim and release bombs, and the organizational structure and military doctrines to plan mass bombing attacks.

It is clear that the European powers surmounted the thousands of problems associated with the expansion, organization, and development of aviation during the war. The intermeshing of the development of tactics, weapons, doctrine, and organization during the war is so pronounced that it is difficult to analyze any strand separately. However, an analysis of the organization of the military will serve as a framework.

The most obvious changes in organization were the evolution of a more compatible structure to fit the new service and the enormous increase in size of all units. At first, the usual army cavalry organization was applied as befitted a reconnaissance arm. Flying units were equally distributed to ground commanders. No thought was given to concentrating forces or differentiating additional functions. Gradually the limitations of the traditional organizational structures were recognized and changed. A more flexible pattern was developed to fit the rapidly increasing functions and potential of the air services. This was a difficult task since the new flying services were often outranked by the senior services, suffered from a lack of appreciation at higher headquarters, and were hindered by a healthy dose of the fliers' own impudence.[7]

The Germans and the French were the trendsetters in redistributing and concentrating their aircraft into fighter, reconnaissance, and bombing units. The Germans had also placed all of their air arm under a separate organization in October 1916, but this was more administrative than operational since most units were still under the control of local army commanders except for some fighter and bomber units directly under the General Headquarters. The French persisted in keeping their units tied to local commanders, but the Italians showed a great deal of ingenuity by retaining most of their long-range reconnaissance and bomber units under the command of a central Army Headquarters.

The Italians were also quick to see the advantages of massing air power over key ground operations, but they were surpassed by the French in the latter stages of the war. The French, who had concentrated on short-range tactical bombing under the control of subordinate military

formations, had not achieved much success until they massed forty squadrons into the First Air Division over Soissons in 1918.[8] Although the Europeans had learned by the end of the war how to mass air power, to organize it with more flexibility, and to handle larger aggregates of men and materials, they still had not resolved how to command and use air power most effectively. What they had learned from tactics did not solve their problems.

World War I opened up the entire spectrum of tactics in air power. From fumbling improvisation to controlled experimentation, to standardization and, in a few cases, to deft mastery, the Europeans learned their trade of making war in the air. In fighter tactics alone, the long, arduous melees of 1915 gave way to the brief, deadly, orchestrated dogfights of 1918. In bombing, the sporadic ventures over enemy lines evolved into the raids of 1918 involving hundreds of aircraft. Not only did the numbers increase, but the types and functions of bombing raids changed as the Europeans used bombers for close support, interdiction and strategic bombing.

Although the Germans and Italians achieved some success in strategic bombing by forcing their opponents to divert sorely needed resources to home defense, the psychological effect was probably more important than the material damages done—a point noted by the critics of air power. The war was to end before any convincing proof of the offensive power of aircraft was gathered; this reinforced the skeptical attitude of senior officers of the army and navy about the ability of the air arm to carry out independent missions. The results of tactical bombing were also not too impressive, but there was no denying the effectiveness of close-support aircraft. At the Somme and Verdun, air support was used extensively, but it was not until 1917, when the Germans introduced specially built ground attack fighters, that the assault fighters came into their own. The other European powers quickly followed, and the French in particular appreciated the possibilities of close support missions.[9]

Fighter tactics showed a slow but steady progression throughout the war; and, probably because of the wartime propaganda and the inherent drama of the heroic dogfight, they were the most publicized part of the war. The struggle for aerial supremacy was a bitter one and one which seesawed back and forth as each side brought out new aircraft and tactics. The struggle was intently followed by the military as well as the general public, for in a grim and impersonal war, this was a flamboyant and personalized form of combat that captured the imagination of all. Like mythical heroes of the past, these twentieth-century "knights of the air" flung themselves into dangerous jousts ending in victory or flaming defeat. These dashing, gallant aviators were ready-made heroes for the publicity men. Enormous amounts of time, money, and energy were

devoted to fighter development and tactics, and the results were forthcoming.

Speed, sturdiness, reliability, and maneuverability of fighters were rapidly improved, but the biggest steps were the introduction of the synchronized machine gun and the standardization of its production. A number of patents for synchronized machine guns had been taken out in Europe before World War I, but none was in operation when the war started.[10] The crude Garros deflector system was tried with some success in March of 1915, but the first workable system was designed by Anthony Fokker for Germany a few months later. In the hands of such pilots as Boelcke, Immelmann, and Udet, the tractor type fighter revolutionized fighter tactics. The Allies matched the Germans a year later when they too introduced a hydraulic synchronized gear system to the fixed-gun format.

The standardization of production which allowed for identical performance of aircraft in units promoted formation flying, the second most important change in tactics. By later 1915 the Germans had achieved this, followed by the French, British and Italians in the next year.[11] Although there would be many more changes in aircraft and tactics in the last two years of the war, the broad lines of tactics for the fighters had been worked out by 1917.

Fighter pilots may have grabbed most of the headlines, but the flyers who took the same risks and produced even more results were the reconnaissance airmen. From the first Battle of the Marne until the last shot was fired, these airmen gathered vital information for their commanders. The mounting of cameras on aircraft and the growing sophistication of the photo interpreter opened up new vistas for ground commanders planning their operations. At sea, the military potential of the airplane in extending the visibility of surface ships was soon appreciated, but it would not be until World War II that the full potential of over-water aerial reconnaissance would be utilized. Strategic photo-reconnaissance was also conducted by European armies with notable success. The techniques employed during World War I may have been primitive, but they marked the beginning of what may have been the most important contribution of the aircraft to modern warfare.[12]

The Russians may have gained more from their Civil War than World War I. The Imperial Air Service was markedly inferior to the other major air services. Equipped largely with foreign models, it was chronically short of supplies and poorly handled during the war.[13] Their organization, patterned after the French, was closely tied to ground support tasks, but, ironically, their chief success was in strategic bombing. Igor Sikorski's famous four-engine bomber, Il'ya Muromets, established a precedent of directly supporting frontal operations with large bombers.[14] By the time

the Bolshevik revolution broke out, the Air Service was in wretched condition. The Civil War that followed was dominated by land engagements; but the fluid battlelines, great distances and lack of good ground and sea communications greatly influenced Russian interest in maintaining air communications and in concentrating their forces. While leaders of the Red air fleet appreciated the need for air power, they found it impossible to secure. On the whole, the Russians viewed ground support operations as the most valuable form of air power, but they did not lose sight of the need for centralizing some of their air power for tactical or strategic goals. The experience gained in the Civil War, while modified by ideas inherited from the Imperial Air Service and the Germans, remained dominant in the formation of the Red Air Force.[15]

In summary, most of the weapons and ideas used in World War II had their origin in the First World War, except for devices such as radar and the atomic bomb, which depended on technological progress in other scientific fields. Furthermore, as historian John W. R. Taylor pointed out, ". . . it is clear that almost every basic tactical and strategic application for air power had been tried out, at least experimentally, by the end of the 1914–18 War. Advances since then have been concentrated mainly on refining the weapons in terms of both aircraft and equipment."[16]

The Post-War Years

After World War I, the military airmen concentrated on three major activities: first, an analysis of the war; second, a justification of air power in the defense structure, preferably as an independent and equal service branch; and third, a general consideration of stalemate in warfare. The shocking disparity between the ends sought and the enormous price in blood and material paid for the meager results obtained during World War I had not only sharply reduced the independence as well as the prestige of the military in the eyes of the general public and the politicians, but also had illustrated the narrowmindedness of modern strategic thinking.[17]

It is easy to see the seductive charm that Douhet's theories had for airmen grappling with these concerns, since he seemed to supply the answers to their problems. His strategy appeared revolutionary, bold and in tune with the new industrial age and the experiences of World War I, when in fact it was none of these. Douhet had borrowed heavily from contemporary prewar sea strategy; his observations about modern industrialism were inaccurate; and his emphasis on strategic bombing was derived from the weakest example of air power during World War I.[18]

A word of caution about Douhet. Many, if not most, of the key officers and officials in the air services of Europe during the interwar

period had neither heard of him nor read his works, but, like all great theorists, Douhet had synthesized and articulated a body of thought that had occurred in whole or in part to many others.

The evidence supporting Douhet's major assumptions—the capability and destructive power of the heavy bomber, the impotence of air defense, and the fragility of a modern industrial society in the face of heavy bombing—was thin and inconclusive. Like most prophets, Douhet was long on prognostications and short on facts, but his theories had a sweeping boldness and grandeur that his critics could not match. Airmen on the continent especially found him useful in arguing for an independent air force and supplying a conceptual framework for the next war, but they ran afoul of many well-entrenched vested interests, bureaucratic inertia, and lots of evidence drawn from World War I.

The prevailing pattern for the European air forces from 1919 to 1936 was to fight out with the other military services and the governmental bureaucracies the issues of an independent air force and use of strategic bombing, only to have the first idea accepted and the second rejected. In Italy in 1923, in Sweden in 1926, in France in 1928, and in Germany in 1933, independent air forces or air ministries were set up, clear recognition of the new role of air power, but the drive for a strategic bombing force failed everywhere.[19]

The reasons why the Europeans ended with basically tactical air forces by the mid-1930s vary from country to country, but in general they have this much in common: they were land powers; they were in agreement on the direction and pace of aircraft technology; and, militarily, they were traditional and conservative. Germany and Russia were the classic cases of continental land powers, but even the French and the Italians, both of whom had had long associations with the sea, were by then conditioned to think in terms of continental land power. In short, although they could appreciate the potential of strategic air power, their immediate interest and security appeared to depend on fielding mass armies to fight decisive battles along their frontiers.

The prospects of developing a true strategic bomber, that is to say, a multi-engine, long range aircraft with a big bomb load, also seemed dim. Before such an aircraft could be built, many tough technical problems had to be solved. New, powerful engines had to be developed, as well as better fuels, more accurate bombing systems, and improved long-range navigational and radio equipment. Such an aircraft would have had to meet the standards of reliability and serviceability essential for their use in operational units, and, above all, every one of these factors had to be combined into a successful aeronautical design. Despite the fact that the Italians and Russians in the early 1930s and the Germans in the late 1930s conducted some amazing long-range flights, only the Russians

were willing to gamble a disproportionate amount of their scarce materials and factory capability to build a large fleet of heavy bombers.[20] The results for the Russians were not encouraging, since the speed, ceiling, and range of the Tupolev TB–3 proved markedly inferior to the warplanes coming off the drawing boards by the mid-1930s.

The French tried another tack. Instead of building a strategic bomber, much of their effort was concentrated on developing a multi-purpose "battleplane" which may have owed something to Douhet for its origins but nothing in its final form. The French effort produced only small, slow, and heavily-armed aircraft designed to support ground operations.[21] The Italians opted for medium bombers, as did the Germans. Medium bombers were more appropriate for the European-scale war they were planning. The Germans, however, did design one other solution to the problem—the dive bomber. The dive bomber was a bridge, an interim solution, to cover the technological deficiencies that had arisen in medium and heavy bomber development. A cheap, quick way to achieve maximum bombing punch with a minimum use of resources, the dive bomber was a calculated-risk aircraft designed to serve until either a superior heavy aircraft or a new generation of medium bombers could be developed.[22]

In sum, there was a consensus among the European military staffs that the aviation technology of the 1930s, especially in terms of engine development, was not mature enough to deliver a strategic bomber that could become the capstone of a complete air force. Later, pressures of rapid rearmament, shortages of fuel and raw materials, and limited production facilities would strongly militate against a decision to build a fleet of heavy bombers.

In addition to technological objections, the Europeans had many doctrinal reasons for preferring tactical over strategical air power. Older, ground oriented officers were in the key command and staff positions; and, although they were comfortable in accepting aviation as an auxiliary arm, they resented the "young Turks" who wanted aviation as an independent arm with a strategic bombing role. In France, the army's doctrine of defense dominated and eventually perverted air theory and practice. Although the increasing importance of aerial bombardment was recognized, the emphasis remained on tactical bombing. Even the establishment of an air ministry in 1928 and the independent *Armeé de l'Air* in 1933 did not appreciably alter air power. Still, France was at least able to maintain her aerial superiority until the depression, when a combination of financial difficulties, war-weariness, political polarization, and the influence of Maginot and Pétain accentuated a defensive strategy at precisely the time Germany started rearming and a major breakthrough in aerial technology had occurred.[23] By the time the French woke up and

started to rearm for offensive air operations again, they found themselves behind the power curve in production, equipment, and strategy. By the spring of 1938, too much valuable time had been lost. French aircraft production had dropped to less than a hundred monthly, French spending for aviation had plummeted to 19 percent of the total defense expenditures compared to 54 percent in Great Britain, and French appreciation of air power had sunk so low that the Chief of the General Staff, General Gamelin, could comment, ". . . the role of aviation is apt to be exaggerated, and [that] after the early days of war the wastage will be such that it will more and more be confined to acting as an accessory to the army."[24]

The Italians did not fare much better than the French, despite the brief presence of Douhet in the ministry and the unbounded enthusiasm of Mussolini for a revolutionary, Fascist air force. Under the energetic Italo Balbo, the Italians built a formidable air force by the late 1920s and early 1930s, but it still was a conventional force. The rhetoric of the Fascist regime might have been Douhetan, but the aircraft were not.[25]

The Russian experience was different in that the Red Air Force never became an independent service, even though a strategic bomber force was built in the 1930s. The Red Army kept the air force tied closely to the ground forces, and the doctrines of tactical bombing and close support prevailed. The strategic bombing advocates did make some serious inroads in these doctrines. In 1926, theoretician Lapchinskii pressed for strategic bombing under the guise of independent air operations. A lively debate ensued, with some Russians arguing the necessity of an independent air force. They never took the extreme position of some of their western counterparts that the next war could be won solely with massive long-range bombardment, but they were effective to the extent that their government began building a fleet of heavy bombers. By the May Day parade of 1933, 50 TB–3s were seen over Moscow and a year later 250 appeared.[26] By 1936, the Soviets had reorganized their heavy bombers into a strategic force—the first of its kind in the 1930s. The chain of events then swiftly reversed this trend. The purges by Stalin, the Russian experiences in Spain and in Asia, and the rapid technological advances in tactical aviation by the western European powers led the Soviets to conclude that their strategic bombing doctrine was erroneous. They changed direction and entered World War II with the most tactically oriented air force in Europe.

Perhaps the experience of the Luftwaffe is the most revealing. Originally organized as an independent force and headed by the second most powerful man in the country, the Luftwaffe was tendered the kind of preferential treatment reserved for a favorite son. The political leadership favored a strategic force and, in fact, cleverly cultivated the image of

such a force at home and abroad. Hitler soon became the most adroit manipulator of the "bombing scare" technique as he bullied his neighbors with the threat of wholesale destruction from the air. But the professionals of the Luftwaffe, many of whom were drawn from the army, had come to the same conclusions as those of the other European professional staffs—that a strategic bombing force was desirable but not feasible and that a tactical force was a sounder and easier choice. Their overwhelming emphasis on tactical rather than strategic bombing continued throughout the history of the Luftwaffe.[27]

In summary, the most striking aspect of the thinking of the Europeans from 1919 to 1936 on the nature of the next air war was the disparity between the popular and the professional estimates of that conflict. The Douhetans won the debate with the general public, but lost it with the professional military. There was a wide-spread popular fear of the destruction of civilization through mass bombing and use of gas. Yet those charged with the responsibility of planning for the next war rejected this view. Aside from their brief flirtations with the Douhetan theory, the professionals held to a more balanced, rational and less exaggerated view of air warfare, a view based on a war they had fought in, studied and, yes, hoped would be like the last one. Neither the popular nor professional view of the character of the future air war was correct, as the real wars of the 1930s would show.

Warfare From Ethiopia Through Poland

Starting with the Ethiopian war and through the first phase of World War II, the European states fought a series of wars on three continents that ultimately either overthrew or drastically modified their principal ideas about aerial warfare. The Italian experience in Ethiopia proved little. They fought a colonial-style war against a feudal regime that could not protect itself against air power. The lessons learned from the experience were scant, save for the imperative need for air transport in a country largely devoid of modern land communications.[28] Spain, however, offered an entirely different perspective. For nearly three years the major European air forces tested their equipment, tactics and personnel there in a combat situation similar to what they might expect in the immediate future. There was a surprising degree of uniformity in how they perceived the results of their experiences in Spain. Strategic bombing was downgraded and tactical bombing emphasized, perhaps unduly. High level bombing was found to be ineffective, while low level, close support bombing was judged effective and an absolute necessity for successful ground operations. The Spanish Civil War experience convinced the Russians, Germans, Italians, and French of the need to integrate the work of their air forces with that of their ground units. Naval aviation, long range bombing, and even air defense were now slighted. The concept

of strategic bombing was decisively downgraded in favor of the more orthodox view of combined military operations.[29]

In France, the concept of the multi-purpose battleplane was brought into question, and the experience in Spain contributed to French indecision in development. More prototypes were ordered, adding to the confused welter already existing in the development program while production languished. Although the French digested the lesson of tactical bombing behind the battlelines, they were much slower in understanding the need for close ground support. Indeed, the results of the Spanish Civil War seemed to the French to validate the lowly estate of air power in their defensive strategy.[30]

The impact of the German experience in Spain on their tactics, development and theory were profound. The Luftwaffe and the German Army had been organized along conventional lines, but both were groping for a new style of warfare. The formation of the new Panzer divisions in late 1935 coincided with the "dive bombing craze" in the Luftwaffe, and the experience in Spain seemed to confirm the views of the "young Turks" in the ground forces and in the air arm that the wave of the future lay in a combination of armour, infantry, and air power. More than anything else, the Spanish war helped to weld the Luftwaffe to a tactical concept of operations geared to direct air support.[31] The successes of the Condor Legion precluded the evolution of a more independent, strategic type of air force, with the impact seen most clearly in the German production and development programs, where they swung into mass production of tactical aircraft. Spain convinced the top leadership in Germany that, like the proverbial gunfighter, they had achieved the technological "drop" on their neighbors, and they intended to use their advantage.

In Asia and in Spain, the Soviet Union had engaged in wars that tested its equipment and tactics. In China and later in Mongolia in 1939, the Soviets found themselves involved in some of the largest air battles fought since World War I. Hundreds of airplanes were used, and losses were heavy on both sides; but the Russians found they were equal to the Japanese except in the cases of the newer single-engine fighters. Again, as in Spain, the accent was on tactical air power, and the need of the Soviets for new fighters and close support aircraft was glaring.[32] The winter war in Finland confirmed these results and spurred the Russians to reorganize and re-equip their air force. By the time the Nazis struck at the Soviet Union, the Soviets were caught in the middle of their modernization cycle, but in terms of doctrine the Soviets were firm. They were committed to a doctrine of air power that stressed the integration of air power with their ground forces, while rejecting a reliance on air power as a single strategy to win a war.[33]

The first year of World War II seemed to confirm the theories of the European air forces. The brilliant successes of the Luftwaffe in Poland, Norway, the Lowlands, and France were attributed to an aggressive, offensive-minded tactical air force. Curiously, the same air force had value as a strategic deterrent. From Munich to the Battle of Britain, the key to the Nazis' successes was their ability to pursue three objectives simultaneously. First, they were able to deter conventional military operations by issuing warnings of strategic instability. Second, they deterred all-out air attacks by promises of restraint and threats of retaliation, and, third, they were able to isolate combat zones for their tactical air attacks.[34] As long as the Luftwaffe seemed to possess a strong deterrent value, it was far more formidable than in actual practice. Once it had to prove that value in the Battle of Britain, the inadequacies of the Luftwaffe were fully exposed.

In looking back at the conventional experience with military aviation from Kitty Hawk to the Battle of Britain, two observations stand out most clearly in my mind. The first is the astonishing pace of the technological development of aviation and the ingenuity and perseverance of the Europeans in using it to make war. I am reminded of a few lines George Bernard Shaw wrote in *Man and Superman* in the year of Kitty Hawk: "In the arts of peace Man is a bungler. I have seen his cotton factories and . . . machinery . . . they are toys compared to the Maxim gun and submarine torpedo boat. There is nothing in Man's industrial machinery but his greed and his sloth: his heart is in his weapons."

The second observation is the seemingly inexplicable failure of the Europeans to understand and properly conceptualize air power. Granted, by the yardstick of human experience two generations of time represent too brief an interval to expect much conceptualization. Still, the disparity between the ingenious military utilization of air power and the ineffective theorizing about it is striking. One can only conclude that Rebecca West was correct in 1937 when she wrote, "Before a war military science seems a real science, like astronomy, but after a war it seems more like astrology."[35]

Notes

1. Robert Saundby, *Air Bombardment; the story of its development* (New York: Harper & Brothers, 1971), pp. 6–7.

2. John Howard Morrow, Jr., *Building German Airpower, 1909–1914* (Knoxville, Tenn.: University of Tennessee Press, 1967), p. 17.

3. *Ibid.*, pp. 23–25, 45; for early interest in Russia see Robert A. Kilmarx, *A History of Soviet Air Power* (New York: Frederick A. Praeger, 1962), pp. 4–5.

4. There seems to be little agreement on the total number of aircraft available in August 1914. Morrow, *German Airpower*, p. 87, using German records, claims the French had 300 first-line aircraft out of 600, the Prussians 295–320 fit out of 450, the English 160 and the Russians 400 with about half fit. William Green and John Fricker, *The Air Forces of the World* (New York: Hanover House, 1958), pp. 98, 112, 244, list Germany with 281 aircraft and 9 Zeppelins, the French with 160 aircraft and 15 dirigibles and the Russians with 244 aircraft. Arch Whitehouse, *The Military Airplane, its history and development* (New York: Doubleday, 1972), pp. 3–9, cites another set of figures.

5. Whitehouse, *Military Airplane*, pp. 3–8, 22–23, 31–38

6. Production figures for France are from Robert W. Krauskopf, "French Air Power Policy 1919–1939."(Ph.D. dissertation, Georgetown University, 1965), pp. 1–2; for Germany, Werner Schwipps, *Kleine Geschichte der deutschen Luftfahrt* (Berlin: Haude & Spenersche, 1968), pp. 69–71, 76–77, and J. A. Gilles, *Flugmotoren 1910 bis 1918* (Frankfurt: E. S. Mittler, 1971), pp. 123–24; for Italy, "Italian Air Force: An Official History," *Aerospace Historian* 20/4 (Winter/December 1973):178–79, Piero Vergnano, *Origini Dell'Aviazione in Italia 1783–1918* (Genova: Edizioni Intyprint, 1964), p. 91; and for Russia, Alexander Boyd, *The Soviet Air Force Since 1919* (New York: Stein and Day, 1977), p. 6, and Kilmarx, *Soviet Air Power*, p. 15.

7. Robin Higham, *Air Power: A Concise History* (New York: St. Martin's Press, 1972), pp. 29–30; Basil Collier, *A History of Air Power* (London: Weidenfeld and Nicolson, 1974), p. 78.

8. Charles Messenger, *The Art of Blitzkrieg* (London: Ian Allan, 1976), p. 29.

9. Bill Gunston, *Fighters, 1914–1945* (London: Phoebus Publishing Co., 1978), pp. 30–31.

10. *Ibid.*, pp. 15–16; Whitehouse, *Military Airplane*, pp. 63–67.

11. Higham, *Air Power*, pp. 35–36.

12. Whitehouse, *Military Airplane*, pp. 72–79.

13. Kilmarx, *Soviet Air Power*, pp. 13–14.

14. *Ibid.*, p. 24; Boyd, *Soviet Air Force*, pp. 4–5.

15. Kilmarx, *Soviet Air Power*, p. 50.

16. John W. R. Taylor, *Combat Aircraft of the World from 1909 to the Present* (New York: G. P. Putnam's Sons, 1969), p. 35.

17. Bernard Brodie, *Strategy in the Missile Age* (Princeton: Princeton University Press, 1959), p. 7.

18. For Douhet's theories see: Giulio Douhet, *The Command of the Air*, Dino Ferrari translator (New York: Coward-McCann, Inc., 1942) and Frank J. Cappelluti, "The Life and Thought of Giulio Douhet," (Ph.D. dissertation, Rutgers University, 1967). A few of the many writers who discuss Douhet's influence are: Brodie, *Strategy in the Missile Age*, pp. 74–83; Edward Warner, "Douhet, Mitchell, Seversky: Theories of Air Warfare," from Edward Mead Earle's, *Makers of Modern Strategy* (New York: Atheneum, 1967), pp. 485–503; Higham, *Air Power*, pp. 67–72; Ken Booth, The Evolution of Strategic Thinking," John Baylis, Ken Booth, John Gernett and Phil Williams, *Contemporary Strategy: Theories and Policies* (London: Croom Helm, 1975), pp. 30–32; B. H. Liddell Hart, *History of the Second World War* (G. P. Putnam's Sons, 1970), pp. 590–93; Hanson W. Baldwin, *Battles Lost and Won* (New York: Discus Books, 1968), pp. 79–81; Hilton P. Goss, *Civilian Morale under Aerial Bombardment, 1914–1939* (Air University, Maxwell Air Force Base, 1948), pp. 70–72.

19. On Poland see: Michael A. Peszke, "The Operational Doctrine of the Polish Air Force in World War II. A Thirty-year Perspective," *Aerospace Historian* 23/3 (Fall/September 1976), pp. 141–43 and for Sweden Klaus-Richard Bohme, "Swedish Air Defense Doctrine, 1918–1936," *Aerospace Historian* 24/2 (Summer/June 1977), pp. 94–99.

20. Taylor, *Combat Aircraft*, pp. 613–15.

21. Krauskopf, "French Air Policy," pp. 89–92, 101–2; Robert J. Young, "The Strategic Dream: French Air Doctrine in the Inter-War Period, 1919–1939," *Journal of Contemporary History* 9/4 (October 1974), pp. 65–66.

22. Edward L. Homze, *Arming the Luftwaffe, The Reich Air Ministry and the German Aircraft Industry, 1919–39* (Lincoln, Nebr.: University of Nebraska Press, 1976), pp. 165–67.

23. Krauskopf, "French Air Policy," pp. 95–99; Young, "French Air Doctrine," pp. 63–67; Russell H. Stolfi, "Reality and Myth: French and German Preparations for War, 1933–1940," (Ph.D. dissertation, Stanford University, 1966), pp. 49–50.

24. As quoted in Anthony Adamthwaite, *France and the Coming of the Second World War* (London: Frank Cass, 1977), p. 162.

25. George H. Quester, *Deterrence before Hiroshima: The Airpower Background of Modern Strategy* (New York: John Wiley, 1966), p. 75; "Italian Air Force," pp. 181–83.

26. John Erickson, *The Soviet High Command: A military-political history 1918–1941* (London: St. Martin's Press, 1962), pp. 382–83; Taylor, *Combat Aircraft*, p. 614.

27. Reichminister der Luftfahrt und Oberbefehlshaber der Luftwaffe, Generalstab, "Luftkriegfuhrung," L. Dv. Nr. 16, 1936, Lw 106/12, in Dokumentenzentrale des Militargeschichtlichen Forschungsamtes, Freiburg; also reproduced in Karl-Heinz Volker, *Dokumente und Dokumentarfotos zur Geschichte der deutschen Luftwaffe*, Beitrage zur Militar-und Kriegsgeschichte, vol. 9 (Stuttgart: Deutsche Verlags-Anstalt, 1968), pp. 466–86; "Die Entwicklung der deutschen Luftstrategie," von Rohden document (4376–447) in the Bundesarchiv/Freiburg.

28. Higham, *Air Power*, p. 81; Green and Fricker, *Air Forces*, p. 171; George Werner Feuchter, *Der Luftkrieg* (Frankfurt a.M.: Athenaum, 1962), p. 143.

29. Kilmarx, *Soviet Air Power*, pp. 146–47; Kenneth R. Whiting, "Soviet Aviation and Airpower under Stalin, 1928–1941," in Robin Higham and Jacob W. Kipp, *Soviet Aviation and Air Power, A Historical View* (London and Boulder, Colo.: Brassey's and Westview Press, 1977), pp. 52–54; Robert Jackson, *The Red Falcons: The Soviet Air Force in Action, 1919–1969* (London: Clifton Books, 1970), pp. 55–56; Boya, *Soviet Air Force*, p. 69.

30. Krauskopf, "French Air Policy," p. 371; Young, "French Air Doctrine," p. 67; M. Astorkia, "Les lecons aeriennes de la guerre d'Espagne," *Revue Historique des Armees* 4/2 (1977):145–73.

31. General der Flieger a.D. Paul Deichmann, *German Air Operations in Support of the Army* (U.S. Historical Study No. 163, June 1962), p. 55.

32. Whiting, "Soviet Aviation under Stalin," pp. 57–59; Jackson, *Red Falcons*, pp. 61–62; Boyd, *Soviet Air Force*, pp. 86–87.

33. Richard E. Stockwell, *Soviet Air Power* (New York: Pageant Press, Inc., 1956), p. 14; Raymond Garthoff, "Soviet Attitudes towards Modern Air Power," *Military Affairs* 19/6 (Summer 1955): pp. 77–78.

34. Quester, *Deterrence before Hiroshima*, p. 101.

35. As quoted in B. H. Liddell Hart, *Europe in Arms* (London: Cassell, 1937), p. 199.

COMMENTARY

CHARLES H. GIBBS-SMITH

Ladies and gentlemen, I really don't know why I have been asked to appear in front of this noble assembly, except that I am in my seventieth year and am probably the only person in the room who has survived the Gotha raids. I remember them very well indeed clustering over London one Saturday morning in 1918.

Having heard the brilliant talks last night and this morning, I, as a historian of hardware, have come to the conclusion that our thinking in regard to war in the air has, from the very outset, been indescribably confused. So many of those concerned with aerial warfare have been so utterly wrongheaded at times that it amazes me that we got through wars as we did, particularly the First World War.

Incidentally, listening to the Group Captain's remarks, repeating Haig on the function of cavalry, I am led to wonder if it was Haig who said that the trouble with aeroplanes was that they always frightened the horses. He was certainly capable of it.

Let me remind you that planning for aerial warfare began long before the twentieth century. In 1670 Francesco de Lana Terzi, an Italian, wrote some of the most fearful descriptions of aerial bombing at sea ever produced, although, of course, his airplanes wouldn't fly. Napoleon, in the 1790s, introduced aerial reconnaissance. The first bombing raid in history occurred in 1849, when the Austrians launched unmanned bomb-carrying balloons against Venice, in an operation very similar to the Japanese effort against the west coast of the United States in World War II. The United States, of course, employed balloons during the Civil War. Unfortunately, Mr. Lowe and his colleagues were convinced that they were being inefficiently employed and had a terrible row with the U.S. Military. By the 1890s the British were using observation balloons in the South African War to good effect.

Work was also proceeding on powered airships during the nineteenth century. In 1852 Gifford's steam-powered airship flew at least five miles per hour. Two decades later, in 1884, Renard and Krebs, artillery captains in the French Army, developed a more efficient airship run by electricity. So you see, attempts to develop an aerial weapon, and some limited

thinking as to the employment of such a weapon, antedated the invention of the airplane by several centuries.

In spite of this preconditioning, the advent of the practical flying machine took the military leaders of the world by surprise. As a result, they reacted with the muddle and confusion that our learned historians have detailed this morning.

In order to clarify such muddle and confusion, I have sometimes found it useful to speculate as to what might have happened had certain key elements of a situation been altered. For example, had the airplane been adopted by military organizations a year or two earlier than it was, would the generals have been able to wield their new weapon more decisively and effectively during the early stages of the First World War?

This could easily have happened. Most people do not realize that for two and a half years after their Kitty Hawk adventure the Wright Brothers did nothing further to develop aviation. They stood down primarily because they couldn't get proper business agreements. They received three very disappointing responses from the United States Army and several disappointing replies from the British Army. In defense of the military, it must be noted that the Wrights imposed the difficult condition that prospective owners and buyers of their aircraft were not allowed to see the product before they bought it. This is an unenviable position for any buyer. After all, they didn't know whether they were going to get something in the form of a dachshund or whatever, with an engine in it. They had to pay according to performance, which was fair enough, but they were not allowed to see any photographs of the aircraft in flight. The only man who got over that difficulty was Colonel Capper of the British Army, who made friends with the Wrights and saw photographs of the craft, but even he wasn't allowed to see the airplane itself.

As a result of this bargaining, the Wrights did nothing from the autumn of 1905 to the spring of 1908. Literally nothing. They never rose an inch off the ground. As an aside, the psychology of the Wrights is another story which we are working on quite keenly at the moment.

The fact of the matter is that if the Wright Brothers had taken their 1905 machine to the Mall in Washington and put it down on its launching rail just to the east of the Washington Monument, and flown it for half an hour over the White House and over Capital Hill, they would have electrified the world. Such a thing would have been so startling, so unimaginable. But the Wrights were by this time so curiously secretive that they refused to fly in public until they were sure they would receive the financial rewards they deserved.

The Wrights' attitude, even if understandable, was unfortunate, for had a public demonstration taken place in the autumn of 1905, all the

technical advances of the First World War might have occurred at least two years earlier, probably more. There were, after all, some extremely clever and adaptive men in those days, except that they were all going along the wrong lines. Once the Wrights had shown them the right lines in the summer of 1908, aviation was absolutely revolutionized within nine months.

As it was, in the two-and-a-half years between 1905 and 1908, European and American designers and engineers stumbled through all sorts of impractical monstrosities. For example, everybody thinks the French were doing wonders. In reality, they were doing very unwonders. I wrote a boring book about the lack of significant developments in French aviation.[1] They had all the clues for such development (given to them by Octave Chanute in 1902). Yet when Wilbur came over in August of 1908, they could only just fly a circle and even then had no concept whatever of flight control. In January of 1908, Henri Farman flew the first circle in Europe (can you imagine—1908?) and he flew it in a quasi-biplane, with no control in roll at all. Can you imagine an airplane yawing itself around using only the rudder? The moment he would put his rudder over, of course, the thing would begin to lift, and he would almost crash into the ground. Then he would have to reverse his rudder. In this fashion, he yawed in the most perilous manner for one kilometer, and that was thought to be the end of the earth. The French papers said that the age of flight had arrived. Mind you, they had said the same thing in 1906, when their dapper little Santos Dumont flew for 21 ⅕ seconds, which you wouldn't really call a very long flight. For that miniscule effort, he was given the fattest luncheon and dinner that was ever given in Paris.

The French were absolutely bereft of ideas and could not produce a decent airplane of any kind whatsoever until 1909. And they had been doing their damndest to do this since 1902. There was ample talent in France all through these years. They had a number of very talented designers who put good engines and everything into their planes, but they could not control roll, and they had problems with stability and aircraft structures.

Despite this talent, however, they made no real progress until Wilbur Wright demonstrated flight control. Wilbur had to show what control in roll did to an airplane, or could do in an airplane, combined by controlling yaw. Once that was demonstrated to the French, and to the world, nothing could stop them. Within a year, the French had moved into the lead in aviation and by 1910 had begun to look at military aviation. Indeed, in 1910 there was a famous meeting in France for military purposes, the *Concorde Militarie*, it was called. Unfortunately, very little came out of it. The best airplane in the whole thing, a most pathetic-looking Antoinette, all cabin and fuselage, couldn't fly; it was too underpowered.

Then what happened? More mystery for you historians of air war. It took two specific events to literally shock the world into a realization of what war might mean in the air. Those two events were very extraordinary. One event took place on 25 July 1909 when Bleriot managed to fly the Channel in a highly unsatisfactory airplane. The next day, after reading the newspapers, you might have thought the atom bomb had fallen. All the papers carried caricatures of the sky covered in airplanes and England underneath, and everybody thought, for heaven's sake, if one small mustachioed Frenchman could fly across the Channel in a very unsuitable airplane before breakfast on a Sunday morning, what on earth would we do if 5,000 mustachioed Frenchmen came in 5,000 little airplanes before lunch? It would, indeed, be a startling event for Great Britain. Thus, Bleriot's flight showed sea power had lost its predominance in Britain's defense system.

The second thing that forced the airplane into the minds of military commanders was the big brass meeting—the first great air meeting of all time—in August of 1909. If you look at the photographs of the commanders-in-chief and their military aides and the political/military people who attended, it is clear that every important military person in Europe turned out for that meeting. It was this meeting that showed for the first time and celebrated, if you care to use that word, the arrival of the airplane as a practical vehicle. Until August of 1909, airplanes were virtually a joke, except to the people who made them and who were killed in them. August 1909 marks the beginning of all air war, all air everything. Within a year, everybody was flying.

If the armies and governments of Europe had had those two extra years the Wrights could have given them, many of the arguments and the trials and tribulations and miseries would have all been solved by the time the war started, and the completely asinine behavior that occurred on the part of the armies would not have happened. I don't know about America, but certainly in England the military and the political leaders acted like lunatics. I am very proud of my country, but I am not proud of its air record during the early years. We had not a single man rise off the ground until 1908 except an expatriate American, S. F. Cody, who was a most picturesque character. (He once upset the army terribly at Farnborough, by riding with a ten gallon hat around Farnborough Common on a white horse.) This man did, in fact, build an ingenious and quite good airplane and fly it in October of 1908, but he didn't build a passably practical airplane until mid-1909.

The British government, in that charming tardy way we have, composed an official secret document in 1908 and 1909. It was—those who haven't seen it, please take note of this—a very, very high level, highly secret conference on aerial navigation chaired by Lord Esher. It was, in

fact, so secret that it was made a sub-department or a sub-function of the Imperial General Staff. They have now at last released, not only the conclusions, but the transcriptions of every word spoken; and it reads like an absolutely, unutterably crazy *Alice in Wonderland*. (The Chief of the Imperial General Staff, for example, argued with his own colonel, before Lord Esher, about how to spot gunfire from balloons.) They didn't interview a single pilot. Think of it, not one pilot! Since the commission took place at the end of 1908 and 1909, they could have brought Wilbur Wright over for two cents from France where he was doing wonderful flying. They had no pilot; they had only one esteemed witness because of the lack of experience in England at that time. That was the honorable Charlie S. Rolls (Rolls of Rolls Royce), whose sole distinction in aviation at that time was in having been given a six-minute ride by Wilbur Wright. The committee also discussed airships, which, in the end, they thought were worth subsidizing, whereas they didn't really think airplanes were worthwhile.

The most charming element of this farce, which really is hilarious, was the examination of Sir Hiram Maxim by Lord Esher, who was a very shrewd cookie indeed. Sir Hiram Maxim was a self-appointed guardian of aviation. He had never made anything beyond a ghastly test in 1894 of a contraption which just rose off its rail before he shut the steam off. That was the end of his researches. He was questioned by Lord Esher in a most delightful way. Asked, for example, whether he had ever built an airplane, he answered, "Oh, yes, I did. I built one in 1894. And all the modern airplanes follow the principles that I laid down then." Needless to say, no principle he ever laid down was ever followed at any time whatsoever.* Then Esher asked him, "Do you know about airplanes in general?" He replied, "I know everything on this planet about airplanes." Looking through the ghostly hand of the shorthand writer at the time, one can imagine Esher's lips curling as this pompous old ass went through his rigamarole about what he did and didn't know about things—especially when we remember that Wilbur Wright had already been flying for two hours and twenty minutes at a time in France, had done everything you could do in an airplane at that time, and had won every prize in the world. To top it off, when Esher asked, "Do you think you could produce as good an airplane as Wilbur Wright?" Maxim said, "One really shouldn't have to do very much to produce an airplane as good as the Wrights.†

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*Maxim did design an airplane, a real airplane, which he produced in 1911 and to which *Flight Magazine* devoted two whole articles with about 30 illustrations. Unfortunately, it never managed to take off once.

†C.H. Gibbs-Smith, *The Rebirth of European Aviation, 1902–1908: A Study of the Wright Brothers' Influence* (London, 1974).

To put this all in perspective, one needs to keep in mind the time frame, 1908–1909, and recall where developments in land and naval warfare were leading. And here was this high-faluting committee talking for days and days about airplanes or flyers, as they were sometimes called, or even airships, as they were referred to by those people who were thoroughly confused between a dynamic airplane and an airship.

But can you imagine if all this had occurred two years earlier, which it would have if the Wrights had not waited until 1908 to demonstrate their airplane. The whole world would have been in a totally different state altogether, and history might have been absolutely transformed.

THE AMERICAN DIMENSION

EUGENE M. EMME[1]

Previous papers in this session have well supported the logic of the architects of this first Air Force Academy Symposium on "Air Power and Warfare." The Continental powers and England gained considerable wartime experience in the exercise of air power before the United States belatedly entered the fray and then had to create an air force "virtually from whole cloth."

The United States had only just acquired some measures of world influence at the turn of the century. It had inherited new responsibilities in the Philippines and Cuba from Spain, and soon completed the Panama Canal. As historian Mahan had argued, and the Naval War College understood, the "New Navy" was still the "first line of defense." The "dreadnaught," or battleship, was now the capital ship. The submarine was just coming out of its experimental stage. Coastal artillery still remained in place as the key to a second line of defense. The Army had begun a major reorganization featuring a general staff and a war college which studied the classic principles of war derived from the great battles of the past. The validity of that experience and, ultimately, all American defense arrangements would be called into question by the arrival of the airplane and the powered balloon called the airship.

The Beginning: 1903–1917

Military aviation received its decisive impetus in December 1903 from Orville and Wilbur Wright, whom we commemorate here. In world military history, balloons such as the American vehicle flown in action at San Juan, Cuba, in 1898, had made a mark, but never as lasting as that to be made by the successor vehicles of the Wright invention.[2]

While perfecting their flying machine at Dayton, Ohio, in 1905, the Wrights twice offered their airplane, or exclusive use of their pending patents, to the U. S. Army. They explained that they considered their Flyer practical for scouting and communications, but that any potential commercial use must await further development beyond their present resources. The Army's Board of Ordnance and Fortifications brusquely turned down each offer of the Wrights because it still smarted from the bad press over the failure of the aerodrome built by Dr. Samuel P.

Langley with an unpublicized federal grant of $50,000. Rebuffed by their government, the Wrights stopped flying, fearful that further exposure would invite the theft of their hard-earned innovations.[3]

A New York congressman and some Ohioans stirred the interest of Theodore Roosevelt and his administration in both the Wright Flyer and its implications. A miniscule Aeronautics Section of the Signal Corps, organized on 1 August 1907, became the government's instrument for staying in touch with aeronautical advances. The Signal Corps soon was advertising for "a practical means of dirigible aerial navigation" and set up a balloon facility at Fort Omaha, Nebraska. By December 1907, the Signal Corps was seeking bids for one flying machine. On 8 February 1908, the Wrights agreed to deliver one Flyer within 200 days.

In July 1908, Lt. Benjamin Foulois, who always had one eye cocked to the future, submitted his thesis to the Signal Corps School at Ft. Leavenworth on the "tactical and strategical value of balloons and aerodynamic flying machines." In a future war, Foulois wrote, an air battle would influence "the strategic movement of hostile forces before they have actually gained contact."[4] As Foulois explained later, he had mainly elaborated upon the doctrine in the Infantry Manual by inserting aviation whenever tactical employment of the cavalry or artillery had been called for. The first fruit of the thesis was his assignment to aeronautical duty.[5]

In August, Wilbur Wright began his spectacular flights in France, from which he would go on to make over a hundred more in Europe, all demonstrating the superior flight control of the Flyer over any European aircraft. But the first demonstration at Fort Myer, Virginia, also in August, was that of the impressive non-rigid airship of Thomas Scott Baldwin of California. His flight engineer was Glenn Curtiss, a builder of motorcycles and of the airship's 20 hp engine. The Army bought the airship, designated it "Signal Corps 1," and later shipped it to Fort Omaha, where it was used to check out a few airship pilots and to provide demonstrations at Fort Leavenworth and at air shows and state fairs. In 1912 it was sold for scrap.[6] (Also in 1908, German Army accepted its first large rigid Zeppelin, and Kaiser Wilhelm was to declare Count von Zeppelin the "greatest German of the century."[7] Later, in Nazi days, a German history of flight was to publish a picture of the Wright Brothers' "German grandfather.")[8]

On 9 September 1908 Orville Wright made two spectacular flights at Fort Myer, one of fifty-seven minutes, the other of over an hour, to be followed by other demonstrations before Washington officials and thousands of onlookers. The most qualified Army officer was Lt. Thomas Selfridge, who had worked with Alexander Graham Bell and associates and had already flown an aircraft. When he flew with Orville, the Flyer crashed from a height of seventy-five feet, killing Selfridge. Orville

Wright was seriously injured, thus postponing completion of the Army acceptance flights until 1909. It was little wonder, given the fragile state of the flying art and its barely organized sponsorship in the Signal Corps, that the Congress rejected a budget request of the Secretary of War in 1908 for $500,000 for Army aeronautics.

Already increasingly evident in the public arena were the non-military speculations about the potentialities of military power to be served by an air weapon not tethered to surface forces. In 1908, H. G. Wells published *The War in the Air*, which, even before Louis Bleriot's hop across the English Channel, depicted "The Battle of the North Atlantic" and "How War Came to New York" in Italian-style airships. In Wells' account, the United States was attacked because:

> It was known that America possessed a flying machine of considerable practical value, developed out of the Wright model; but it was not supposed that the Washington War Office [sic] had made any wholesale attempts to create an aerial navy. It was necessary to strike before they could do so.[9]

Orville Wright completed the trials of the Flyer at Fort Myer in July 1909 in the presence of President Taft and the Secretaries of the War and Navy Departments. The rebuilt Wright Flyer exceeded all Signal Corps specifications, remaining aloft seventy-two minutes and averaging forty-two mph with a passenger. The U. S. Army soon had the first and only military airplane in the world, a short-lived and singular technological lead never again enjoyed by the United States until the appearance of the B–17 and the later atomic bomb. As agreed in the contract with the Army, Wilbur Wright proceeded to check out Lts. Lahm and Humphreys at College Park, Maryland. Although both officers were then transferred back to their respective non-flying line organizations, others, including Henry H. Arnold, were later given instruction at locations such as Dayton, Ohio; College Park, Maryland; and Augusta, Georgia.

After the International Air Meet in Rheims, France, in 1909, the flying machines of dedicated mechanics and sportsmen generated a flying boom around the world. In September of that year, Orville Wright flew a record altitude flight of 1,600 feet above Berlin, Germany, while, on the same day, Wilbur flew around the Statue of Liberty in New York. Soon many airplanes were built in the United States, and, even if they did not fly very well, they replaced balloons at county fairs.[10]

The first congressional appropriation of $125,000 in 1911 for Army aviation ended the Wright Flyer era. Five new aircraft were ordered, and a permanent flying school was soon established at North Island, San Diego. A few experiments, beyond those involving only higher and further flights, had long term significance but were not immediately pursued by the Army. The low-recoil machine gun developed by Colonel Isaac Lewis and fired from an aircraft by Captain Chandler, chief of the Aero-

nautical Section, was to become a standard air weapon in Europe. A bomb sight was tested, bombs dropped, and airborne photography and radio tests made. Twelve of the first forty-eight officers assigned to Army aviation were killed in accidents. Pusher aircraft of the Wrights and Curtiss were dropped in favor of tractor aircraft (with the propeller in front of rather than behind the crew) such as the Curtiss JN-1 or "Jenny." This tractor evolved after 1914 into the basic trainer used throughout the war to come, and later was used as a bomber by Marine aviators and as a plaything by hundreds of civilians.

On 18 July 1914, Congress authorized the Aviation Section of the Signal Corps, with a strength of 60 officers and 260 enlisted men. After the outbreak of war in Europe in August, the First Aero Squadron was created on 1 September 1914, under Captain Foulois. In his "History of Rockwell Field," Major Henry H. Arnold later wrote about the First Aero Squadron:

> This was the first operating unit of any kind ever organized. . . .
>
> The question now arose for the first time as to whether a flying officer of limited administrative experience or non-flying officers of considerable administrative experience in the Army should not be placed in command of such a squadron. It is also to be noted, however, that this question had not been satisfactorily solved even several years later [1916].[11]

The First Aero Squadron was always provisional until 1917, in the sense that it did not have a full complement of planes, even when three other squadrons were organized on paper. Also apparent was the need for greater understanding of the potential of combat aircraft, beyond the obvious reconnaissance mission. Lt. Thomas D. Milling summarized very well the relationship between doctrine and equipment at that time when he observed, "Our doctrine has been consistent since 1913 within the limits of our equipment."[12]

On the day before the founding of the First Aero Squadron, a British Royal Flying Corps reconnaissance plane spotted the armies of German General von Kluck's "inward wheel" heading southeast to Paris. This intelligence, soon confirmed, led to a series of battles called the "miracle of the Marne."[13] The halt of the German offensive and the eventual "race to the sea" created the trenches of the Western Front. Within a few months, the Army Signal Corps issued its first specification for a reconnaissance two-place biplane with a speed of 70mph. Twelve bids were received, but the lack of a reliable engine thwarted procurement of the desired airplane.[14]

At first, few Americans, including military leaders in Washington, seriously believed that the war in Europe would involve the United States. With the sinking of the *Lusitania* in May 1915, unrestricted German U-boat operations greatly increased military concern despite President Woodrow Wilson's strict neutrality posture.[15] Hindering American un-

derstanding of the war, especially its evolving air operations, was the inability of neutral observers to penetrate the cloak of secrecy laid down by both sides.

The U.S. Navy knew about Dr. Langley and the Wright brothers, Navy Lt. George Reed having almost flown in the tests at Fort Myer. Later he flew with Army Lt. Frank Lahm at College Park. To handle the queries about aviation being directed at the Navy Secretary's office, Captain W. I. Chambers was made its air coordinator. Along with Glenn Curtiss, the developer of the first practical seaplane, Chambers brought the airplane into the Navy, which had expressed no interest in aviation until convinced it could help the fleet.

Chambers arranged the first ship-to-shore flight by Eugene Ely, a pilot employed by Curtiss in one of his firm's pushers, from a plank platform on the cruiser USS *Birmingham* at Hampton Roads on 10 November 1910. Two weeks later, Glenn Curtiss informed the Secretary of the Navy that he would provide free flight training for an officer at his winter camp on North Island, San Diego. Lt. T. G. Ellyson was detailed and became the first naval aviator. In early January 1911, Ely landed on a platform on the USS *Pennsylvania* at anchor in San Francisco Bay and soon took off again. Later in the month, Glenn Curtiss made the first successful hydro-airplane flight with his "Silver Fish" off North Island, Lt. Ellyson assisting in the preparations. In February, Curtiss taxied his seaplane out to the *Pennsylvania*, was hoisted aboard and then returned to the water to taxi back to North Island. It was a persuasive demonstration, and in March, Congress appropriated $25,000 for naval aviation. The Wright Company now offered to train one Navy pilot, contingent upon the purchase of one airplane for $5,000. Lt. John Rodgers was sent to Dayton, to become Naval Aviator No. 2. By 8 May 1911, the U. S. Navy had purchased three airplanes: the Curtiss "Triad," a "hydra-terra-airplane" to whose float Curtiss had added wheels for both land and water landings, a Curtiss pusher, and a Wright Flyer.[16]

Captain Chambers was directed to set up an experimental station at Annapolis, where Lt. John Towers and others were training. There and on exercises, experiments went on in the application of the airplane to Navy needs. Off Cuba, Lt. Towers confirmed that submerged submarines could be seen from the air; other experiments went on with radio telegraphy, photography, and water-based operations to include the testing of catapults. At the Washington Navy Yard, Naval Constructor Holden C. Richardson worked on hull designs for seaplanes, a wind tunnel for aircraft design, and flight testing. From 1912 on, year-round flight training and operations were located at the first Naval Aeronautics Station, Pensacola, Florida.

In 1912, a Marine, Lt. A. A. Cunningham, began flight training at the Burgess and Curtiss factory at Marblehead, Massachusetts, and became Naval Aviator No. 5. Later called the "Father of Marine Corps Aviation," Cunningham and his associates soon were engaged in exercises in Cuba with an Advance Base Brigade.[17]

One of the earliest steps taken by the United States after the "guns of August" began firing in Europe, was to create in March 1915 the first federal agency responsible for coordinating and stimulating aeronautical research. A rider to the Naval Appropriations Act of 1915 created the National Advisory Committee for Aeronautics, "N.A.C.A.," which could never live down its Navy birthright in the eyes of some Army airmen. Modelled after a British body founded in 1910, the NACA was to examine and make recommendations "on the problems of flight, with a view to their practical solution," a general and unwarlike charter in keeping with the neutral position of the United States. The twelve man membership of NACA included the chiefs of the Army Signal Corps and its Aviation Section, the director of Naval Aviation and its Constructor, the chiefs of the Weather Bureau and the Bureau of Standards, and professors interested in aerodynamics as it grew out of fluid mechanics.[18]

At the first meeting of NACA in the office of the Secretary of War, chaired by Brig. General George Scriven, Chief Signal Officer, on 23 April 1915, the membership considered his previously submitted position that the problem "most requiring attention involved military aviation and national defense." "Nothing," he said, "will so readily bring order from chaos as the carefully considered decisions [sic] of this Advisory Committee."[19] But the NACA was to become concerned with the technical problems of civilian as well as military aviation. Its recommendations bound none of its members, and, in unmilitary fashion, it elected its own chairman.

A month after NACA's first meeting, the first German Zeppelin attacks on London highlighted a capability unavailable in the United States. The Committee, for its part, modestly surveyed research capabilities nation-wide, gathered what basic knowledge it could in Europe, and began to issue its widely-used bibliographies. In 1916, the NACA undertook some policy initiatives by inviting aircraft engine manufacturers to discuss the problems of attaining more powerful and more reliable aircraft engines, by recommending a government air mail service, and by seeking the creation of a laboratory at an Army-Navy aircraft proving field, which became Langley Field at Hampton, Virginia, in 1917.[20] The dozen or so employees of NACA at Langley, however, did no research in its wind tunnels until after the war.

Another scientific initiative, this time by the National Academy of Sciences in 1916, prompted President Wilson to establish a National

Research Council (NRC) to engage scientists on defense problems, particularly submarine detection. Once the United States entered the war, some scientists put on uniforms. Among them was Major Robert Millikan of the California Institute of Technology, the head of the Signal Corps Science Research Division.[21]

In November 1915, Major William Mitchell, then a General Staff officer, apparently prepared a survey of national defense needs in aviation. He claimed that aviation would be particularly useful as "a second line of defense," by acting as a backstop to the Navy when attached to harbor and coastal defenses, by carrying on reconnaissance and spotting for artillery, and by destroying attacking aircraft and submarines. Army aviation should be increased, said Mitchell, to 46 officers, 243 enlisted men, and 23 aircraft of various capabilities. By 1916, and at his own expense, Mitchell began taking flying lessons during his off-duty time.[22]

In early 1916, Congressional support for aerial rearmament greatly accelerated when the First Aero Squadron quickly wore itself out in supporting General John Pershing's Punitive Expedition against Pancho Villa. An emergency appropriation for the Aviation Section of $500,000 was followed by the enormous sum of $13 million, a figure nine times the total of all funds which had been received by Army aviation to date. (Incidentally, Captain Foulois must have had a typing pool larger than the Aviation Section, since so many original and carbons of his report on the demise of the First Aero Squadron are scattered through the files in the National Archives.)

In April 1917, when the United States entered the war in Europe, its Army's aviation had 131 officers (mostly pilots), 1,087 enlisted men, and no aircraft capable of combat. Naval aviation had forty-five float seaplanes, six flying boats, three land planes, and one blimp, none ready to operate with the fleet. Almost ten years had passed since the Army accepted its Wright Flyer, but American air power was almost non-existent, with a handicraft industry, no organized planning or research and development, and very little knowledge of aviation progress in Europe.

World War I: 1917–1918

American air power in the Great War was scarcely born when it was demobilized. A nightmare for that air power ensued from the utterly rash promises by industrial, military and political leaders in 1917 that thousands of American planes would gain perpetual air superiority, darken the skies over Berlin, and end the war. The first American-built but British-designed DH–4s reached France in May 1918, unready for operations and often damaged in transit. The American model had a reputation as a "flaming coffin" until the gas tank between the pilot and observer was re-positioned after the war. To the hundreds of airmen

arriving for flight training in France, it appeared that their presence was designed more to raise that country's morale rather than to get on with the air war. When promised first-line European aircraft were not delivered, the American airmen who eventually qualified in Allied flight schools had to take whatever aircraft were offered them. Those American airmen who got to the front did a great job with what they had. James Lea Cate's assessment seems sound: "Had the war dragged on into 1919, the boasts might have been made good."[23]

German Field Marshal Hindenburg and General John J. Pershing credited the Allied victory to the waves of fresh American infantrymen whose assaults cracked the Western Front. But it was also true that those ground forces were protected by air actions that denied superiority to the Germans over the battlefront. In the rear areas, by the fall of 1918, British bomber crews attempted to strike at the center of cities in the Reich. The resulting panic caused the German government to ask for an immediate halt to the bombing raids as part of its armistice proposals.[24]

Perhaps it was indeed inopportune, as Raymond Fredette has observed, that General Pershing just missed witnessing the first bombing raid by German Gotha bombers on London on 13 June 1917.[25] A vivid demonstration of air power's potential might have been most persuasive. The Gotha bomber raids on England, for example, helped to spur the creation of the independent Royal Air Force in the midst of the decisive phase of the war on the Western Front.[26]

Professor-General Bill Holley has treated very well the incredible history of the American aircraft production program in his *Ideas and Weapons*. The haste and waste in the program offered lessons that were well learned in time for the World War II buildup. Hampering the World War I American air effort as well were the requirements to mobilize and train tens of thousands of raw recruits after the United States had entered the war, not to mention the problems of organizing and staffing the higher direction of the air effort.[27]

A few highlights from the American experience in the Great War may be suggestive. The splendid biography of Billy Mitchell by Colonel-Professor Al Hurley provides a clear understanding of Mitchell's early air power role. Mitchell got himself to Spain and then to Paris four days after the American declaration of war. Fluent in French, he wrangled his way to that nation's share of the front, absorbing briefings on air employment and taking lessons in flying its latest aircraft. Mitchell seemed more influenced by his three-day visit early in May with British airmen, principally Major General Hugh Trenchard.[28] Trenchard impressed on Mitchell the concepts of "forward action" and the "relentless offensive."[29] For various reasons, Mitchell's reports to Washington about all this had little impact.

Mitchell also had contributed to the preparation of French Premier Ribot's request for American resources that became the bottom line for the take-off of the ambitious U. S. aircraft construction program. Ribot asked for an American "flying corps" of 4,500 planes, 5,000 pilots, and 50,000 mechanics to be sent to France in 1918. American acceptance of this goal led to sending the Bolling Mission to Europe to determine what kinds of airplanes should be built. Its prompt recommendations included ideas on the strategic bombing of enemy industries. Top priority was given to the production in the United States of the British DH–4 reconnaissance bomber and the American all-purpose Liberty engine, with the second priority, pursuit planes, to be purchased in France and England. In the meantime, Pershing made Lt. Colonel Mitchell the Aviation Officer of the AEF. Soon, however, Mitchell was subordinated to Brigadier General Benjamin Foulois. Eventually, the leadership and talent Mitchell showed as Chief of the Army Air Service, First Brigade, on the American sector of the front won him fame. General Trenchard's early impression of Mitchell was noteworthy: "If only he [Mitchell] can break the habit of trying to convert opponents by killing them, he'll go far."[30]

Those few American squadrons which reached France by late 1917 served with French and British units after they had been organized and trained. General Pershing refused to flesh out depleted and tired Allied air units with Americans. After April 1918, a few American squadrons began to operate in support of their own forces. While news from the trenches was drab and bloody, the individualism of air combat made heroes of Eddie Rickenbacker, Frank Luke, and others. Contrary to Hollywood's later dramatization, however, aerial combat involved a lot more than glamorous dawn patrols and was fully subject to the vagaries of the weather and the fragility of the flying machines themselves.

Pershing made Brigadier General Mason Patrick, a West Pointer, his Chief of Air Service, A.E.F., in May 1918. Eventually Patrick assigned Mitchell the leadership of all American air units with the First Army. The struggle for the St.-Mihiel salient offered the best example of air power's potential on a battlefield. Mitchell's plan to gain air superiority required 1,500 planes, only 609 of them piloted by Americans, the rest being drawn from Trenchard's Independent Force, along with a French Air Division, and other Allied squadrons. Only a third of the force directly supported the First Army; the rest, in two brigades, struck at the flanks of the salient and at the German air force facilities in the rear of the salient. Pershing praised the action's success, and all airmen saw it as a model for the effective concentration of air forces.

In the remaining Allied offensives, Mitchell usually had only American squadrons at his disposal and used them mainly in close support and counterair roles. German air opposition persisted to the end. Meanwhile,

Trenchard's Independent Force bombed German targets in an effort that gained momentum from September onward. The Armistice aborted planning for a much larger bombing campaign by the Inter-Allied Independent Air Force under Trenchard, who would have been responsible to Marshal Foch, the Supreme Commander.

How is one to evaluate the limited American effort? Statistics are one measure. The U. S. Army Air Service in France constituted 10 percent of the Allied air forces, dropped 139 tons of bombs, and reached as far as 160 miles behind the German lines. Some 237 American airmen were killed in battle; no figures for greater operational, training, and other losses are available. There were 58,000 Army airmen in France, 20,000 in training in England, and some in Italy. A total of 10,000 Army aviators completed flight training, but one must also note that 27,000 officers and men of the Air Service had been assigned to obtaining the spruce used in the manufacture of aircraft.

Over 3,000 DH–4s and 7,800 training planes had been produced, a total of some 11,000 aircraft against the 27,000 planned. Of the 1,005 aircraft in American air units at the front, only 325 were American made. There was no lack of doctrine, or leadership, or courage for the employment of American air power in France, only the absence of the equipment and the manpower at the right time and place.[31]

For its part, U. S. Navy aviation concentrated on the development of the HS series of flying boats. The Royal Naval Air Service had used some of those flying boats, two-engine long-range Curtiss "Large America" flying boats, to score a unique success by shooting down, at sea, two German naval dirigibles in May and June 1917. American naval aviation operated out of twenty-seven bases in Ireland, England, France, and Italy. On anti-U-boat patrol, the Navy reported attacks on twenty-five U-boats, sinking or damaging a dozen.[32] Operating with the Northern Bombing Group in France, the mission of the naval airmen was expanded to bomb German submarine and dirigible installations with DH–4s. Round-the-clock bombing was being discussed when the Armistice intervened. In the Italian theater of war, Navy, Marine, and some Army pilots flew Caproni bombers in Allied air units against Austrian targets.

The U. S. Navy's air force had grown to a total of 6,716 officers and 30,693 men in Navy units, and 282 officers and 30,000 men in Marine Corps units. Of these, 18,000 had been sent abroad.[33]

Despite the employment of air power and its rapid development during the war, for many observers, air power had yet to prove itself in warfare as a military and naval instrument. As America demobilized her

military forces after the Armistice, the contrast between reality and vision would set the tone for its military aviation during the next twenty years.

Nascent Air Power: 1919–1937

With the conclusion of "the war to end wars," "the long armistice" began.[34] From its position of isolation, the United States tried to secure peace through the Washington Naval Treaties of 1921–1922 and the Kellog-Briand Peace Treaty six years later. In preparation for a presidential election during a deepening depression in 1932, the Hoover Administration, supported by Army Chief of Staff Douglas MacArthur, considered a ban on all submarines and aircraft carriers for submittal to the World Disarmament Conference in Geneva.[35] In an increasingly nationalistic world, fantasies about disarmament abounded while Congress investigated "merchants of death" and the impact of the airplane on national defense. Congress tried to perpetuate peace by passing the Neutrality Acts prohibiting the sale of armaments to any belligerent while Adolf Hitler tore up the Treaty of Versailles by announcing the existence of the Luftwaffe and universal military service in Nazi Germany.

In the United States, the postwar demobilization was chaotic. American airmen returned from France to help answer Congressional inquiries about the failure of the billion dollar aircraft construction program. Of the 200,000 men in the wartime Army Air Service, only 10,000 officers and enlisted men remained on duty by June 1920. A year later, the aircraft inventory was 1,100 DH–4s, 1,500 Jenny trainers, 179 SE–5 pursuits, and 12 Martin MB–2 bombers. There were fewer than 900 active Army pilots and observers. Sixty-nine of these were killed in 330 flying accidents in 1921 alone. Ninety percent of the aircraft industry was bankrupt. The Army Reorganization Act of 1920 was a crushing blow to Army Air Service expectations. Although authorized strength was set at 1,516 officers, 2,500 flying cadets, and 16,000 enlisted men out of a total postwar Army of 280,000, there was no money to recruit to these levels or to purchase many new airplanes. The airmen would have to make do with Liberty engines until late in the 1920s.[36]

Most frustrating to Army airmen who were usually junior in rank and rarely West Pointers, was the prevailing dim view of the future of military aviation held by those who managed the purse strings and the promotion lists. Frustration soon turned into a struggle not only with the General Staff and the Secretary of War, but also at the summit on Capitol Hill, where the fate of the post-war services was being deliberated. The fundamental issues then, as now, inevitably involved the White House.

The first postwar Congressional dialogue on aviation centered on whether all Federal aviation activities should be centralized in a cabinet-level Department of Aeronautics. Foulois and Mitchell at least agreed on this possible step. But it proved impossible to achieve unified com-

mand of "air power" whether it operated over land or over the sea, despite the precedent in the creation of the Royal Air Force in England. Billy Mitchell soon directly challenged the Navy's long-standing claim to be "the first line of defense," by asserting that his bombers could sink any battleship. The celebrated and highly publicized sinking of the unsinkable German battleship *Ostfriesland*, seemed to justify Mitchell's claim, but his oral "bombs" led President Harding to note that Mitchell gave the admirals "apoplexy"; and later President Coolidge was provoked into calling him a "God-damned disturbing liar."[37]

After 1923, a single Department of Defense with an independent air force became the central issue in the American air power story. Mitchell, after cooling-off trips to Europe in 1922 and to the Far East in the first half of 1924, launched even more inflammatory attacks upon the Navy's admirals and the Army's General Staff. Having succeeded in alienating every responsible person with authority to help him, he was transferred into "exile" at San Antonio. The crash of the Navy dirigible, the *Shenandoah*, gave Mitchell the occasion he wanted to assure his court martial. He accused the Navy and War departments of "incompetency, criminal negligence, and almost treasonable administration of aviation." To undercut the airman's charges, President Coolidge created the Morrow Board, which met, heard all of the familiar witnesses, and reported out before Mitchell's trial. The framers of the Army Air Corps Act of 1926 would attempt to remove some complaints on flight pay and promotions and gave the Air Corps a spokesman by authorizing an Assistant Secretary of War for Air. In the meantime, Mitchell resigned and continued to express his views.[38]

Billy Mitchell's legacy was permanently ingrained in the Army Air Corps. Not the least of his marks was made by the corpus of his many papers on the role of airplanes in national defense. Defining "air power" as "the ability to do something in the air," Mitchell's central idea was that air forces rendered armies and navies obsolete because they could achieve a decision in war by directly attacking "vital centers" of an enemy nation. After he resigned, he continued to spread the gospel, wherever possible, that "the airplane is the arbiter of our nation's destiny."[39]Colonel Hurley's biography and Dr. Frank Futrell's monumental work on the history of Air Force thought permit me little opportunity to say more.[40]

The beliefs of Mitchell, however, made it absolutely unnecessary for him to quote Hugh Trenchard or, if he knew them, the theories of Giulio Douhet, later collected in *The Command of the Air*. Mitchell met and talked with Douhet, although where and when he did remains not fully clear. It would be interesting to know if there is more on the Mitchell-Douhet connection. We have more evidence about the views of Douhet's associate, Count Caproni, which were communicated to Americans in

1917.[41] At any rate, General "Hap" Arnold's later judgment on Billy Mitchell seems fair enough: despite his political failings, no one should ever forget that Mitchell was ahead of his time in his ideas on the employment of air power.[42]

Demobilization proved equally as disruptive to Naval Aviation. During the war, that aviation had been loosely organized and was mothered by various bureaus of the Navy. Most of its pilots were reservists, and few remained on active duty after demobilization. The Navy had only 319 active naval aviators in June 1920, with 3,296 inactive, including reservists.[43]

The Chief of Naval Operations, Admiral William Benson, vehemently opposed the proposal in 1919 to combine Army and Navy aviation. Billy Mitchell lashed out directly at Benson, decrying his shabby outlook on the "ugly duckling" of the Navy. More air-minded admirals on the Navy's General Board advised the Secretary of the Navy in June 1919 that "a naval air service must be established, capable of accompanying and operating with the fleet in all waters of the globe."[44] The president of the Naval War College, Admiral William S. Sims, gave Congressional friends studies which argued that a superior fleet of aircraft carriers, similar to those developed by the Royal Navy, "would sweep the enemy fleet clean of its airplanes, and proceed to bomb the battleships, and torpedo them with torpedo planes. It is all a question of whether the airplane carrier, equipped with eighty planes, is not the capital ship of the future."[45]

Naval aviation got another boost when the National Advisory Committee on Aeronautics (NACA) recommended that the War, Navy, Post Office, and Commerce Departments have separate bureaus of aeronautics, to be coordinated by a top-level board of civilians. This NACA proposal, which smacked of retaining for NACA a post-war policy role in all aviation, was rejected by the Joint Army and Navy Board. The Secretaries of War and Navy successfully refused any connections with the NACA by creating an Aeronautical Board to consider policy questions regarding the roles and missions of aviation in both services.[46] In February 1920, CNO Benson agreed to give bureau status to naval aviation. The new status was not to be public knowledge, however, until 10 August 1921, after the sinking of *Ostfriesland* by Mitchell's bombers in July.[47]

Admiral William Moffett, chief of the Navy Bureau of Aeronautics until he was killed in the crash of the dirigible *Akron* in 1933, was a different personality from Mitchell. Moffett, an Academy graduate, worked within the system to put aviation into the corpus of the Navy. With the help of airmen executives who were all Annapolis products after 1922, the Navy learned to operate aircraft carriers, which evolved from

surface auxiliaries into capital ships in a task force. With the commissioning of the first make-shift aircraft carrier, *Langley*, the Bureau of Aeronautics (BuAer) was underway. Moffett, who now bore the brunt of Billy Mitchell's attacks on the Navy, came to regard him, he said, as a man "of unsound mind and suffering delusions of grandeur." One wonders what Moffett and Major General Mason Patrick, again Chief of the Army Air Service, said to one another about Mitchell at meetings of the NACA.[48]

The Navy steadily advanced its sea-air capabilities after an NC–4, one of the three flying boats built during the war, completed in May 1919 the first trans-Atlantic flight from Newfoundland to Plymouth , England, by way of the Azores and Lisbon.[49] The Naval Appropriation Act for FY 1920 had already funded conversion of a collier into the *Langley*, which used aircraft landing hooks and deck cables developed by the British and catapult launchings. Also authorized in 1920 was the procurement of two merchant ships as seaplane tenders, the construction of one rigid dirigible (later the *Shenandoah*), and the purchase abroad of another (the ill-fated British R–38). A third dirigible, the *Los Angeles*, was acquired from Germany as part of the reparations settlement. By 1923, flights from the *Langley* had begun, and the fleet exercises in Panama used patrol squadrons. The next year, while he was flying mail to the Canal Zone, Army Lt. Moon, bombed the *Langley* with ripe tomatoes and delayed a fleet exercise for a day.[50]

"BuAer's" greatest achievement in the 1920s was the development of the aircraft carrier as a part of the Navy's capital ship construction program. Two battle cruiser hulls, permitted under the Washington Naval Treaties of 1922, became the aircraft carriers *Saratoga* and *Lexington*, commissioned in 1928. The completely new carrier *Ranger* appeared in 1934, followed by *Enterprise* and *Yorktown* in 1936, and the promise of another carrier, *Wasp*.[51]

All major Navy ships had catapult scout planes, and flying boats were not neglected. The "flying aircraft carriers," the *Akron* and *Macon*, however, were expensive disasters. C. G. Grey, editor of the English journal, *The Aeroplane*, once quipped: "The airships breed like elephants and aeroplanes like rabbits."[52] The Navy could afford no more of the airships, which most Army airmen always considered unworthy combat vehicles.

Since the Washington Naval Treaties forbade the United States to build a major naval installation in the Philippines, Pearl Harbor became the major port for the Pacific Sea Frontier. Fleet exercises after 1931 included the *Saratoga* and *Lexington*, although the cost of fuel was a major constraint. In the 1932 exercises, aircraft from the "Sara" and the "Lex" successfully "bombed" Pearl Harbor. Supplemented by the three

new carriers, the carrier force was generally divided by 1936 between the Atlantic and the Pacific Sea Frontiers. Only the *Langley*, converted to a seaplane tender, was ever on station in Asiatic waters.

After the Japanese Army, supported by carrier aircraft, invaded China in 1937, the U. S. Navy's efforts to equip its sea-based air power with up-to-date aircraft, to lay keels for more aircraft carriers, and to train manpower became most urgent. In the fleet exercises of 1939, Naval Aviation was deemed to be "fast reaching a high state of readiness." Still, in 1940, the Japanese carrier force had grown to ten.[53]

When the MacArthur-Pratt agreement of 1931 affirmed that the Army Air Corps was to be responsible for the land-based air defense of the United States and its possessions, Marine Corps aviators were required to become qualified on aircraft carriers. By 1934, sixty of the hundred-odd regular Marine Corps aviators had served on aircraft carriers and had gained experience on more up-to-date aircraft. In 1933, however, the creation of the Fleet Marine Force to seize shore bases for naval operations basically altered the mission of the Marine Corps aviation to one of close air support for amphibious operations. By 1939, the number of active Marine Corps aviators had grown to 245, plus reservists, but those numbers would soon double again and again.[54]

Meanwhile, the Army Air Corps got its first veteran flyer and non-Academy-graduate as its chief in the person of Major General James E. Fechet in 1927. In the post-Mitchell period, every Army airman was still a rebel, but he maintained a low profile. One of Fechet's aides, later General Ira Eaker, has said that Fechet approved "more special projects to keep the air effort in the headlines than any of his predecessors." The Pan-American Goodwill Flight and the in-flight refueling endurance flight of the *Question Mark* occurred during Fechet's regime.[55]

Fechet's successor, Benjamin Foulois, sounded a theme that rapidly would become more than a theory, telling an Army War College class that air power was "the strength of a nation in its ability to strike offensively in the air. . . . The real effective air defense will consist of our ability to attack and destroy the hostile aviation on the ground before it takes to the air."[56] Four years before, when defending fighters had failed to intercept a bomber attack during maneuvers in Ohio, Major Walter Frank concluded that "a well planned air force attack is going to be successful most of the time." In the classrooms at the Air Corps Tactical School, Lt. Kenneth Walker was credited by his students with originating the theorem that: "A well organized, well planned, and well flown attack will constitute an offensive that cannot be stopped."[57] A similar emphasis on the power of the air offensive prevailed in Europe, and Douhet was not its sole author. The most famous acknowledgment of the power of the air offensive came from Prime Minister Stanley Baldwin of England

who, enroute to the World Disarmament Conference in Geneva in 1932, stated: "The bomber will always get through."[58]

Without a doubt, President Roosevelt's assignment to the Army Air Corps of the task of flying the air mail proved a turning point in 1934. General Foulois took up the assignment with a "can do" attitude. Beginning in the depths of a severe winter across the nation in late February, nine Army airmen were killed within three weeks while flying the mail. The press deemed the Army Air Corps to be incompetent or ill-equipped. Roosevelt's Postmaster General eventually renegotiated air mail contracts with the same airlines, which had merely changed their names. But there were at least two important consequences for Army aviation. First, a War Department board under Newton Baker reviewed once again the status of aviation in the Army. It re-stated that the Air Corps should remain in the Army and recommended that the War Department buy aircraft directly from industry through bid contracts or design competitions. Secondly, the White House set up a Federal Aviation Commission under Clark Howell, a publisher, to consider once more the idea of a separate air force.

Before the Howell Commission reported out, the Army chose a solution recommended earlier by two of its own boards and gave the Air Corps a mission not tethered to other Army forces by establishing a provisional General Headquarters Air Force (GHQAF). Brig. General Frank Andrews become head of the GHQAF on 1 March, 1935. The GHQAF was headquartered at Langley Field, Virginia, with other wings at Barksdale Field, Louisiana, and March Field, California, to support the "tactical mission" of coastal defense.[59] In the meantime, Lt. Colonel Henry H. Arnold had led a flight of ten Martin B-10 bombers to Alaska, returning to Seattle non-stop over water on a 8,290-mile round trip. The B-10, the first prototype of the modern bomber, had closed cockpits, retractable landing gear, and a speed faster than that of contemporary fighters.

Sustaining the continued struggle of the Army Air Corps to develop and procure heavy bomber forces was the dynamism of the revolution in flight technology in the early 1930s. It suffices to stress here the appearance of the Boeing 229, designated the XB-17, which flew non-stop from Seattle to Wright Field in August 1935—2,100 miles at 232 mph with four modest-sized engines in flush wing-mounts. To Army airmen from Generals Oscar Westover and Andrews on down, the XB-17 "was a vision of the promised land." Earlier, in May 1934, Air Corps arguments with the Army General Staff had prevailed and had secured the mission of "the destruction by bombs of distant land and naval targets." The Boeing Aircraft Company had then begun "Project A," a more advanced bomber with a range of 5,000 miles, and a speed of 200 mph with a 2000-

lb bomb load. The resultant X–15, contracted for in June 1935, flew in 1937. It was underpowered but contributed to the ultimate B–17 and the B–29. In October 1935, the War Department contracted for the XB–19, a forerunner of the wartime B–29 and post-war B–36.[60]

In testimony before the Howell Commission, most of the senior Air Corps representatives had supported the idea of giving the GHQAF a fair trial before seeking a further reorganization. But some of the heady thoughts on the primacy of air power in modern war as taught by the majority of the instructors at the Air Corps Tactical School were freely expressed by Major Donald Wilson, Captains Harold George and Robert Olds, Lts. Kenneth Walker and Laurence Kuter, and others. To George, air power was "the immediate ability of a nation to engage effectively in air warfare."[61] To Walker, "An Air Force is an arm which, without the necessity of defeating the armed forces of the enemy, can strike directly and destroy those industrial and communications facilities, without which no nation can wage modern war."[62]

It is generally conceded that between 1933 and 1937 the Army and the Navy had not been ungenerous in funding their respective air arms within the fiscal constraints imposed by the state of the national economy and inevitably slim budgets. The Army Air Corps justified its infant heavy bombers in terms of coastal defense rather than by trying to sell a concept of a strategic air offensive against some specific enemy. From a budget of $6 million for FY 1936, the Army Air Corps only received $3.5 million for aircraft procurement for FY 1938, the year the German Luftwaffe rose like a phoenix to dominate the diplomatic balance of power in Europe. A numbers game also may have come into vogue in the selection of aircraft in this period. In 1936, the Air Corps was directed to order more airplanes for the dollar, or more two-engined Douglas B–18s rather than fewer B–17s.[63] The interregnum came to an end for the Army Air Corps in September 1938, however, thanks to ex-Corporal Adolf Hitler. He remembered trench warfare.

Take-Off: 1938–1941

Erosion of the "long armistice" had been underway in Europe ever since Nazi Germany falsely claimed in 1935 that its new Luftwaffe already had "air parity" with the Royal Air Force. Nazi Germany's aggrandizement was transparent in 1936 with the reoccupation of the demilitarized Rhineland and the commitment of the Condor Legion to the Spanish Civil War. In the United States, the interregnum persisted despite President Roosevelt's attempt to alert public opinion concerning the stark portents for the future of peace reported by his ambassadors and attaches in London, Paris, Berlin, and Tokyo. In September 1937, President Roosevelt tested the public's readiness for a policy change by calling for an

active "quarantine of aggressors," a thought that was not well received nationwide. "FDR" was branded a "war monger" by the isolationists; Congress responded by extending the Neutrality Act. But a series of international crises were to prompt small changes in American military policy, if only to prepare adequate defenses for the continental United States.

In December 1937, Japanese bombers intentionally sank the USS *Panay* and machinegunned its lifeboats in Chinese waters. The United States only protested, and the undeclared war by Japan continued. However, American rearmament began when Roosevelt soon called for augmenting American defenses because of the threats "to world peace and security." U. S. Navy aviation got the first boost with the passage of the Naval Expansion Act in May 1938, which marked a significant step toward a "two-ocean navy" and which provided for a 3,000-plane program to move carrier aircraft beyond the biplane era. From this legislation came the Navy's first modern production fighter, the Brewster Buffalo, the precursors of the Grumman F4F and TBF, and the Douglas SBD, the dive bomber which would win the battle of Midway four years later.[64]

For the Army Air Corps, the thrust to expand its initial force of B–17s continued to fare poorly under a President who had once been Assistant Secretary of the Navy. At Langley Field, the GHQAF under General Andrews was developing heavy bomber operations with thirteen B–17s. In May 1938, three of these bombers departed Langley Field and intercepted the Italian liner *Rex*, 725 miles out of the port of New York. *It was a good navigation job by Lt. Curtis LeMay.*[65] *The next day*, pictures of a B–17 at mast-height alongside the *Rex* appeared on the front pages of the New York *Times* and other eastern newspapers. The Navy blew a fuse. The primary mission of the B–17 in national strategy was scrubbed when the word was passed down from on high that Army Air Corps planes were limited to operational flights not to exceed 100 miles from shore. Secretary of War Harry Woodring laid it on the line when he directed that no production B–17s be procured in FY 1940. Deputy Chief of Army Staff General Stanley Embick stated simply: "Our national policy contemplates preparation for defense, not offense . . . Defense of sea areas other than within the Continental Zone, is a function of the Navy." It was little wonder that General Andrews told the National Aeronautical Association convention in St. Louis that the United States was no better than a fifth or sixth rate air power in the world.[66]

The so-called "Munich Crisis" of September 1938 was the turning point in American air power policy before World War II. England and France appeased Hitler because of their fantastic belief that, in the event of war, the German air force was more powerful than all of the Western air forces combined, plus that of the Soviet Union.[67] Everyone forgot

that air operations from German bases could barely reach England, but the collective action required of both England and France proved impossible. It was a triple tragedy: Hitler's bloodless victory gave him the Czech "Little Maginot Line"; it put him in command of the German Army General Staff which had been prepared to depose him; and, it encouraged more adventures by Hitler, who believed that those "worms of Munich will not fight."

It is difficult to recreate the climate of Munich. Douhet virtually became a household word in France and England. There had not been enough gas masks, air-raid shelters, or hospital beds in Paris or London during the crisis. "Peace in our time" was the scrap of paper which British Prime Minister Neville Chamberlain brought back from the Munich conference, for which the mobilization of the English fleet and the activation of the Maginot Line had been to no avail. There were only four armed Spitfires, and the relative weakness of the Royal Air Force and the French Air Force presented grim alternatives.[68] Hitler was correct. Neither Britain nor France really fought until they were attacked, which was also true of the Soviet Union and the United States. But that is another subject.

Two days before the Munich outcome, President Roosevelt dispatched Harry Hopkins, the director of the Works Progress Administration, on his first secret fact-finding mission to survey the capacity of the American aircraft industry. Hopkins, with the Deputy Chief of the Army Air Corps, General Arnold, reported that American production was almost 2,600 planes of all types per year.[69] After Munich, Roosevelt confided to Hopkins that he was "sure then that we were going to get into the war and he believed that airpower [sic] would win it."[70]

On 14 November 1938, Roosevelt outlined the "Magna Carta" of American air power, as Arnold termed it, at a top level White House conference. The President wanted at least an Army air arm of 20,000 planes and an annual production of 24,000 aircraft. Only this would influence Hitler. Congress, Roosevelt opined, might only approve 10,000 aircraft, of which 3,370 would be combat effective types and 3,750 combat reserve. Seven aircraft factories should also be built, only two of which would be activated. And, he said, the United States had to defend the Western hemisphere "from the North Pole to the South Pole."[71]

Support of the White House was now the pacing factor in the rise of American air power, although other events also proved fortuitous. With the death of General Westover in a crash, Brig. General H. H. Arnold became Chief of the Air Corps in September 1938. He recruited officers to staff the air portions of the President's budget and message for the Congress in January 1939 (Colonels Carl Spaatz and McNarney, Majors Ira Eaker and Muir Fairchild, and Captains George Kenney and Lawrence Kuter). In November 1938, the Army's new Assistant Chief

of Staff was Brig. General George C. Marshall, who proved to be the point man in getting Arnold into the Combined Chiefs of Staff.[72] By late 1938, as Dr. Joseph Ames, Chairman of the NACA, wrote Charles A. Lindbergh in France, a new atmosphere pervaded Washington. It was a state of "peacetime war." Lindbergh had urged NACA to aim for the development of a 500mph airplane, and Ames, in reply, invited him to help NACA obtain additional laboratories for its aerodynamic and engine research and flight cleanup work on all new Navy and Army aircraft.

The take-off of American air power began on 12 January 1939, in President Roosevelt's State of the Union Message to the Congress. Responding to Munich, he declared that "our existing forces are so utterly inadequate that they must be immediately strengthened," and he sought $300 million (less than he had said he wanted) for Army Air Corps aircraft procurement.[73] Within three months, Congress authorized upwards of a three-fold expansion of the Air Corps to 5,500 planes, 3,203 officers, and 45,000 enlisted men. This was a sharp contrast to the existing "utterly inadequate strength" of 1,700 tactical and training planes, 1,600 officers, and 18,000 enlisted men. As events would show, this was only the first expanded blueprint for the Army Air Corps. Planners had first to program for twenty tactical combat groups in the spring of 1939, and then re-program for forty-one groups by May 1940, fifty-four groups by July 1940, and eighty-four groups by the fall of 1941. These goals could not be instantly attained, and many growing pains would be experienced.[74]

A major early problem soon stemmed from the purchase of first-line aircraft by Britain and France at the cost of the build-up of the American forces. By the end of 1939, the two countries had ordered 2,500 aircraft of all kinds and by April 1940, 2,500 combat aircraft. Obsolete planes such as the P–36 and its water-cooled offspring, the P–40, had to be produced until the more advanced P–38s and P–39s could be built. B–25s and B–26s were ordered to replace B–18s and A–20s, and the P–47 design was pushed. For FY 1940, seventy B–17s were ordered as well as sixteen four-engine Consolidated B–24s on a second production line. Contract civilian flying schools expanded pilot training to 7,000 per year in 1940. Bases for air defense and training had to be built "boom-style" in many places, including Alaska, Puerto Rico, and Panama. In March 1939, the GHQAF became a responsibility of the Chief of Air Corps, not the General Staff of the Army.[75]

In May 1939, Colonel Lindbergh returned from Europe to attend meetings of the NACA. He met with General Arnold at West Point, briefing him on European aviation, particularly the German Air Force. Lindbergh agreed to serve on the Kilner Board, with Colonels Spaatz and Naiden, to determine the technical characteristics of all military

aircraft. The Kilner Board also recommended that first-line aircraft sold to England and France carry with them a responsibility on the part of the purchasers to report on their combat effectiveness. With the help of Lindbergh, Arnold, and BuAer chief Admiral John Towers, the NACA put together its requirements for an additional laboratory.[76] In July 1939, production models of the B–17 arrived at GHQAF at Langley Field. Seven made a "goodwill flight" to Argentina, at an average speed of 260 mph.

On 1 September 1939, the day the German *Wehrmacht* lunged into isolated Poland and World War II began, George C. Marshall became Acting Chief of Staff of the U. S. Army and Roosevelt declared the neutrality of the United States. U. S. Navy ships and PBY flying-boats began a Neutrality Patrol over the Carribbean and Atlantic sea approaches. Roosevelt also promptly dispatched an appeal to Germany, Italy, France, Britain, and Poland to refrain from "ruthless bombing from the air of civilians in unfortified centers of population." Herr Hitler replied that FDR's request "corresponds completely with my own point of view."[77] American airmen noted that the German air force seized command of the air by destroying in one day the Polish air force on its airfields. The bombing of Warsaw to end the final resistance was the largest such bombardment of a city to date. The Polish campaign ended quickly and demonstrated a new word for the textbooks—*Blitzkrieg*. Screaming Stuka Ju-87 dive-bombers were shown in newsreels around the world and shocked Americans. The "phony war" began in Western Europe, but there was no air war yet.

American airmen also noted that Polish opposition to the Luftwaffe in the air had been virtually nil, although the Stuka, however stable a bombing platform, was indeed vulnerable without air superiority or greater defensive firepower. There was some soul searching. Major Harold George, commanding the 94th Bombardment Squadron, advised the GHQAF commander that "today American bombardment groups could not truly defend themselves against American pursuit groups." Early outcomes of the continuing bomber versus fighter debate were an increase in the defensive armament of the war-improved B–17s and arguments for "pursuit escorts," even before the effectiveness of radar was fully appreciated.

General Arnold dispatched hand-picked observers to the "phony war." Lt. Colonel George Kenney reported from Paris that observation balloons were worthless and most reconnaissance planes were slow and vulnerable. Just before the German attack in the west, General Delos Emmons and Colonel Spaatz were sent to Europe. From May to September 1940, Spaatz observed the fall of Belgium, Holland, and France, and the Battle of Britain. Once the British Fighter Command's system

of integrated radar-fighter sector control was appreciated, even General Arnold began to think that night operations might be essential for B-17 forces. Spaatz's diary and his reports consistently maintained that England, fighting alone, would survive. The Luftwaffe, he argued, would not win daylight air superiority over England or otherwise achieve a decision during the ill-coordinated bombing campaign against the city of London.[78] The German bombers could not defend themselves from the Hurricanes and the Spitfires, and Spaatz clearly agreed with Winston Churchill, who most persuasively stated what has been quoted only partially ever since—that Bomber Command was a part of the Battle of Britain. On 20 August 1940, Churchill said, lest anyone continue to ignore it:

> Never in the field of human conflict was so much owed by so many to so few. All hearts go out to the fighter pilots, whose brilliant actions we see with our own eyes day after day, but we must never forget that all the time, night after night, month after month, our bomber squadrons travel far into Germany, find their targets in the darkness by the highest navigational skill, aim their attacks, often under the heaviest fire with serious loss, with deliberate, careful discrimination, and inflict shattering blows upon the whole of the technical and war-making structure of the Nazi power. On no part of the Royal Air Force does the weight of the war fall more heavily than on the daylight bombers who will play an invaluable part in the case of the invasion and whose unflinching zeal it has been necessary in the meanwhile on numerous occasions to restrain.[79]

Bomber Command's first raid on Berlin, a modest one, caused Hitler to alter the outcome of the entire Battle of Britain, the first turning point for the Allies in World War II.

While the German *Blitzkrieg* raced through Belgium and Holland and poured over France, President Roosevelt began his secret correspondence with the other former naval person, Winston Churchill, now just made Prime Minister. This tie led to the Atlantic Charter and coalition planning for the defeat of the Axis. On 16 May 1940, before Dunkirk and the Battle of Britain, President Roosevelt called upon the Congress for a further expansion of annual American aircraft production to 50,000 airplanes. He emphasized the importance of the Army and Navy air arms in hemispheric defense, but also planned to make available to the Royal Air Force new bombers from among the 50,000.[80] Months before Roosevelt's request, General Marshall had approved the "First Aviation Objective" of the Air Corps, a force of 12,835 planes by April 1942. But by July 1941, the Army and the Navy had authorization for 50,000 airplanes. Arnold and Marshall also agreed that the buildup of the Army air forces did not mean their complete independence; they still depended on the Army's supporting services. In the process, however, the Army Air Corps became the Army Air Forces (AAF).[81]

The tragedy of France in May 1940 masked other decisions by President Roosevelt which influenced the future history of air power, including his unpublicized decision to develop an atomic bomb before the

Germans could. In June 1940 he created the National Defense Research Committee, later called the Office of Scientific Research and Development (SRD), in response to a proposal by Vannevar Bush of M.I.T., Chairman of the NACA and the first director of the SRD. The new office established working committees, similar to NACA's technical committees, to develop high technology armaments such as the proximity fuse, computers, radars, and rockets, all without putting scientists into uniform. NACA retained responsibility for aerodynamic research, though most of its work in the war would focus on solving the problems of existing equipment.[82]

One of the remarkable documents in the history of American air power was the first product of the new War Plans Division of the Air Staff of the Army Air Forces. "AWPD–1" appeared just before Pearl Harbor in response to a White House request through the Secretaries of War and of Navy on 8 July 1941 for an estimate of the "overall production requirements required [sic] to defeat our potential enemies." Arnold placed Colonel Harold George in charge of an Air War Plans Division, to which was assigned a bevy of non-Ph.D.'s who were products of the Air Corps Tactical School.[83] The plan was drafted, approved by Marshall and the Secretary of War, and submitted to the President on 11 September 1941 as the "Air Annex" to the estimate of overall production requirements.

AWPD–1 became the blue print for the procurement and deployment of the rapidly expanding Army Air Forces, particularly for the European theater. In concept, it was a "synthesis" of the doctrine of strategic air power as it had evolved at the Air Corps Tactical School and as it related to a global war outlined in the joint Rainbow 5 Plan modified by the Anglo-American Combined Chiefs of Staff. AWPD–1 proposed "Possible Lines of Action" which called for the defeat of the Luftwaffe and the support of an invasion of Nazi-held Europe by targeting bombing on electric power, oil, and transportation systems, in that order of priority. These priorities were remarkable forecasts, confirmed by events and the post-war testimony of the members of the U. S. Strategic Bombing Survey, Albert Speer, and scholars.[84] The only post-war complaint would come from the airmen authors who yet believe that AWPD–1 could have been carried out much sooner at less cost in blood and energy. But that document's projection that strategic air power could not be built up in England to conduct decisive operations until mid-1944 proved right on the mark.

The major contribution of the AAF, according to AWPD–1, was for simultaneous war against Germany and Japan by strategic bombing. The AAF would need 239 combat groups and 108 support squadrons, 63,467 planes of all types, and 2,164,916 men. By April 1944, if the concerted

effort was instituted immediately, the air offensive against Germany would reach effective strength. This forecast by anonymous staff officers ranks among the most valid in modern military history, since the Army Air Forces eventually had a peak strength of 2,400,000 men, 243 combat groups, and nearly 80,000 aircraft.[85]

In the fall of 1941, the Navy air arm, like the Army Air Forces, was not yet prepared or deployed for a global war in Europe or Asia. The Navy could muster eight aircraft carriers, seven large and one small, five patrol wings and Marine aircraft wings, 5,900 pilots, and 21,678 enlisted men. The naval battles to come in the Pacific would be fought most often in the air where surface fleets never saw one another.[86] For openers, Japanese naval air forces struck Pearl Harbor on 7 December 1941.

Notes

1. The author has previously discussed the historical evolution of air power: "The Impact of Air Power," *Air University Quarterly* Review, II (Winter 1948), pp. 1–13; "The Meaning of National Air Power," *National Air Review* (NAA) (January 1950), p. 13; "Some Fallacies Concerning Air Power," *The Annals* of the American Academy of Political and Social Science, 299 (May 1955), pp. 12–24; "The Evolution of Air Power," *The Impact of Air Power* (Princeton: 1959), pp. 5–18; "Technical Change and Western Military Thought, 1914–1918,"*Military Affairs*, XXIV (Spring 1960), pp. 6–19; "The Contemporary Spectrum of War," *Technology and Western Civilization* (M. Kranzberg and C. Pursell, eds.), II (New York: 1967), pp. 576–90; and, "Introduction," *Two Hundred Years of Flight in America* (San Diego: 1977), pp. 3–31.

2. Most useful accounts of early U. S. military aviation are: I. B. Holley, *Ideas and Weapons* (New Haven: 1953), and Alfred Goldberg (ed.), *A History of the U. S. Air Force* (Princeton: 1957), pp. 2–11.

3. Charles H. Gibbs-Smith, *Aviation: An Historical Survey* (London: 1970), pp. 129–34.

4. Benjamin D. Foulois and C. V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of B. D. Foulois* (NY: 1968), p. 43; John F. Shiner, "The Army Air Arm in Transition: Gen. Benjamin D. Foulois and the Air Corps, 1931–1935," Ph.D. Dissertation, Ohio State, 1975, p. 7.

5. Interview of B. D. Foulois by the author, Andrews AFB, MD, August 23, 1960.

6. Best concise history of lighter-than-air flight in the U. S. is Richard K. Smith, "The Airship in America," *Two Hundred Years of Flight in America* (San Diego: 1977), pp. 69–108.

7. Francis T. Miller, *The World in the Air*, II (NY: 1930), p. 155.

8. Peter Supf, *Das Buch der deutschen Fluggeschichte* (Berlin: 1935).

9. H. G. Wells, *The War in the Air* (NY: Dover, 1950), p. 69; Edward Mead Earle, "H. G. Wells," *Nationalism and Internationalism* (New York: 1950), pp. 116–18.

10. Walter T. Bonney, *The Heritage of Kitty Hawk* (New York: 1962), pp. 141–42.

11. As quoted in E. L. Jones, "History of the U. S. Air Arm," a looseleaf chronology prepared over many years, microfilm in National Air and Space Museum Library, M–186, p. 294; cf. H. H. Arnold, *Global Mission* (NY: 1949), pp. 31–47.

12. Interview of Milling by Thomas Greer, January 1952, *Development of Air Doctrine in the Army Air Arm, 1917–1941* (USAF Historical Study No. 89, Air University: 1955), p. 3.

13. Cf. J. F. C. Fuller, *A Military History of the Western World* (NY: 1953), III, pp. 215f.; Theodore Ropp, *War in the Modern World* (Durham: 1959), pp. 222–24, 248, 317.

14. Holley, pp. 33–34.

15. Cf. Stanton A. Coblentz, *From Arrow to Atom Bomb: The Psychological History of War* (New York: 1953), pp. 389–92.

16. On early Navy aviation: A. N. Turnbull and C. L. Lord, *U. S. Naval Aviation*, (New Haven: 1949); A. D. Van Wyen and L. M. Pearson, *U. S. Naval Aviation, 1910–1960* (Washington: NAVWEPS 00–80P–1, 1960); William Armstrong, "Aircraft Go to Sea: A Brief History of Aviation in the U. S. Navy," *Aerospace Historian*, 25 (June 1978), pp. 79–91; T. Roscoe, *On the Seas and in the Skies: A History of the U.S. Navy's Air Power* (New York: 1970).

17. Robert Sherrod, *History of Marine Corps Aviation in World War II* (Washington: 1952), pp. 1–18; E. C. Johnson, *Marine Corps Aviation, 1912–1940* (Washington: 1977).

18. Jerome C. Hunsaker, "Forty Years of Aeronautical Research," *Smithsonian Report for 1955* (Washington: 1956), pp. 241–71; Daniel J. Kevles, *The Physicists* (New York: 1978), pp. 104–105; George Gray, *Frontiers of Flight* (New York: 1948), pp. 9–15; Arthur Levine, "U. S. Aeronautical Research Policy, 1917–1958," Ph.D. Dissertation, Columbia University, 1963.

19. Statement dated April 16, 1915, in E. L. Jones, "Chronology on American Flight" (no pagination), microfilm in NASM Library (M–104), NACA secretariat shared offices with the Signal Corps Aviation Section its first year.

20. Cf. Holley, pp. 106–112; Goldberg, p. 11.

21. Kevles, pp. 112f., 133–34; Michael Keller, "History of the NACA Langley Laboratory, 1917–1947," Ph.D. Dissertation, University of Arizona, 1969.

22. Alfred F. Hurley, *Billy Mitchell: Crusader for Air Power* (Bloomington: 1975), p. 20.

23. W. F. Craven and J. L. Cate (eds.), *The Army Air Forces in World War II*, I(Chicago: 1948), p. 4.

24. Raymond H. Fredette, *The Sky on Fire: The First Battle of Britain*, with Foreword by Hanson Baldwin and postscript by Sir John Slessor (New York: 1966), p. 256; E. M. Emme, "German Air Power, 1919–1939," Ph.D. Dissertation, University of Iowa, 1949, p. 2.

25. Fredette, p. 57.

26. Fredette, pp. 196–99.

27. Best dissection of U. S. aircraft program remains Holley, *Ideas and Weapons*, pp. 118–46.

28. Hurley, pp. 22–27; Cate, pp. 12–13.

29. Andrew Boyle, *Trenchard* (New York: 1962), pp. 168, 180–81, 185–88.

30. Boyle, pp. 298–99.

31. Cate, pp. 10–16; Goldberg, pp. 23–27.

32. The L–12 on May 14, and L–14 on June 14, 1917. Douglas H. Robinson, *Giants in the Sky: A History of the Rigid Airship* (Seattle: 1973), pp. 132–33; Turnbull and Lord, p. 139.

33. Van Wyen and Pearson, p. 29; Armstrong, p. 83; Robert L. Perry, "Trends in Military Aeronautics, 1908–1976," in *Two Hundred Years of Flight*, pp. 138–140.

34. Ropp, pp. 256–92.

35. Gerald Wheeler, *A Sailor's Life: Admiral William Veazie Pratt* (Washington: 1974), pp. 354–56; Henry H. Arnold, *Global Mission*, p. 121.

36. Craven and Cate, I, pp. 17–24; Goldberg, pp. 29–30.

37. Hurley, pp. 64–66.

38. Hurley, pp. 40–42, 56–109; Goldberg, pp. 30–31.

39. William Mitchell, "Airplanes in National Defense," *The Annals* of the American Academy of Political and Social Science, CXXXI (May 1927), pp. 38–42.

40. James L. Cate, "Development of U. S. Air Doctrine, 1917–1941," *Air University Quarterly Review*, I (Winter 1947), also in *Impact of Air Power*, pp. 186–91; Robert F. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964* (Maxwell AFB, AL: 1974), pp. 17–30.

41. J. L. B. Atkinson, "Italian Influence on the Origins of the American Concept of Strategic Bombardment," *Air Power Historian*, IV (July 1957), pp. 143–49; Colonel Edgar S. Gorrell (USAS), "An American Proposal for Strategic Bombing of Germany [report of November 28, 1917]," *Air Power Historian*, V (April 1958), pp. 102–17.

42. Arnold, *Global Mission*, pp. 157–58.

43. Clark G. Reynolds, *The Fast Carriers* (New York: 1968), pp. 14–15.

44. Van Wyen and Pearson, p. 31.

45. Elting E. Morison, *Admiral Sims and the Modern American Navy* (Boston: 1942), p. 506, as quoted by Reynolds, p. 14; Wheeler, *Sailor's Life*, pp. 192–93.

46. U. S. Navy, Administrative Histories, World War II, 48, "Bureau of Aeronautics," vol. 1, p. 41.

47. Van Wyen and Pearson, pp. 39–41.

48. Gerald Wheeler, "Mitchell, Moffett, and Air Power," *Air Power Historian*, VIII (April 1961), pp. 79–87; Wheeler, *Sailor's Life*, pp. 199–201.

49. Richard K. Smith, *First Across* (Annapolis: 1973).

50. Van Wyen and Pearson, pp. 39–43; I. B. Holley, "An Enduring Challenge," Harmon Lecture No. 16 (USAFA: 1974), pp. 1–2.

51. Cf. Wheeler, *Sailor's Life*, pp. 170–79.

52. R. K. Smith, "The Airship," *Two Hundred Years of Flight*, pp. 75–79.

53. U. S. Navy, Administrative Histories, 36, "Aviation in Fleet Exercises, 1911–1939," vols. 15 and 16; Reynolds, pp. 4–6; cf. Samuel E. Morison, *The Two Ocean War* (Boston: 1963), pp. 13–16.

54. Wheeler, *Sailor's Life*, p. 356; Sherrod, pp. 29–33; E. Johnson, pp. 64–82.

55. Ira C. Eaker, "Major General James E. Fechet, 1927–1931," *Air Force* (September 1978), pp. 94–97; Goldberg, pp. 37–38.

56. Futrell, p. 35.

57. Futrell, pp. 31–33; Emme, "Emergence of Nazi *Luftpolitik*, 1933–35," *Air Power Historian*, VII (April 1960), pp. 92–102.

58. *New York Times*, November 11, 1932, p. 4.

59. Goldberg, pp. 37–38; I. B. Holley, Jr., *Buying Aircraft: Materiel Procurement for the Army Air Forces* (Washington: 1964), pp. 124–49.
60. Goldberg, pp. 40–41; Arnold, p. 155.
61. Futrell, pp. 36–37.
62. Futrell, p. 37.
63. Goldberg, pp. 41–43.
64. Reynolds, pp. 19–20; Craven and Cate, pp. 101f.
65. Curtis E. LeMay, *Mission with LeMay* (Garden City, NY: 1965), pp. 183–92.
66. Goldberg, pp. 42–43.
67. Charles A. Lindbergh, *Autobiography of Values* (New York: 1978), pp. 163–175; *Wartime Journals of Charles A. Lindbergh* (New York: 1970), pp. 48–82; cf. Leonard Mosley, *Lindbergh: A Biography* (Garden City, NY: 1976), pp. 214–245; J. W. Wheeler-Bennett, *Munich* (New York: 1948), pp. 99–100, 159, 416.
68. Emme, "German Air Power," pp. 357–409, and *Impact*, pp. 10–12, 58–68.
69. Henry H. Adams, *Harry Hopkins* (New York: 1977), p. 140; Arnold, p. 177.
70. Robert E. Sherwood, *Roosevelt and Hopkins* (New York: 1950), pp. 99–100.
71. Craven and Cate, I, p. 105; Futrell, p. 50.
72. Laurence S. Kuter, "George C. Marshall: Architect of Airpower," *Air Force Magazine* (August 1978), pp. 65–67.
73. Futrell, pp. 48–49; Arnold, pp. 168–171.
74. Craven and Cate, I, p. 105; Futrell, pp. 50f.
75. Holley, *Buying Aircraft*, pp. 169–171.
76. Lindbergh, *Wartime Journals*, pp. 183–89, 194, 208, 214, 229, 233, 248; Arnold, 188–89, 91.
77. Text in Emme, *Impact*, p. 68.
78. Carl Spaatz, "Evolution of Air Power," *Military Affairs*, 11 (Spring 1947), pp. 1–16; "Leaves from my Battle-of-Britain Diary," *Air Power Historian*, IV (April 1957), pp. 66–75; Futrell, pp. 52–53.
79. Quotation in *Impact*, pp. 78–79.
80. Holley, *Buying Aircraft*, pp. 229–246.
81. Futrell, p. 55.
82. J. P. Baxter, *Scientists Against Time* (New York: 1947); Vannevar Bush, *Pieces of the Action* (New York: 1970).
83. Original members were Lt. Colonels Orvil A. Anderson and Kenneth Walter, and Major Haywood S. Hansell, but George acquired detail of Colonels M. R. Schneider and A. W. Vanaman, and Majors Samuel E. Anderson, Laurence S. Kuter, and Hoyt S. Vandenberg. Best coverage is in Futrell, pp. 50–62.
84. U. S. Strategic Bombing Survey, *Overall Report*, September 30, 1945, submitted to President Harry S. Truman, pp. 39–50; Haywood, S. Hansell, *The Air Plan That Defeated Hitler* (Atlanta: 1972), Craven and Cate, I, pp. 50–52, 146–50, 131–132; Emme, *Impact*, pp. 188–191; Futrell, pp. 59–62; Holley, *Buying Aircraft*, pp. 237–238; D. MacIsaac, *Strategic Bombing in World War Two: The Story of the Strategic Bombing Survey* (New York: 1976); D. MacIsaac, ed., *The United States Strategic Bombing Survey*, 10 Vols. (New York: 1976); Arnold Krammer, "Fueling the Third Reich," *Technology and Culture*, 19 (July 1978), pp. 394–422; Albert Speer, *Inside the Third Reich*, and *Spandau: The Secret Diaries* (New York: 1977) pp. 48–49.
85. Goldberg, p. 49.
86. Van Wyen and Pearson, p. 85.

III

WORLD WAR II IN THE AIR: DIFFERENT NATIONAL PERSPECTIVES

Air power came into its own in World War II. The main facets of the Anglo-American side of the air war are known, but a comprehensive understanding of the entire air war is still not possible. To move toward that understanding, the symposium planners invited papers on the less well-known experiences of the other major parties to the conflict—Japan, Russia, and Germany—as well as an estimate of the work remaining to be done.

Presiding over this investigation was Doctor Stanley Falk, the Chief Historian of the United States Air Force and a respected authority on World War II. A specialist on Japan, Professor Alvin Coox of San Diego State University, and a specialist on Russia, Doctor Kenneth Whiting of the Air University, presented excellent overviews of the prewar records and wartime employment of the air forces of these two countries. A third specialist, Doctor Horst Boog, came from West Germany for this session and took a different tack from the first speakers by offering a penetrating analysis of the nature, origins, and consequences of the "command thinking" of the leadership of the Luftwaffe.

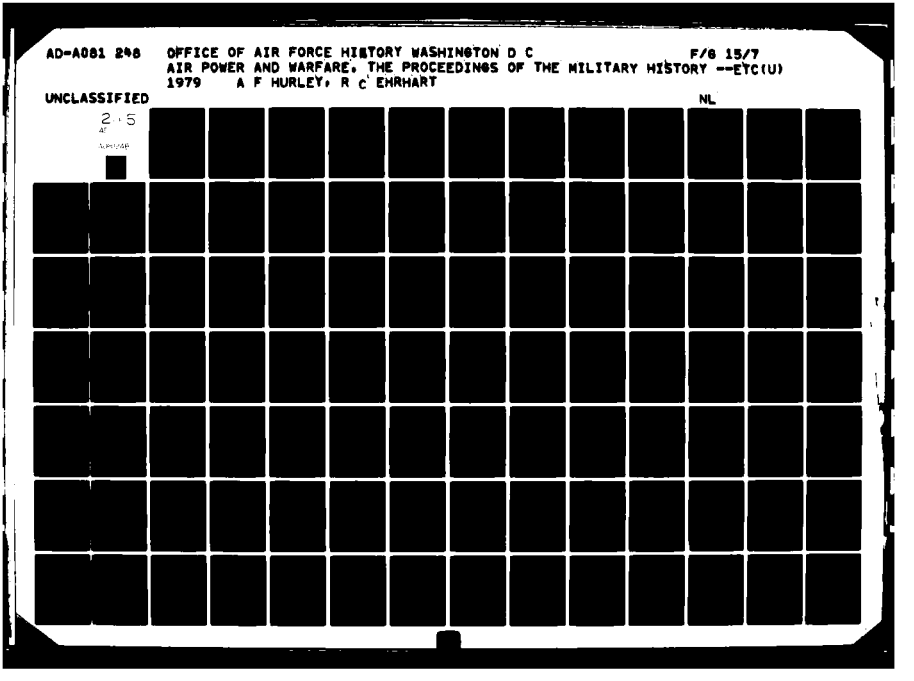
Together, these speakers reminded the audience of the complexity of air warfare and the consequence of neglecting factors less obvious than the proper employment of air forces in battle. To Boog's warning that "the fate of the Luftwaffe proved again that one cannot fight successsully a war for which one is not organizationally and doctrinally prepared," Coox added the consequences of becoming involved in a war of attrition not only with improper doctrine but also with insufficient productive capabilities. And Whiting concluded that, in the case of the Soviet Union, doctrine and organization were not so important as the overriding fact that "it was the productive capability of the Soviet aviation industry that enabled the VVS [the Soviet Air Force] to gain air superiority in the second half of the war—it simply swamped the Luftwaffe under a flood of first-rate aircraft."

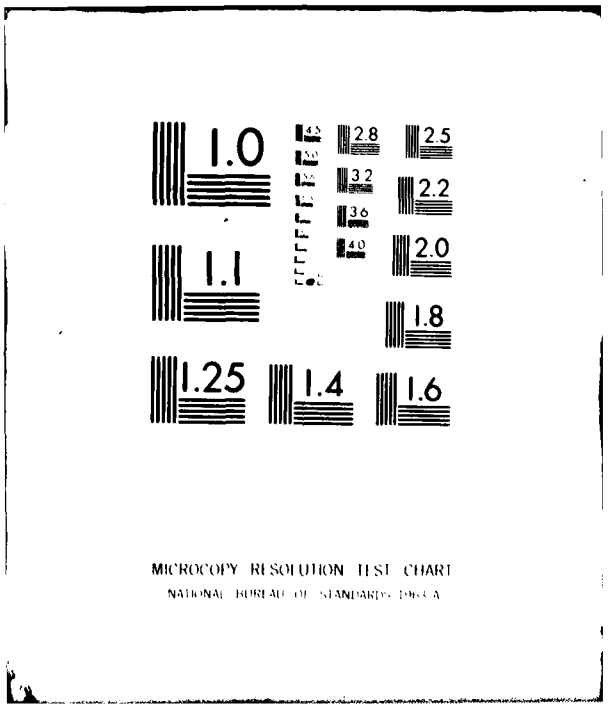
Doctor Alfred Goldberg, the senior historian in the U.S. Department of Defense, followed the papers with an expert assessment of the work remaining to be done in the area to which he has devoted much of his professional life. Not enough has been done, he argued, on the role and influence of logistics, of technological developments and production, of interservice competition, and of intelligence in air operations. In closing, he reaffirmed the views of the planners of this symposium by admonishing his current and future audience that "we have much to do, and we ought to get on with it."

The inclusion by Doctor Goldberg of the influence of intelligence on air operations as a field requiring more work prompted an authoritative comment on the significance of ULTRA by Doctor Harold Deutsch of the U.S. Army War College, who was in the audience. His insights merited, in the view of the editors, the publication of an expanded comment by him as the final paper in this session. Readers especially interested in this newly-revealed aspect of the war should also consult two articles by Doctor Deutsch: "The Historical Impact of Revealing the ULTRA Secret," *Parameters*, VII, No. 3 (1977), pp. 16–32; "The Influence of ULTRA in World War II," *Parameters*, VIII, No. 4 (1978), pp. 2–15.

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THE RISE AND FALL OF THE IMPERIAL JAPANESE AIR FORCES

ALVIN D. COOX

Unique Considerations[1]

Twentieth-century Imperial Japan exhibited a number of characteristics which differentiated it from other Great Powers. Japan emerged from 250 years of self-imposed feudalistic isolation only in the 1850s, little more than 100 years ago, and then under considerable Western duress. The end of the Shogunate and the founding of a modern state occurred only with the ascension of the Emperor in 1868. No national military establishment appeared until 1873, when the first draft laws were introduced. From this date until the Japanese attacked Pearl Harbor, a mere sixty-eight years intervened.

In addition to the relative brevity of Imperial Japan's modern experience, mention must also be made of the country's geographic and intellectual isolation from Western currents, including scientific and technological know-how, and from the ongoing Industrial Revolution. Vis-à-vis the industrialized world of Europe and the United States, Meiji Japan began its existence as an underdeveloped, have-not member of what today would be called the Third World. One could not have predicted with certainty, a century ago, that Japan would escape the colonial fate of other large and ancient Asian countries such as India and China.

Prewar Allied Ignorance and Underestimation of Japanese Aviation[2]

Against this unique backdrop a formidable military establishment was created. Yet, so far as Japanese military and naval aviation was concerned, prewar Allied knowledge was dismal. Complacent, chauvinistic, and arrogant, Western intelligence services generally regarded Japanese airmen as inferior to their European or American counterparts.

Japanese pilots were thought to be myopic, night-blind, poor at dive bombing, and accident-prone. After all, wasn't it well known that Japanese babies were strapped papoose-style on their mother's back, and thus they suffered from twisted vision and a wobbly sense of balance? In addition, the Japanese diet of rice caused vitamin and protein deficiencies which in turn contributed to vision problems, particularly in thin

air and in darkness. When Japanese pilots sank the British capital ships *Repulse* and *Prince of Wales* off Malaya at the end of 1941, certain incredulous Western observers insisted that it was German pilots who had flown this special mission.

Just as Western intelligence denigrated Japanese flying personnel, so were Japanese aircraft deemed to be fairly numerous but "mostly derivative and emphatically second rate." Japanese warplanes were shoddy, made of plywood and glued paper. An Australian combat pilot who survived the Malayan campaign (one of the very few) recalls that Allied intelligence "experts" constantly issued assurances that the best Japanese fighter aircraft "were old fabric-covered biplanes which couldn't stand a chance against the [Brewster] Buffaloes."[3]

That this ignorance of Japanese aviation was not entirely accidental, we know from the Japanese sources. The Japanese displayed only obsolete or obsolescent weaponry and equipment to the public. They downplayed their specifications and capabilities, and they kept the better materiel in the homeland. As one source said, thus were they "free from prying eyes, and we led the world seriously to underestimate the combat strength of our naval aviation."[4] Imperial Japan, of course, was also a tightly controlled totalitarian state by the 1930s, and its laws on military secrecy were taken very seriously and enforced very vigorously.

Japanese Army Air Force: Early Developments

Japanese military aviation history began with the construction of primitive ballons in 1877–1878 and the purchase of a French model. The first successful manned Japanese military balloon went aloft in 1901. During the Russo-Japanese War in 1904 a provisional army balloon unit operated against Port Arthur.[5]

As early as 1909, the Army General Staff (AGS) was showing interest in three-dimensional warfare. Within a year a joint Army-Navy-civil research committee sent a civilian engineer to Europe. During 1910, the Japanese Army tried to assemble domestic aircraft; neither of two models was successful. Thereupon, it was decided to dispatch two officers to Europe and America to investigate the possibilities of buying aircraft and to study flying techniques. By the end of 1910, Captain Hino had flown a German (Grade) plane over a training field in Tokyo for 1 minute 20 seconds, a distance of 1000 meters at 20 meters altitude. Captain Tokugawa flew a French Farman for 3 minutes at 70 meters altitude for a distance of 3000 meters. This was the beginning of the Japanese military air force.[6]

During World War I, the Japanese Army engaged in minor operations to clear the Germans from the Far East in 1914. All operational

Japanese aircraft (three Farmans, one Nieuport, and one balloon, with a total of eight pilots and three observers) went to attack Tsingtao in North China. The first Imperial Japanese Army Air Force (IJAAF) air-to-air combat experience occurred when the Nieuport engaged a pesky German plane without result. The first Japanese bombing operations also took place at Tsingtao, against the city and against shipping (fifteen sorties, forty-four bombs or mountain artillery shells). In December 1915 an army air battalion was formed at Tokorozawa near Tokyo, built around one aviation and one balloon company, under the transportation corps belonging to the Imperial Guards Division.[7]

After the Bolshevik Revolution, thirty-one Japanese Army planes took part in the Siberian Expedition of 1918–1922. Nothing much was learned from the campaigns at Tsingtao or in Siberia, except that much better aircraft were needed. Because of their continuing interest in the Manchurian theater, however, the Japanese forces in Siberia did devote considerable attention to weather and terrain conditions on the Asian continent.[8]

Cut off from European and American aviation sources in World War I, the Japanese Army Air Force made little progress. In 1914, Japanese airplane production totalled six; in 1915, four. In 1918, donations to the Army by the president of a Japanese shipping line enabled that service to purchase twenty Sopwith bombers, six Spad scouts, and three Nieuport trainers. With the imminent arrival of numerous modern aircraft, the IJAAF set up the first flying school in March 1918 at Tokorozawa.[9]

As the war wound down in Europe, the Allies began to release surplus materiel for sale. In 1918, the French sold the Japanese thirty Salmson bombers and three balloons; in 1919, forty Nieuport trainers and one hundred Spad fighters. From Britain the Japanese bought fifty Sopwith fighters. At this point the IJAAF ceased purchases.[10]

A French offer to send military aviation advisers to Japan, all expenses paid, was welcomed by the IJAAF (July 1918). Their specialties were in flying, gunnery, propulsion, photography, and communications. In January 1919, fifty-seven French advisers arrived under Colonel Faure.[11] Among the first consequences was the reorganization of the IJAAF flying schools, now located at Akeno and Shimoshizu. Several years later, during the progressive war ministership of General Ugaki, an independent IJAAF was established on 1 May 1925. The Air Battalion was upgraded to Air Regiment, and an Army Air Force Headquarters was created.[12]

IJAAF Combat Experience

The escalation of Japanese troubles with China led to the outbreak of the limited Manchurian Incident (1931) and the all-out China Incident,

an undeclared war (1937). The IJAAF saw its first real combat during the latter protracted conflict. Since the Army Air Force achieved early air superiority over the Chinese, the IJAAF essentially used the China theater as a training zone, much more suitable than the constricted Japanese homeland. The IJAAF stressed ground support, although bombers did strike Chinese interior cities such as Chungking.[13]

The most important IJAAF battle experience before the Pacific War took place over the frontier between western Manchukuo (Japanese-occupied Manchuria) and the Soviet Russian satellite state, the Mongolian People's Republic (MPR), between May and September 1939—the little-known but fiercely fought Nomonhan or Khalkhin-gol Incident. A greatly outnumbered Kwantung Army Air Force slaughtered the Soviet Far Eastern Air Force, largely novices at first, in swirling dogfights until later summer.[14] Then the tide turned, especially after the Soviet ground offensive of 20 August and the attrition of Japanese planes and crews by Zhukov's aces, newly arrived from Spain. Zhukov mentions reinforcement by twenty-one Heroes of the Soviet Union.[15]

Whereas few Soviet pilots are known to have made kill-claims of any size, more than fifty IJAAF pilots became aces against the Russians. Of them, fourteen Japanese pilots claimed twenty kills or more. Before his death in August, Second Lieutenant Shinohara shot down fifty-eight Soviet planes. The conflicting data are irreconcilable: skeptics scoff at Japanese claims to have shot down or destroyed 1,389 Soviet planes, using a total available inventory of 574, and losses of 192. For their part the Russians said they brought down 660 Japanese planes, lost 207, and committed only 450. The Japanese are convinced that as many as 3,000 Soviet planes saw action on the Nomonhan front at one time or another.[16]

To the lore of air warfare, *à la japonaise,* must be added the exploit of Second Lieutenant Kanbara (nine victories plus three probables). On 7 August, Kanbara shot down a Soviet fighter plane, landed beside it on the grassy steppes, leaped from the cockpit, drew his samurai sword, and chopped down the hapless Russian pilot on the spot.[17]

Rise of the Japanese Naval Air Force

Like the Army, the Japanese Navy began its aviation history by building unsuccessful observation balloons circa 1877. After the creation of the Naval Aeronautical Research Committee in 1912, six Imperial Japanese Navy (IJN) officers were dispatched to France and the United States. They were to recommend purchase of seaplanes and were to learn to fly and maintain them. Two of these IJN officers flew Farman and Curtiss seaplanes from the new naval air station at Oppama in November 1912. Domestic training of IJN pilots proceeded on a small scale.[18]

In 1913 the first Japanese seaplane tender, *Wakamiya Maru,* entered service. The tender saw combat against the Germans at Tsingtao in 1914, when four IJN seaplanes flew reconnaissance and bombing sorties. In 1916, the first IJN air corps was activated at Yokosuka; in March 1918, the second naval air corps was established at Sasebo. The first operational IJN plane designed domestically was turned out in 1917 by the Yokosuka Naval Arsenal.[19]

During the period of diminished activity immediately following World War I, the tender *Wakamiya Maru* was the scene of an Imperial Japanese Naval Air Force (IJNAF) success. In June 1920 an officer took off in a British plane from a deck specially installed on the seaplane tender. Meanwhile, the world's first true aircraft carrier, *Hosho,* had been laid down in December 1919 and would be completed three years later.[20]

The tempo of Japanese naval aviation activity accelerated with the arrival in Japan in 1921 of a team of ten British experts, including the head of Sopwith. To meet the requirements of carrier operations, a deck fighter along the lines of the Sopwith was developed in Japan. With the appearance of the aircraft carrier *Hosho* in 1922–1923, it was time to try deck takeoffs and landings. A former British naval lieutenant was hired as the first test pilot. After his success, takeoff and landing adventures by IJN pilots soon followed.[21]

Like foreign counterparts, Japanese airmen after World War I sought to demonstrate the vulnerability of surface vessels to air power. The Japanese Navy decided to sacrifice tonnage already earmarked for the scrap heap by the terms of the naval limitation agreements reached at the Washington Conference (1921–1922). A captured Tsarist Russian battleship was picked for the successful bombing experiment by navy and army planes on 9 July 1924, in Sagami Bay. Several years later, in April 1927, the Japanese Navy Air Force was split from the IJN BuShips; the new chief reported directly to the navy minister.[22]

British influence on the IJNAF continued. Three British inspectors came out in 1929 to conduct training in aircraft inspection. In 1931, two more British officers came to Yokosuka to provide instruction in tactics and strategy, flying, gunnery, and ordnance. Few will remember that the famous Genda Minoru (Capt., IJN; later General, Japanese Self Defense Force) received advanced training from these British air officers. Genda later found the British lectures on offensive tactics for carrier aviation highly useful in his own planning assignments against Pearl Harbor.[23]

After the signing of the London naval accord in 1930, the IJNAF secretly pursued four build-up plans. In 1932 the Naval Air Establishment was created. Early development was disappointing. When Admiral Ya-

mamoto became chief of engineering at IJNAF HQ in 1931, he already had discerned the weakness of Japanese naval fighters. The validity of his criticisms—"Fit the aircraft carrier to the fighter plane, not the plane to the carrier"—was demonstrated during the Shanghai Incident of 1932. One American-piloted Chinese Boeing demonstration biplane mauled formations of three and six IJNAF aircraft before being shot down. Although the IJNAF managed to achieve its first air-to-air kill in history during the six-to-one encounter, the Japanese Navy Air Force also lost its first pilot in combat. The poor technical performance of its fighters was particularly disturbing.[24]

Meanwhile, new Japanese aircraft carriers were steadily joining the fleet. *Hosho* was followed by *Akagi* (converted from a battlecruiser) in 1927 and the next year by *Kaga* (converted from a battleship). Both new carriers, of 29,600 tons, carried sixty planes. The small *Ryujo*, carrying forty-eight planes, was completed in 1933. Thus, with four carriers available in the early 1930s, the IJNAF devoted intensified attention to aircraft design. The Japanese aviation industry began to produce excellent carrier fighter, attack bomber, and flying boat designs in the middle of the decade. These modern planes would stand the Japanese Navy in very good stead when enormous operational offensive needs arose in the later 1930s and early 1940s.[25]

When full-scale fighting commenced in China in July-August 1937, carrier- and shore-based planes went into action immediately. At first the Chinese Air Force chewed up the IJNAF's weak biplane fighters. In August, *Kaga* lost eleven of twelve unescorted attack bombers in one raid. Subsequently, the untried Claude monoplanes arrived to sweep the skies clear over China by early December. In one action, the Claudes downed ten new Russian I-16s.[26] The IJNAF did not participate in the huge air battles at Nomonhan in 1939, but, to the Japanese Army's immense chagrin, the IJAAF was beginning to think of calling for naval air assistance toward the end of that costly warfare.[27]

The tactic of firing torpedoes from carrier planes was first attempted in 1930. Two years later a torpedo designed exclusively for aerial use was developed. In 1934 IJNAF planes began practicing the release of torpedoes in the period between night and dawn. Between 1932 and 1935, dive bombing came to be regarded as especially useful in surprise attacks on aircraft carriers. From about 1936, IJN thinking veered toward the decisive air battle prior to decisive combat between the main surface fleet.[28]

Between 1937 and 1939 the carriers *Soryu* and *Hiryu* were completed. Several months before the outbreak of the Pacific War *Shokaku* and *Zuikaku* were added. *Shoho* and *Zuiho* were being converted from high-speed oilers. Thus, drawing on the new carrier inventory, the IJN

was able to form the 1st Air Flotilla in April 1941. This flotilla, including six carriers, would implement Yamamoto's grand design by striking Pearl Harbor. From the heavy carriers' decks would fly 360 torpedo and dive bombers, horizontal and high level bombers, and fighters—about 25 percent of the front-line IJNAF strength in 1941.[29]

Levels of Experience and Training

Japanese Army and Navy airmen gained much combat experience from the fighting over China and Manchuria/Mongolia after 1937. Their fighter pilots were among the best, if not the best, in the world by 1941. Around 50 percent of IJAAF pilots had had combat experience against the Chinese and the Russians. Ten percent of land-based navy pilots saw action in China. Eight IJN pilots were in the ten to fourteen kill category; four IJA pilots in the seven to ten bracket.[30]

As long as they could, the Japanese stressed high levels of training. By the time of the Pacific War, IJAAF flying schools were turning out pilots at the rate of 750 per year, while Navy training units were graduating 2,000 per year. Army training emphasized pilots; the IJNAF focused on training aircrewmen. Until the Pacific War, two out of three IJAAF flying cadets were enlisted men, one out of three were regular officer candidates. Navy trainees were 90 percent enlisted personnel.[31]

Japanese pilots received about 300 flying hours in training units before assignment to a tactical unit. (The comparable figure for primary, basic, and advanced training given to a US Army Air Corps cadet was 200 hours.) In 1941 the Japanese Navy gave special tactical training to the carrier airmen preparing for torpedo attacks in the shallow waters of Pearl Harbor and to the airmen based in the Marshall Islands who were to hit Wake Island at long range over water.[32]

By 1941, 3,500 IJNAF pilots had been graduated from flying schools or training units. The figure for the Army was 2,500 pilots. About 600 of the best Navy pilots, averaging 800 flying hours, were attached to the carriers. Army and Navy pilots operating in Malaya and the Philippines averaged 500–600 hours; squadron and flight commanders had much more experience.[33]

Throughout the Pacific War, the Japanese remained convinced of the need for a large number of pilots even if quality had to be sacrificed. To the very end there were enough men to fly the planes produced. The last figure for 1945 was 18,000 pilots to operate 10,700 effective planes (4,800 Army, 5,900 Navy). But while the Japanese turned out 5,400 new pilots in 1943, the Americans were producing 82,714 that year.[34]

At the end of the war, the average flying time of regular IJNAF and IJAAF pilots entering combat had declined to around 100 hours. Few

pilots were left with more than 600 flying hours, and they were usually assigned as instructors, staff officers, or escorts for suicide forces. Half of all remaining pilots had less than 100 hours; they were to be employed in the first suicide assaults against the expected Allied invasion. "The caliber of the pilots produced during the wartime years," said IJNAF ace Sakai, "was at best questionable."[35]

Japanese Aircraft Production

The Big Three aviation firms in Japan were Mitsubishi (1918), Nakajima (airframes, 1917; engines, 1924), and Kawasaki (1919). Smaller manufacturers included Aichi, Tachikawa, Kawanishi, Hitachi, and Nippon Hikoki (Japan Aircraft). The Japanese government encouraged, protected, controlled, guaranteed, and, to a certain extent, subsidized the domestic aviation industry, which went over to exclusive military-naval production about 1939. Cooperation between aircraft manufacturers was as nonexistent as that between the Army and the Navy. The armed forces developed their own separate aeronautical design and minor production facilities (four IJN air depots, one IJA air arsenal).[36]

Total annual military aircraft production rose from 445 in 1930, to 1,181 in 1936, and to 4,768 in 1940. In 1941, a total of 5,088 military planes were produced. (The comparable figure for Germany that year of 1941 was 11,706; for the USA, 19,433.) Between 1942 and 1945, Japan produced 58,822 planes which tended to increase in weight and to be improved in performance. (The comparable figure for Germany was 92,656; for the USA, 261,826.) The peak year for the Japanese was 1944 (28,180 planes). German and American production peaked that year, too, at 39,807 and 100,752 respectively.[37]

If one Japanese wartime plane must be singled out, it would have to be the IJN's beloved carrier-based, single seat Mitsubishi A6M Zero (Zeke). In all, the Japanese Navy took delivery of 10,938 Zeros. It was the feeling of IJN pilots that the Zero fighter was "about equal" to the Curtiss P-40 and Grumman F4F Wildcat but no match for the Vought F4U Corsair and Grumman F6F Hellcat, which the Japanese naval pilots "particularly disliked."[38] No original Japanese jet fighter design attained the production stage by war's end.[39]

When the Pacific War broke out, the Japanese inventory was 7,500 planes. Wartime production added 65,000, for a total of 72,500. At war's end the inventory was 18,500. Thus 54,000 planes must have been lost: combat losses, 20,000; training, 10,000; other noncombat losses, 20,000; ferrying, 4,000.[40]

In the main campaigns, Japanese plane losses to all causes totaled 40,000. The history of the air war in the Pacific can be traced through the following data:[41]

Phase 1 (Dec. 1941–April 1942)	1,100 planes lost
Dutch East Indies	1,200
Midway-Aleutians	300
China-Manchuria	2,000
Solomons-Bismarcks-New Guinea	10,000
Central Pacific	3,000
Southeast Asia	2,200
2nd Philippines campaign (1944–45)	9,000
Ryukyus	7,000
Defense of Japan	4,200

During the air war, numerous Japanese pilots became aces. The ace of aces was a Navy pilot, Warrant Officer Nishizawa, with a confirmed score of eighty-seven before he was killed in action. If unofficial kills are included, he downed at least 102 enemy aircraft. The highest IJAAF score (apart from Shinohara's fifty-eight at Nomonhan) was fifty-one achieved by M/Sgt Anabuki.[42]

Kamikaze: The Divine Wind Expedient

The Japanese *kamikaze* (divine wind) or *tokko* (special attack) operations of desperation deserve a separate paper. Not only did the *kamikaze* warriors (including one-man *Baka* guided missiles) attack ships, they also rammed B-29s and crashlanded on Allied airfields. For suicide missions, the Army decided that at least seventy flying hours were necessary for pilots. The Navy deemed thirty to fifty hours sufficient if training planes were used for the attacks. During winter 1944–1945 and spring 1945 all regular training was halted in favor of suicide pilot preparation. Expendable, low-powered trainers proved maneuverable, cheap to build, and fairly easy to fly. Since the planes carried bomb loads of only 50–250 kilograms, however, they were often loaded with extra gasoline, and hand grenades were sometimes heaped around the pilot in the cockpit.[43]

Suffice it to say that the *kamikaze* effort against warships was massive and occasionally spectacular. In the second Philippines campaign, there were 650 suicide missions, with 26.8 percent achieving hits or damaging near-misses and 2.9 percent sinkings. This experimental offensive cost the Japanese only 14 percent of the 4,000 planes they lost in combat. During the Okinawa campaign, the *kamikaze* lost 63 percent of the 3,000 planes shot down, the IJNAF having flown 1,050 suicide sorties; the IJAAF, 850. Twenty-five Allied ships were sunk; Allied vessels were hit 182 times, suffering damaging near-misses 97 times. The damage rate was only 14.7 percent effective (1.3 percent sinkings).[44] The war ended

before the *kamikaze* could unleash their ultimate death-defying operations.

Why the Japanese Lost the Air War

The reasons for the destruction of the IJAAF and the IJNAF in World War II cannot, of course, be separated from the larger geostrategic, economic, scientific, technological, demographic, and psychological reasons for the defeat of Imperial Japan. Nevertheless, so far as the Japanese air forces were concerned, a number of specific explanations can be adduced.

1. Early successes lulled the Japanese into a false sense of security. When they "woke up" toward the end of 1943, it was too late for them to recover.

2. The Japanese doctrinal approach to air power was narrow and uncoordinated. The IJAAF was chronically subordinated to ground forces in a tactical role. Neither the IJAAF nor the IJNAF (which had a slightly broader conception) could ever mount sustained and heavy strategic attacks at long range against economic targets or rear zones.[45]

3. It was the belief of the IJNAF that its Army counterpart would cooperate only if operations were conducted over land. "The Army flyers," says Genda, "didn't like to fly over the ocean." The AGS "acted as though they didn't realize the importance of the control of the seas."[46]

4. The Japanese did not exploit the advantages of interior lines of communication. They frittered away their best air units in piecemeal fashion around their far-flung defensive perimeter—the consequence of envisaging a relatively short and victorious war.[47]

5. With the isolation of Japan from the continent and Southeast Asia, the importation of oil and other natural resources dwindled seriously. By the end of the war, training time for IJNAF pilots engaged in other than suicide operations had to be reduced to fifteen hours per pilot per month. Substitute aviation fuels were introduced or tested. Some bordered on desperation and included alcohol, pineroot oil, camphor oil, isopropy, and ether.[48]

6. Not only did the IJAAF and IJNAF fail to cooperate effectively, but the Army and Navy competed viciously for allocations of Japan's limited supplies of raw materials and production facilities. This "civil war" far transcended the usual connotation of rivalry, jealousy, or competition. Realistically speaking, unification of the separate military and naval air forces was an impossibility.[49]

7. The Japanese lavishly expended the veteran, highly trained pilots with whom they started the war. When they escalated the replacement training program, they underestimated the difficulties and emphasized quantity. The new pilots were a poor match for the improved Allied air

forces and, indeed, for their own seniors. The most advanced Japanese wartime planes proved too "hot" for the inexperienced new men to handle. It was the weakness of orthodox air operations which gave birth to the wasteful tactic of the *kamikaze.* The Japanese did not rotate seasoned pilots from combat nor did they try to preserve them by developing air-sea rescue techniques.[50]

8. The qualitative edge of Japanese aircraft was lost as the war went on. Japanese planes suffered chronically from weak landing gear and poor brakes. This was attended by a general deterioration in maintenance, repair, supply, engine and flight testing, workmanship, components, and dispersal. Here, too, Army-Navy cooperation was almost nonexistent. Spare parts for their varied and complex aircraft types were in constant short supply.[51]

9. Air-ground communications and the absence of good fighter-bombers hampered air support of ground operations. The Japanese never developed an air transport capability for troop carrying or supply drops. Indeed, the Japanese armed forces despised and neglected logistical considerations. Japanese combat officers called logistics "boring" and neglected it whenever they could.[52]

10. Although they produced some excellent aircraft, the Japanese eventually could not match the Allies in developing new kinds of aircraft and engines in quality or quantity, especially after the Japanese aviation industry began to suffer from enemy air attacks as well as from the consequences of hasty wartime attempts at expansion and dispersal. Duplication of effort and useless secretiveness were rife. New Japanese airplane output suffered from material deficiencies, compounded by ineffective substitute components and inferior workmanship, insufficient testing (many trainers received no test flights), clumsy flying, and costly ferrying losses caused by navigational mistakes, mechanical failures, poor maintenance, and pilot error. The IJNAF found itself rejecting 30 to 50 percent of the planes produced late in the war; corrections might take a precious month. Commander Nomura admitted after the war that IJNAF pilots became "convinced in their own mind that they were flying greatly inferior aircraft," and they "had a horror of American fighters."[53]

11. Japanese operations in defense of the homeland were essentially ineffective. Their early warning radar was poor in quality and inadequate in quantity. Their collection and analysis of warning data were inefficient; their control of interceptor units was haphazard; and their night-fighter techniques were primitive. As usual, the Army and the Navy failed to cooperate; many of their radar installations were operated side by side. When IJN picket boats broadcast reports of visual observation of approaching enemy planes, the IJA would have to monitor that particular channel to obtain intelligence for its own use. In addition, as a percentage of the total Japanese fighter force, no more than 26.5 percent (450 planes) were ever assigned to defend the homeland. The figure was only 16.8 percent as late as December 1944. At war's end, 535 fighters were as-

signed, but this amounted merely to 16.5 percent of the 3,250 planes available. Interceptor attacks per B-29 sortie amounted only to 0.02 in July 1945, 0.04 in August.[54]

Conclusion

It is difficult to believe that the combat life of the powerful Imperial Japanese air forces lasted little more than eight years, from 1937 to 1945. During that brief but momentous period, Japanese warplanes blackened the skies from China to Mongolia, from Hawaii to Alaska, from Malaya to Burma and India and Ceylon, from Australia to the Philippines. For the nation which bewailed its scanty natural resources, its limited land area, and its demographic inferiority, Imperial Japan certainly waged military operations on a grand and ferocious scale. Nor were the Japanese frugal with their manpower. According to incomplete data, in the worst months of the war IJNAF flight personnel were dying at the rate of 1,500 to 1,800 per month. The Japanese Navy alone had lost 17,360 airmen by May 1945.[55]

Those of us who can remember the old red-ball (*hi no maru*) insignia certainly did not react as benignly or as calmly as we do today when we see very similar markings on Japan Air Lines passenger planes or Japan Air Self Defense Force (JASDF) military aircraft. Our survey of Japanese military and naval aviation has thus come full circle.

Notes

1. For background, see Coox, "Chrysanthemum and Star," pp. 37–60. (See accompanying bibliography for complete citations).
2. Unless otherwise noted, this section is based on Tolischus, p. 144; Potter, pp. 47–48; Edmonds, pp. 5–6; Woodburn Kirby, pp. 116–17,147, 166–67, 240.
3. Caidin, p. 268.
4. Okumiya and Horikoshi, p. 12.
5. BBSS, 87: 3–7.
6. BBSS 87: 7–14.
7. Shibuya, pp. 110–23; BBSS, 87: 14–19.
8. BBSS, 87: 23–26.
9. Kuwabara, p. 144; BBSS, 87: 23.
10. BBSS, 87: 20–25.
11. BBSS, 87: 35–36.
12. Izawa, p. 256; BBSS, 87: 37–42.
13. Naito, 1: 278–82; BBSS, 87: 87–90. 160, 168, 172–220.
14. BBSS, 87: 168–72.
15. Zhukov, p. 150.
16. Naito, 1: 280.
17. Izawa, p. 329.
18. Kuwabara, pp. 23–56. For survey bearing on this entire section, to the London Naval Conference of 1930, see BBSS, 95: 1–29.
19. Kuwabara, pp. 77–94.
20. Kuwabara, pp. 160, 154.
21. Shibuya, pp. 169–72; Kuwabara, pp. 145, 184, 190–93.
22. Kuwabara, pp. 203–10.
23. Genda, 1: 60–68.
24. Section based on BBSS, 95: ch. 2; USSBS, *Japanese Air*, p. 4.
25. Mayer, p. 76; Francillon, p. 39.
26. Okumiya and Horikoshi, pp. 13–15.
27. Author's interview with Capt. Ohmae Toshikazu, IJN.
28. Potter, p. 52; USSBS, *Japanese Air*, p. 4.
29. Mayer, pp. 82–85; USSBS, *Japanese Air*, p. 6; USSBS, *Interrogations*, 1: 23 (Capt. Fuchida Mitsuo, IJN).
30. Shores, p. 120; USSBS, *Japanese Air*, p. 35.
31. USSBS, *Interrogations*, 2: 533 (CDR Terai Yoshimori).
32. USSBS, *Japanese Air*, pp. 6, 35, 38.
33. USSBS, *Japanese Air*, p. 5.
34. USSBS, *Japanese Air*, pp. 35–39.
35. Coox, *Final Agony*, pp. 95, 96; USSBS, *Japanese Air*, p. 40; Sakai, pp. 26–27.
36. Kuwabara, pp. 168–74; BBSS, 87: 31–58 (licensing arrangements), 58–86 (domestic production); USSBS, *Japanese Aircraft Industry*, *passim*.
37. USSBS, *Japanese Air*, pp. 28–29, 32; USSBS, *Japanese Aircraft Industry*, pp. 1–5, 115–57.
38. Shibuya, pp. 199–207; Yanagida, *passim;* Okumiya and Horikoshi, pp. 2–3; USSBS, *Interrogations*, 2: 532 (CDR Nomura Ryosuke); Green, 3: 47–50.
39. Francillon, pp. 404–7.
40. USSBS, Japanese Air, pp. 30, 33; USSBS, *Interrogations*, 2: 374–75 (CDR J. Fukamizu).
41. USSBS, *Japanese Air*, p. 34, Exhibit D.
42. Izawa, *passim*. There are numerous errors of transcription and identification in Shores, p. 124, and Mayer, p. 135.
43. USSBS, *Interrogations*, 1: 60–64 (Capt. Inoguchi Rikihei, IJN); USSBS, *Japanese Air*, pp. 36, 60, 72–73.
44. USSBS, *Japanese Air*, pp. 23–24, 60–80; USSBS, *Interrogations*, 1: 24 (Capt. Fuchida Mitsuo, IJN).
45. USSBS, *Japanese Air*, p. 1.
46. USSBS, *Interrogations*, 2: 496–97 (Genda).
47. USSBS, *Japanese Air*, p. 3.

48. Coox, *Final Agony*, pp. 94–95; USSBS, *Interrogations*, 2: 533 (CDR Terai Yoshimori); USSBS, *Japanese Air*, pp. 24–25.
49. USSBS, *Interrogations*, 2: 329 (Adm. Yonai Mitsumasa), 2: 496–97 (Genda). For historical background, see BBSS, 95: 74–75, 80.
50. USSBS, *Japanese Air*, p. 2.
51. Coox, *Final Agony*, p. 55; USSBS, *Japanese Air*, pp. 31, 36.
52. Author's interview with Col. Imaoka Yutaka, IJA; USSBS, *Japanese Air*, p. 2; USSBS, *Interrogations*, 2: 531–32 (CDR Nomura Ryosuke).
53. Coox, *Final Agony*, p. 95; USSBS, *Japanese Aircraft Industry*, Appendix V; USSBS, *Interrogations*, 2: 532 (CDR Nomura Ryosuke).
54. USSBS, *Japanese Air*, pp. 2, 26–27, 45–59; USSBS, *Air Campaigns*, pp. 52–53.
55. BBSS, 95: Chart 3.

Select Bibliography

English-Language Sources

Caidin, Martin. *The Ragged, Rugged Warriors*, New York, 1966.
Coox, Alvin D. *Japan: The Final Agony*. New York, 1970.
Francillon, R. J. *Japanese Aircraft of the Pacific War*. New York, 1970.
Green, William. *War Planes of the Second World War*, vol. 3: *Fighters*. Garden City, NY, 1964.
Gunston, Bill. *The Encyclopedia of the World's Combat Aircraft*. New York, 1976.
Kirk, John, and Robert Young, Jr. *Great Weapons of World War II*. New York, 1961.
Mayer, S. L., editor. *The Japanese War Machine*. Secaucus, NJ, 1976.
Morris, Eric, *et al. Weapons & Warfare of the 20th Century*. Secaucus, NJ, 1976.
Okumiya, Masatake, and Jiro Horikoshi with Martin Caidin. *Zero! The Story of Japan's Air War in the Pacific: 1941–45*. New York, 1957.
Potter, John Deane. *Yamaoto: The Man Who Menaced America*. New York, 1967.
Sakai, Saburo, with Martin Caidin and Fred Saito. *Samurai!* New York, 1958.
Shores, Christopher. *Fighter Aces*. London, 1975.
Tolischus, Otto D. *Through Japanese Eves*. New York, 1945.
U.S. Strategic Bombing Survey [USSBS], Aircraft Division. *The Japanese Aircraft Industry*. Washington, DC, 1947.
——, Military Analysis Division. *Air Campaigns of the Pacific War*. Washington, DC, 1946.
——, (Pacific), Military Analysis Division. *Japanese Air Power*. Washington, DC, 1946.
——, (Pacific), Naval Analysis Division. *Interrogations of Japanese Officials* (OPNAV-P-03-100), 2 vols. Washington, DC, 1946.

Japanese-Language Sources

Boeicho Boeikenshusho Senshi Shitsu [BBSS] [Office of Military History, Institute for Defense Studies, Defense Agency], v. 95: *Kaigun Koku Gaishi* [General History of Naval Aviation] (Tokyo, 1976).
——, v. 87: *Rikugun Koku Heiki no Kaihatsu Seisan Hokyu* [Army Air Ordnance: Development, Production, and Supply] (Tokyo, 1975).
Genda, Minoru. *Kaigun Kokutai Shimatsuki* [Record of the Particulars of Naval Air Units], 2 vols. (Tokyo, 1961).
Naito, Ichiro.
Izawa, Yasuho, with Hata Ikuhiko (editors). *Koku Joho, Bessatsu* [Air Intelligence, Special Edition]. Nihon Rikugun Sentokitai [Japanese Army Fighter Units] (Tokyo, 1973).
Kuwabara, Vice-Adm. Torao. *Baigun Koku Kaisoroku* [Recollections of Naval Aviation] (Tokyo, 1964).
Naito, Ichiro. *Nippon Hikoki Monogatari* [Stories of Japanese Aviation], 3 vols. (Tokyo, 1972).
Shibuya, Atsushi. *Hikoki 60-nen* [Sixty Years of Aviation] (Tokyo, 1972).
Yanagida, Kunio. *Zeroshiki Sentoki* [The Type Zero Fighter Plane] (Tokyo, 1977).

SOVIET AIR POWER IN WORLD WAR II

KENNETH R. WHITING

When the Germans attacked the USSR on 22 June 1941, the Soviets had more combat aircraft than did the Luftwaffe and its allies on the Soviet border. Within a few days, however, the Soviets had lost much of their air force, and the Luftwaffe roamed the skies over Russia with almost complete impunity. Four years later, the pitiful remnants of the once mighty German Air Force were unable to put up even a token opposition against the thousands of Soviet planes swarming over Berlin. Why were the Soviet airmen sitting ducks in June 1941, and what happened to reverse the situation by 1944–1945? These are the questions bound to arise in the mind of anyone examining Soviet air power in World War II.

Before describing the Russo-German air war, however, it would seem appropriate to assess what the Soviet Air Forces, or VVS,* brought into the war in the way of equipment, combat experience, and doctrine. In other words, we need to understand how the Soviet VVS had evolved slowly from a mixed bag of foreign aircraft inherited from the Tsarist regime into an organization quantitatively and qualitatively capable of first holding and then defeating the Luftwaffe.

Early Military Aviation Developments

Until Stalin's Five-Year Plans for the industrialization of the Soviet Union at a forced tempo began to produce results in the early 1930s, the Red Army was largely a mass of infantry militia. Aviation, armor, and technical personnel made up only 10 percent of the armed forces. The expansion of the Soviet aircraft industry called for in the First Five-Year Plan began from an extremely small base. In 1929 the air force of the

*In 1941 the Soviet Air Forces (*Voenno-vozdushnye sily*), or VVS, came in five varieties: (1) Long-range aviation (*dal'nebombardirovochnaya aviatsiya*), or DBA; (2) Frontal aviation (*VVS fronta*); (3) Army aviation (*VVS armii*); (4) Corps aviation (*korpusnye aviaeskadril'i*); and (5) Reserve aviation (*aviatsionnie armii reserva*). DBA was controlled by the High Command Frontal aviation by the *front* commander, VVS of the Army units were attached to each army, while both Corps and Reserve aviation were controlled directly by the High Command and could be shifted about as needed. Most writers refer to the lot as the VVS. In addition, Soviet air power included the interceptor component of PVO *Strany* (the national air defense force), Naval aviation, and the Civil Air Fleet.

Red Army consisted of "a thousand combat aircraft of old construction," and there was little hope of any improvement until Soviet industry could provide the basis for a modern aircraft industry.[1] During the rehabilitation of the national economy in the NEP (New Economic Program) period (1921–1928), the aircraft industry could progress only at a snail's pace because of the lack of a machine-tool industry, the shortage of metals of any quality, and the scarcity of technically trained manpower. During that period the USSR was importing most of its aircraft and just about all of its engines. The 1929–1932 period, however, witnessed a real expansion of the aircraft industry; old plants were expanded and modernized, and new ones were built. According to an official Soviet source, between 1928 and 1932 the labor force in the aviation industry increased by 750 percent and the number of engineers and technicians by 1,000 percent.[2]

Just how many aircraft plants there were in 1928 and how many were built in 1932 was the subject of confused guessing by Western observers. The estimates of the number of aircraft plants in 1932 vary from six airframe and twelve engine plants to a total of over forty (with 150,000 personnel). In the Second Five-Year Plan (1933–1937), the output of aircraft quadrupled, going from 860 in 1930 to 3,578 in 1937.[3] By 1938 there were probably around seventy plants (twenty-eight airframe, fourteen engine, and thirty-two for other components).[4] Exact figures are difficult to find for, as the authors of *The Soviet Aircraft Industry* point out, the Soviet habit of referring to aircraft plants by numbers, or by the honorary designation *imeni* (in the name of), makes for a good deal of confusion. For example, the Fili plant built by Junkers to produce all-metal planes during the early part of the Red Army-*Reichswehr* honeymoon was redesignated Plant No. 22 *imeni* Gorbunov when the Russians took it over.[5] Although the specifics are lacking, the evidence as a whole indicates a rapid expansion of the Soviet aircraft industry during the first two Five-Year Plans.

During the 1930s, Soviet aircraft designers were under intense pressure to overcome the country's dependence on foreign aircraft. In 1929, Polikarpov got the jump on the next decade with his R-5 reconnaissance plane. By 1934, the R-5 was equipped with a new 680 hp engine and had a top speed of 135 mph. Produced in a number of versions, the R-5 is best known as a reconnaissance aircraft, but also served as a two-seat fighter (DI-2) and as a dive-bomber. It was produced in large numbers and was used in the Russo-German War up to 1944.[6] Tupolev produced a new bomber in late 1930, the TB-3 (*tyazhelyy bombardirovshchik*, or heavy bomber), a four-engine monoplane with a top speed of 110 mph. Over 800 were produced and were used as night bombers early in the struggle against the Germans.[7]

In 1933, Polikarpov came to the fore as the preeminent Soviet designer of fighter aircraft when he produced two outstanding fighters in the same year. The I-15, a single-seat sesquiplane with a gull upper wing, was powered by a 700 hp M-35 engine (Wright Cyclone built under license). Entering service in late 1934, the I-15 had a top speed of 230 mph and a ceiling of 32,000 ft. The I-16, developed in the same year, was a single-seat, single-engine, monoplane powered by a 480 hp M-22 engine (a Bristol Jupiter under license) which gave it a top speed of 220 mph.[8] In 1934 it got a new engine, a 775 hp M-25B (Wright Cyclone 9) which increased its speed to 280 mph.[9] The best of the Soviet fighters in the late 1930s, the I-16 remained in production until 1941 and was used during the early part of the Russo-German War.

In 1934, Tupolev turned out the SB-2 (*skorostnoy bombardirovshchik*, or fast bomber), a monoplane powered by two 860 hp M-100 engines (Hispano-Suiza under license) which gave it a top speed of 230 mph. Carrying four machine guns and a bomb load of 2,000 lbs., the SB-2 went into series production in late 1935, and over 6,000 were produced.[10] Vladimir M. Petlyakov's team, under Tupolev's management, designed the TB-7 bomber in 1936. First flown in December of that year, the TB-7 did not go into serial production until 1939 and into service until 1941. Production of the Pe-8, as it was called by then, was phased out in 1944. It was a four-engine monoplane bomber powered, in its earliest production version, by four Mikulin-designed AM-35A (1,350 hp each) engines. It had a top speed of 250 mph, a range of 3,000 miles, increased in 1941 to 4,800 miles when it got M-30B engines, and it carried a bomb load of 4,400 lbs.[11]

By the late 1930s, the VVS had a sizeable inventory of combat aircraft, about 2,500. The best machines were the I-15 and I-16 fighters, the SB-2 and TB-3 bombers, and the R-5 reconnaissance plane. This was the stable of planes available for the subsequent Soviet adventures in Spain, China, and Mongolia in the late 1930s.

One of the problems involved in the creation of a bigger and more potent VVS in the 1930s was that of training the pilots and the technicians needed to keep the aircraft operational. Although a Soviet calculation in 1933 that it would take more than a hundred trained men to keep one airplane serviced and operational was certainly an exaggeration, the demand for trained manpower was bound to increase exponentially as aircraft poured off the assembly lines and were sent into operational units. Several developments, however, helped to solve the manpower problem. For one thing, the on-going mechanization of agriculture resulting from collectivization was developing a reserve of potential mechanics among the peasants tinkering with and operating tractors and trucks. In addition, the Society for the Promotion of Defense, Aviation and Chemical War-

fare (called *Osoaviakhim* in its Russian acronym), a voluntary organization dedicated to training young people in those skills needed by the armed forces, taught tens of thousands how to operate, maintain, and repair engines, radios, and motor vehicles. *Osoaviakhim* also saw to it that the young enthusiasts learned how to shoot straight and even had its own aircraft in which future pilots could learn the rudiments of flying. After studying theory for a year in the evenings and on weekends, the aspirant began a fifty-hour flight training program in a U-2, UT-1, UT-2, or I-5.* "By the end of 1940 the clubs had almost achieved their target of 100,000 trained pilots."[12] Thus, it was not too surprising that the Soviets were able to replace the pilots lost in the early part of the Russo-German War. But the help of *Osoaviakhim* notwithstanding, the VVS had to become one great technical training institution with academies and flying schools mushrooming up all over the country.

Combat Experience in the 1930s

While Stalin was pushing industrialization and building up a formidable military force in the late 1920s and early 1930s, he was trying to follow a relatively non-belligerent foreign policy. The disaster that befell the Soviet intervention in Chinese affairs between 1924 and 1927, the absence of any chance of revolution in Western Europe in the early 1930s, plus the concentration upon the "building of socialism in one country," contributed to a semi-isolationist period in Soviet foreign policy. There was, however, some apprehension about Japanese objectives in the Far East, apprehensions that led to the formation of the semi-autonomous Special Far Eastern Army, with accompanying air forces, in August 1929.

The only Soviet military action in the Far East in this period was a conflict with the Chinese over the Soviet rights to co-management of the Chinese Eastern Railway, which crossed Manchuria. Chang Hseuh-liang, warlord of Manchuria, had begun a campaign to drive the Russians out of the Chinese Eastern Railway administration. Blyukher, the commander of the new Special Far Eastern Army, a force of about 100,000 men supported by tanks and aircraft, hit the Chinese along the Sungari River and also encircled a large force near Manchouli. It was all over in six weeks. The Soviets used thirty-two aircraft in the first blooding of the VVS.[13]

By 1934 it was obvious that Stalin was going to have to shelve his "semi-isolationist" policy and seek foreign allies, since, in addition to the

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*The U-2 (*uchebnyy*—trainer) was a 1928 Polikarpov product and over 40,000 were produced. The UT-1 and UT-2 (*uchebno-trenirovochnyy*—basic trainer) were designed by Yakovlev in 1938, and the I-5 (*istrebitel'*—fighter) was another Polikarpov product, a stubby little monoplane of 1930 vintage.

expansionism of the Japanese in the East, the Germans under Hitler were becoming a threat in the West. Thus, the Soviets faced potential enemies in both East and West, the perennial nightmare of Russia's policymakers, Tsarist or Communist. In September 1934 the Soviet Union joined the League of Nations, and the Seventh (and last) Comintern Congress in 1935 adopted a "united front" policy which called on all Communist parties to cooperate with any anti-fascist party, whatever its leanings otherwise.

Hardly had Stalin moved toward collective security when his partners, England and France, began to be pushed around by Hitler and Mussolini. Then the Spanish Civil War put him in a dilemma: he had either to let down his leftist allies in the popular fronts or support the Loyalist government against Franco. He solved the dilemma by intervening in a very cautious manner through the device of the International Brigades. Beginning in October 1936, the Soviets provided aircraft, tanks, and artillery, as well as the skilled personnel needed to operate the weapon systems and to act as instructors.

Just how many men Stalin sent to Spain is unknown. According to an official Soviet account, he sent "557 Soviet volunteers including 23 military advisors, 49 instructors, 29 artillery experts, including anti-aircraft specialists, 141 aircraft pilots, 107 tank drivers, and 29 sailors; communications specialists, engineers, and doctors totalled 106, and there were 73 interpreters and other specialists."[14] Other sources, equally unreliable, give much higher figures.

In aircraft, the Soviets provided about 1,500 machines, although in any one month not more than a third of that number was operational. Of the thousand or so fighter aircraft, around 500 to 600 were I-15s or I-15Bs; the rest were I-16s* There were over 200 SB-2 bombers; the remainder were R-5 reconnaissance planes. Soviet aircraft made up over 90 percent of the Republican air force by early 1937, and the Republicans had air superiority until late that year. At that point, the Nazis equipped the Condor Legion in Spain with Me-109 fighters and Ju-87 dive-bombers, which were superior to the Soviet I-15s and I-16s. The obvious inability of the Soviet fighters to cope successfully with the Germans led Stalin to begin phasing out the Soviet air force in Spain in mid-1938, so that by the end of the year all Soviet aircraft were out of the country.

Although Soviet fliers gained valuable combat experience in Spain, the concepts derived were mostly negative. For example, the VVS came

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*The I-16 had many nicknames applied to it during the Spanish Civil War. It was called *Rata* (Rat) by the Franco forces, *Mosca* (Fly) by the Loyalists, while the Soviet fliers referred to it as *Ishak* (Donkey). With its short, barrel-like configuration it was an easy plane to identify and everyone in Spain got to know it.

to the conclusion that strategic bombing was an ineffective use of pilots and machines, a conclusion the Germans also drew from their Spanish experience. In retrospect, considering the modesty of the bombing effort in both cases plus the rather primitive equipment involved in that effort, it is not surprising that neither the *Lufwaffe* nor the VVS was impressed with the results obtained in the Spanish adventure. The Soviet pilots were also made painfully aware of the inferiority of their machines in combat with the German Me-109s. All in all, the Soviet involvement in the Spanish Civil War, especially in the air war, was far from successful.

The Soviets, while trying to consolidate a "united front" against Germany and Italy in Europe and to aid the Spanish Loyalists in their own peculiar way, did not neglect the threat posed to their Far East region by Japanese expansion into Manchuria, Northern China, and Inner Mongolia. Every effort was put forth to make the Special Far Eastern Army as self-sufficient as possible so that Soviet forces would be able to face Germany and Japan simultaneously if worst came to worst. The Japanese estimated that Blyukher's army east of Lake Baykal quadrupled its strength between 1931 and 1936 and in the latter year consisted of nearly 20 rifle and four cavalry divisions plus 1,200 aircraft and an equal number of tanks. When the Japanese began their all-out attempt to conquer China in July 1937, the Soviets added still more men and equipment to their Far Eastern forces; and the number of aircraft rose to nearly 2,000 by 1938.[15]

Stalin believed that by helping the Chinese, he could keep the Japanese so busy in China that they would not be tempted to make any incursions into Soviet territory. The Soviets not only delivered aircraft to the beleaguered Chinese, but also set up and maintained depots and assembly plants, trained Chinese pilots, and sent "volunteer" Russian pilots. For example, on 29 April 1939, in the air battle over Wuhan, over half the sixty-five Soviet-built fighters were flown by Russians. The Japanese Ambassador in Moscow, Shigemitsu, protested the Soviet involvement, stating that some 500 Soviet aircraft and 200 pilots had entered China (up to May 1938).

The Soviet aircraft used in China were I-15 and I-16 fighters and SB-2 and TB-3 bombers. The I-15s and I-16s, which had shown up badly against the Me-109s in Spain, did much better against the less effective Japanese fighters of that period, and the Soviet pilots in China were able to evaluate the ability of the Japanese pilots, to study their air tactics, and to observe Japanese equipment. China was the ideal area for testing Soviet aircraft and trying out air tactics under actual combat conditions. It was in China that the Soviets realized that the 7.62mm machine gun was a very inadequate weapon for making bomber kills; as a result, they began to install the 12.7mm gun, the equivalent of the American 50-

caliber. Japanese control of the air, easily acquired following the near annihilation of the Chinese Air Force (CAF) in 1937, was increasingly difficult to maintain in 1938 when Soviet aircraft and pilots entered the fray.

Although Soviet assistance to China was somewhat erratic because of trouble with the Japanese at Lake Khasan in 1938 and Khalkhin-Gol in 1939 as well as the war with Finland in the winter of 1939–1940, the Russians were the main external contributors to China's defense between 1937 and late 1940. In September 1939 the American ambassador in Moscow claimed that the Soviets had sent at least 1,000 aircraft and 2,000 pilots to China.[16]

While the Soviets were engaging the Japanese indirectly in China in the late 1930s, they found themselves in direct confrontation on two occasions: at Changkufeng, or Lake Khasan, in 1938, and at Khalkhin-Gol in 1939. On both occasions the Japanese seemed to be feeling out Soviet resolve and capability, and in both confrontations the Soviets demonstrated an ability to defend their borders.

The Lake Khasan engagement, to use the Soviet terminology, began in early July 1938 when the Japanese protested the Soviet fortification of Changfukeng Hill, a point between Lake Khasan and the Tumen River on the disputed Korean-USSR border.[17] This frontier skirmish, which began on 29 July, rapidly escalated into a "limited war," as both sides put in more forces until the Soviets had twenty-seven infantry battalions plus several artillery and tank regiments. At that point, the Japanese thought the engagement was getting out of hand, and hostilities ceased on 11 August with the Soviets in control of the disputed territory.

The VVS component of the 1st Independent Red Banner Far Eastern Army which confronted the Japanese at Lake Khasan was commanded by P. Rychagov, who was executed in 1941 as one of the scapegoats for the massive Nazi destruction of Soviet aircraft. His airmen, facing light Japanese opposition, were able to penetrate the enemy positions in depth and demonstrated a considerable capability. But Soviet aviators found that aviation was not very effective against an enemy well entrenched with his artillery well dug in.[18]

The next clash with the Japanese was, according to Soviet terminology, the Khalkhin-Gol Incident, which took place on the border of Manchukuo and Mongolia between the little Khalkhin-Gol River and the village of Nomonhan.[19] It began on 11 May 1939 and lasted until 16 September; again both sides kept increasing their commitments. During June the main activity was in the air, some attacks involving over a hundred planes. In July Georgi K. Zhukov took command of Soviet forces and launched a decisive offensive in late August. He insisted on very close airground cooperation and had his pilots study the terrain

jointly with their infantry and tank colleagues. His successful employment of some 500 Soviet aircraft went a long way towards insuring victory, especially by inhibiting enemy reinforcement of the battlefield.

The Red Air Force on the Eve of the Great Patriotic War

As a result of their experiences in Spain, in China, and against the Japanese, the Soviets acquired a great deal of expertise. Some of the Air Force leaders had become quite knowledgeable about strategy, tactics, and the like. But then Stalin unleashed the purge. Tukhachevsky, along with six other top commanders, was shot on 12 June 1937, to begin the senseless purge that wiped out about four-fifths of the top commanders of the Red Army. No military force could stand a blood-letting of that magnitude without suffering pernicious anemia in its command system.[20]

Soviet aviation was especially hard hit by the Purge. Ya. I. Alksnis, who had succeeded Baranov as commander of the VVS in 1931, was arrested in 1937 and probably died in 1940. His deputy, V. V. Khripin, also disappeared in 1937. Alksnis was succeeded by a nonentity named A. D. Loktionov, who in turn gave way in September 1939 to Ya. I. Smushkevich. The latter was a veteran of the Soviet air activities in Spain and had made quite a reputation as an air commander in the Far East. He was destined to be shot as a scapegoat during the debacle of June 1941. About 75 percent of the senior officers in the VVS were eliminated by the end of 1939. The purge also extended to the aircraft industry, to the research organizations, and to some of the design bureaus. Even Tupolev was under arrest for a short period. To an undetermined extent, therefore, the wisdom that had been accumulated in the various campaigns between 1936 and 1939 was thrown away. It would seem fair to say that the poor showing of the VVS in the Winter War with Finland and in the early phase of the Great Patriotic War could be at least partially attributed to Stalin's blood lust in the late 1930s.[21]

While Zhukov was thumping the Japanese in Mongolia, Stalin surprised the world with the Soviet-German Non-Aggression Pact on 23 August 1939, an act tantamount to Soviet acquiescence to the German invasion of Poland. With 1,600 aircraft at its disposal in Poland, the Luftwaffe went after the enemy's airfields at the outset and destroyed the Polish Air Force within a week.[22] In short, the air war in Poland was a romp for the Luftwaffe and a dress rehearsal for the attack on Russia twenty-two months later.

For the Soviet Union, any euphoria engendered by the victory at Khalkhin-Gol or the easy entry into Poland was chilled in the Winter War with Finland. When the Finns refused to relinquish territory, Molotov stated that it would be up to the military to clarify the situation; and on 30 November the Red Army attacked. The Finnish campaign was

not the VVS's finest hour. Since the Finnish Air Force had only about 145 obsolete planes, the Soviet VVS had a 15 to 1 advantage. Nevertheless, coordination with the ground forces was extremely poor, bombing accuracy was mediocre, and even the fighters in air-to-air combat were unimpressive. One set of figures gives the Soviet losses as 684 aircraft compared to Finnish losses of 62.[23]

The miserable performance of the Red Army and its VVS in the Winter War, Zhukov's candid appraisal of Soviet shortcomings at Khalkhin-Gol, and close observation of German efficiency in Poland alerted Stalin to the need to reorganize the Red Army and to equip it with better weapons.[24] Voroshilov was replaced as Commissar of Defense by Marshal Semyen K. Timoshenko, and Georgi Zhukov became Chief of the General Staff. The new bosses immediately began re-equipping the VVS with new types of planes better able to stand up to the Luftwaffe. But, as Zhukov says in his memoirs, when the Germans attacked, the VVS was in the midst of its reorganization, its pilots were not yet fully trained in the new aircraft in the inventory, and only 15 percent of them were trained for night flying.[25]

In January 1940, A. I. Shakurin replaced M. M. Kaganovich as head of the Aviation Industry Commissariat and went to work with a will. According to Shakurin, his job was to accelerate the output of better aircraft at literally breakneck speed, instructions he got from Stalin himself. His job was helped by the completion of the new TsAGI (research facility), replete with laboratories and wind tunnels, an expansion and modernization that had been under way since 1935.[26]

While the VVS was demonstrating its strengths and weaknesses in action on the Khalkhin-Gol, over the plains of Poland, and in the cold and fog of Finland, Soviet aircraft designers proceeded to come up with new types of aircraft ranging from heavy bombers to dive-bombers to fighters.

Vladimir M. Petlyakov's Pe-2 dive-bomber went into series production in 1940, and over the next five years 11,426 were turned out. It carried five machine guns and a 3,300-lb bomb load and had a top speed of 335 mph at 16,000 ft.[27] Sergei V. Il'hushin's DB-3F (*dal'nyy bombardirovshchik*—long-range bomber; the F stood for *forsirovannie*—supercharged), later redesignated Il-4, was in service by 1940. It had a top speed of 265 mph at 20,000 ft and a range of 2,000 miles. The Il-4 became the backbone of Soviet long-range aviation during the war; 5,256 were built between 1940 and 1944.[28]

In 1940 three new fighters went into series production: the MiG-3, the Yak-1, and the LaGG-3. And in 1941 the famous Il-2 *Shturmovik* began to come into the service. These four aircraft were to be produced

in large numbers during World War II. The MiG–3, some 3,322 of which were built in the 1940–1941 period, was a product of the team of Artem Mikoyan and Mikhail Gurevich. This new fighter had a top speed of slightly over 400 mph at 22,000 ft. A match for the German Me-109 above 16,000 ft, it was at a disadvantage below 13,000 ft.[29] Aleksandr S. Yakovlev's Yak-1 was influenced by the British Spitfire and the German Me-109, both of which he had seen in visits to England and Germany. A low-wing monoplane, it had a top speed of 400 mph at 20,000 ft. The Soviets produced 8,721 of them during World War II.[30] The LaGG–3, produced by the team of Lavochkin, Gorbunov, and Budkov, went into series production in early 1941. A low-wing monoplane with the same short fuselage that characterized most of the fighters of that period, the plane had a top speed of 335 mph; total production was 6,529.[31]

Il'yushin's famous Il–2 *Shturmovik* dive-bomber completed its state acceptance trials in March 1941 and went into series production immediately. A few were being sent to VVS units by July. Its armament consisted of two 23mm cannons, two 12.7 mm machine guns, and eight rockets or 13,000 lbs of bombs. It was so heavily armored that it was called a "flying tank." The Il'yushin *Shturmovik* became one of the most celebrated planes of World War II, a tank-destroyer par excellence. The Soviets produced 36,163.[32]

According to Shakurin, in the second half of 1940 production ended on all the old fighters. Since by that time there were twenty-eight aircraft, fourteen engine, and thirty-two aircraft component factories in operation, Shakurin had every right to anticipate a VVS adequately equipped with modern machines within the next few years.[33] Unfortunately for the VVS, the overwhelming bulk of the aircraft it received up to mid-1941 were obsolete since the newer types did not begin to flow into combat units until early 1941, just before the Nazis destroyed most of them on the ground.[34]

The German Onslaught, 1941–1942

As Soviet aircraft designers were coming up with better products in 1940–1941, Hitler was even then readying his forces for war with Russia. Convinced that a *blitzkrieg* against Russia was feasible, on 18 December 1940 he issued Directive No. 21, or "Case Barbarossa," which described in general terms the strategy for the attack on the Soviet Union set for mid-May 1941. The Soviet VVS got short shrift in "Barbarossa":

> The enemy will be energetically pursued and a line will be reached from which the Russian Air Force can no longer attack German Territory. The final objective of the operation is to erect a barrier against Asiatic Russia on the general line Volga-Archangel. The last surviving industrial area of Russia in the Urals can then, if necessary, be eliminated by the Air Force.
>
> The effective operation of the Russian *Air Force* is to be prevented from the beginning of the attack by powerful blows.[35]

Because of German involvement in the Yugoslavian-Greek campaign, "Barbarossa" had to be delayed until 22 June. When the Luftwaffe did strike, however, the "powerful blows" Hitler had called for were powerful indeed. Caught parked on their airfields, the Soviet planes were sitting ducks for the German fliers, and as many as 2,000 Soviet aircraft may have been destroyed in the first 48 hours of the war—even the Soviet admitted to 1,500 lost in the first 24 hours.[36]

The Red Army and its VVS were caught flat-footed. Rather than use territory acquired in Poland, Romania, and elsewhere between 1939 and 1941 as a buffer through which the Germans would have to penetrate, Stalin had moved his forces to forward areas in this new territory. The VVS had moved a number of airfields close to the new frontier created in September 1939, and most of the other airfields in the western military districts were being reconstructed by the NKVD in a leisurely fashion. The Soviet fighters, concentrated on a few fields, presented an ideal target for the Luftwaffe's surprise attack. Furthermore, the Aircraft Observation, Warning, and Signal Service was poorly organized and provided little, if any, early warning.[37]

The German pilots, having the advantages of complete surprise plus favorable weather, were able to fly continuous high-altitude and low-level attacks on Soviet airfields. Luftwaffe bombers flew up to six missions a day, while dive-bombers and fighters flew up to eight. Since the Soviet aircraft were lined up on the airfields in rows with no protection, the German pilots had perfect targets to aim at. The few Soviet planes that did manage to get into the air were immediately shot down.

The destruction was almost unbelievable. According to a German account, the first wave of 637 bombers and 231 fighters was directed at Soviet airfields,[38] and even the official Soviet account of the war has 1,000 German bombers attacking 66 Soviet airfields with a loss of 1,200 Soviet aircraft, 800 of that number on the ground.[39] The German High Command reported the destruction of just over 4,000 Soviet aircraft by 29 June, i.e., a week after the start of the offensive.[40] The Soviet and German figures for kills and losses are unreliable at best, and the discrepancies sometimes border upon the ludicrous; but even the Soviets admit the almost unbelievable havoc wrought by the Luftwaffe in the opening days of the German offensive.

Poorly organized anti-aircraft defense, inferior planes, inexperienced pilots, and utter confusion in the upper echelons of command combined to make Soviet efforts to counter the Luftwaffe onslaught futile. The Soviet I-15Bs and I-16s were not in the same league with the German Messerschmitt 109s. About all the Soviet fighters and dive-bombers could do in the summer of 1941 was to try to give some assistance to the Soviet ground forces. Furthermore, the Soviet DBA, or Long-Range Bom-

bardment Aviation, equipped with Il–4s and obsolete TB–3s, was unable to hamper the German offensive by striking deep behind the lines. Because of the dreadful situation on the ground, Long-Range Aviation was used primarily for close-support operations, which was hardly the most efficient use of the DBA.[41]

According to Field Marshal Kesselring, commander of the Luftwaffe's 2nd Air Fleet, German pilots achieved "air superiority" two days after the opening of hostilities. (In his book, he also describes the massacre of Soviet medium bombers as they arrived over German targets at regular intervals and were shot down with ridiculous ease by the German fighters.)[42]

Without air support, either tactical or strategic, the Red Army was at the mercy of the Luftwaffe, and the German Panzer Groups could operate deep behind the Russian fronts with little hindrance from the VVS, while calling upon their own air units when they got into a tight spot. The German *Blitzkrieg* proceeded as Hitler expected. In the first three months of the war, von Leeb's Army Group North pushed through the Baltic states and began the siege of Leningrad; von Bock's Army Group Center trapped three Soviet armies and four mechanized corps for a total of 287,000 prisoners; and von Rundstedt's Army Group South achieved one of the greatest "round-ups" of the war when it captured in the Ukraine some 665,000 prisoners, 3,178 guns, and 884 armored vehicles.[43]

The Soviets had almost as many aircraft as the enemy's 1,150 planes for the Ukraine, but 75 percent of the Soviet aircraft were obsolete. The VVS, according to the Russian version, flew over 26,000 sorties during the August-September fighting in the Kiev and Black Sea area.[44] Plocher, however, points out that the Luftwaffe had air superiority during the whole of the Ukrainian campaign and was able to prevent "any serious Soviet air interference with German ground forces"; the Luftwaffe carried out "virtually undisturbed attacks against Russian troops and materiel in the pocket."[45] The magnitude of the German victory would seem either to support Plocher's version or demonstrate the ineffectiveness of 26,000 Soviet sorties.

By the end of September, Hitler became enthusiastic about a renewal of the drive on Moscow by Army Group Center. The campaign began well with a great double encirclement of the Soviet forces in the Vyazma-Bryansk pocket.[46] While the infantry mopped up the Russians trapped in the pocket, the Panzers pushed ahead. Then came the rains, and the German advance was stopped dead in its tracks—not so much by the Russians as by mud, as roads became bottomless bogs that could not be negotiated by wheeled vehicles or even tanks. There was nothing the invaders could do but wait until cold froze the ground.

The figures given in the official Soviet account of the air war in Russian for the first four months—i.e., up to the October pause in the German drive on Moscow—are 250,000 sorties, mostly against German tank and motorized troops, and the destruction of 3,500 enemy aircraft.[47] The Soviet estimate of German losses is undoubtedly on the high side; but even using the Soviet figures, the Luftwaffe comes out very well in comparison with the VVS losses in the summer and fall of 1941.

The Luftwaffe, however, was down to 2,000 aircraft by early November, since some units had been withdrawn for rest and repair after four months of intensive effort and other units had been transferred to the Mediterranean and West European fronts to cope with the growing U.S.–British threat.[48] Furthermore, as the Luftwaffe's strength on the Russian front began to thin out in late 1941, the Soviets were getting new and better planes. The battle of Moscow in November-December was to demonstrate that the days of overwhelming Luftwaffe air superiority were numbered.

Stalin, stunned at first by Hitler's surprise attack, recovered quickly and consolidated control of the war in his own hands. He had already, in May 1941, made himself Chairman of the Council of People's Commissars, or SOVNARKOM (*Soviet Narodnykh Komissarov*), thus combining control of both Party and Government. A week after the Germans struck, he created, with himself at the head, the State Defense Committee, or GKO (*Gosudarstvennyy Komitet Oborony*), which had absolute control of the Government and the Armed Forces. GKO administered military matters through *Stavka* of the Supreme High Command (*Verkhovnogo Glavnokomandovaniya*), or *Stavka VGK*. *Stavka*, in turn, worked through either the General Staff or through its own *Stavka* representatives at the various *fronts*.[49] Early in July 1941, *Stavka VGK* coordinated the air forces of three *fronts* (Northwestern, Western, and Southwestern), including units of the 7th PVO (national air defense) interceptor force and some DBA units. In August a number of VVS units were coordinated with units from the Reserve and from DBA on the combined Bryansk and Central *fronts*. To carry out these coordinated operations, *Stavka VGK* dispatched its own representative to the headquarters of the combined *front* to be responsible for air actions. The *Stavka* representative for aviation used the staff and communications of the *front* commander to control air operations and reported to both the *front* commander and to *Stavka* on the results. The system worked so well that the functions of the aviation representative of *Stavka VGK* were gradually increased.[50]

Having been immobilized by the *rasputitsa*, the "season of bad roads," from mid-October to mid-November, the Germans finally got moving again when the weather cleared and frost hardened the ground

enough for aircraft, tanks, and wheeled vehicles to operate.[51] But the Germans were in for an unpleasant surprise as they neared Moscow. During the late summer and early fall, Stalin had pulled in toward Moscow well-trained troops and aircraft from the Far East and Trans-Baykal commands as well as forces from Outer Mongolia and Central Asia. These reinforcements for the defense of Moscow included over a thousand planes.[52]

The cold that ended the *rasputitsa* became much more intense in late November and early December, and freezing weather reduced the Luftwaffe to a semi-mobile force of frozen planes. The Soviet aviators, on the other hand, knew how to care for their aircraft in the cold and fared much better. According to the official account, they flew 51,300 sorties during the two-month battle for Moscow, 86 percent of them in close support missions, while "the enemy lost about 1,400 planes in the Moscow sector."[53] Leaving aside the validity of the statistics, the authors do go on to point out, and correctly, that the increased activity of the VVS was the result of the availability of good airfields with good technical services in the Moscow area plus the fact that cover was provided by the Moscow PVO *Strany* interceptors. Furthermore, for the first time, Frontal, Long-Range Bomber, and PVO fighter aviation were unified under the single control of the Commander in Chief of the VVS, thus facilitating an economy of effort and a higher degree of flexibility.[54]

On 30 November Zhukov and the General Staff got Stalin's approval for a counterattack which involved all three Soviet *fronts* defending Moscow. The counterattack got under way on 5 December, and over the next three weeks the Soviet offensive rolled the Germans back from the capital.

Soviet air was a vital element in the counterattack, as Frontal Aviation, the Moscow PVO, the *Stavka* Reserve, and Long-Range Aviation supported ground operations. (Incidentally, "Long-Range Aviation" would seem to be a misnomer for an outfit that, to quote Zhukov, "bombed and strafed his [German] infantry marching formations, tank and truck columns.")[55] The Soviet counterattack in December 1941 was the first time the Luftwaffe had been on the defensive since September 1939, and the VVS had even gained air superiority in some localities by December. Moreover, new aircraft were beginning to arrive on the *fronts* in respectable quantities from the new eastern factories by the end of 1941.

When it had become obvious to the GKO shortly after the German onslaught began that the enemy would in all probability overrun much of the heavily industrialized region of Russia, the Soviets decided to transfer as many plants as possible from the Ukraine and Russia east of the Volga River. Many of them went to Central Asia, the Urals, and

western Siberia—all regions out of bomber range for the short-legged German Luftwaffe. It was during this period that the absence of a German long-range bombing capability was so crucial. According to the official Soviet account, they had moved 1,360 large plants and ten million people by the end of December, a total of one and one half million tons of freight and humans.[56]

The evacuation of most of the aircraft industry to the east caused a severe drop in output in the second half of 1941 and the first three months of 1942 (1,039 aircraft in January, 915 in February, and 1,647 in March). After that, however, the production rate accelerated swiftly: over 25,000 for 1942, 35,000 for 1943, 40,000 in 1944, and 20,900 for the first half of 1945. Counting the 15,735 produced in 1941, the total Soviet output during the Great Patriotic War was about 137,000 planes of all types. Half of the total were single-engine Soviet fighters, and about 40,000, or nearly one-third of the total, were Il-2 *Shturmoviks*.[57]

Combat operations in 1941 had revealed serious shortcomings in the Soviet Air Force organizational structure, the main weakness being an inability to concentrate air in massive operations. Air power was being used in a piecemeal fashion, partly because of the way in which it was parcelled out to *front* commanders, to army commanders, and to *Stavka*. In April 1942, Novikov replaced Zhigarev as commander in chief and began to re-structure the VVS by creating "air armies." The 1st Air Army, formed on 5 May 1942, was made up of two fighter and two composite divisions, a U–2 night bomber regiment, a reconnaissance squadron, and a liaison squadron. Eventually there were seventeen air armies, formed from frontal and army aviation, and varying in size according to the importance of the theater and the availability of aircraft. In the 1942–1943 period they averaged 900 to 1,000 aircraft, in the 1944–1945 period around 1,500; for certain operations, some air armies had 2,500 to 3,000 aircraft.[58] Furthermore, the old composite divisions (combining fighter, attack, and sometimes tactical bomber aircraft) gave way to divisions made up of a single type of plane. The creation of the air armies was a giant step forward in mobility, concentration of forces, and central control of the Soviet air forces. In addition, General Novikov was devoted to the task of building up the *Stavka* Reserve, a force that could be shunted from one *front* or theater to another with some speed.[59]

Stalin, greedy for victories to offset the ignominious routs of 1941 and buoyed up by the successful defense of Moscow, pushed his generals into a series of ill-advised offensives in early 1942. As a result, the Soviets suffered several setbacks in the Crimea and at Kharkov, forcing them once again back onto the defensive.

Hitler, in a state of euphoria as a result of the Soviet fiasco at Kharkov, came up with an overly-ambitious schedule for 1942. The main

emphasis was on drives through the Don Bend and along the Volga with a simultaneous drive through the Kuban to the oil fields at Grozny and Baku. By 23 August the German tanks reached the Volga just north of Stalingrad. The Luftwaffe then proceeded to reduce the city to rubble, and from mid-September to mid-November the men of the Red Army and the *Wehrmacht* fought tooth and toe-nail in the wreckage of the city strung out along the right bank of the Volga for thirty miles. The main brunt of the cellar-to-cellar fighting fell on General Chuikov's 62nd Army. The Germans referred to this war in the rubble as the *Rattenkrieg* (war of the rats).[60]

VVS's main tasks in the defense of Stalingrad were close air support, reconnaissance, and very short-range bombing. As the authors of the Soviet official history put it:

> Ground-attack-planes and fighters operating with infantry and artillery attacked the enemy right on the front line, and aircraft of the front and long-range bombers struck against reserves, artillery and troops located 2 to 5 kilometers from the front line.[61]

The Commander in Chief of the VVS, General A. A. Novikov, remained at Stalingrad to see to it that his troops did their job right, as did the ADD Commander, General A. Ye. Golovanov. Novikov, as the *Stavka VGK* representative to coordinate air at Stalingrad, was involved in the planning of the counteroffensive being prepared by Zhukov while the battle for the city raged. The importance of the VVS's role can be seen in the following account of how the counteroffensive was planned. When Novikov informed Zhukov that his aviation was not yet ready, the latter informed *Stavka*. On 12 November Zhukov received a reply informing him that it would be better to postpone operations until air support was ready. As *Stavka* put it: "The experience of the war shows that operations against the Germans can be successful only if carried out with superiority in the air."

The Soviet Offensives, Stalingrad to Berlin

The Stalingrad counteroffensive which began on 19 November 1942 marked the end of the first period of the Great Patriotic War.* By then, the VVS had a superiority in numbers and, on occasion, even superiority in the air. At the end of the first period two new fighters came into the inventory, the La-5 and the LYak-9. The La-5 was an adaptation of the LaGG–3 and went into series production in July 1942, thus making it available for action at Stalingrad by September. The 287th Fighter Division was equipped with La-5s, which, according to the Soviets, were

*Soviet historians are addicted to "periodization," and World War II is no exception. They divide it into the "imperialist" period from 1 September 1939 to 22 June 1941 and then divide the Great Patriotic War into three periods: 22 June 1941 to 18 November 1942; 19 November 1942 to 31 December 1943; and from 1 January 1944 to the end of the war.

faster in level flight than the German fighters.[63] The Yak-9, a modified Yak-7, entered combat over Stalingrad. It had a top speed of about 360 mph and was armed with a 37mm cannon and two 12.7 mm guns.[64] Furthermore, the strength of the fighter regiments was increased from twenty-two to thirty-two aircraft. Experience during 1941 and most of 1942 had proved the desirability of making the basic battle unit the *zveno*, or flight of four aircraft, subdivided into two pairs (*para*). A relative abundance of new aircraft, better organization (especially the creation of the air armies and bolstering of the *Stavka* reserves), and sharper tactics—partly derived through those of the opponent—all meant a large step forward in VVS's drive for air superiority.

The counteroffensive launched on 19 November worked like a charm. By 23 November, General von Paulus' 6th Army, some 250,000 men, had been encircled in the "cauldron," or as the German has it, the "*Kessel*," an area about the size of Connecticut.

Once the trap was closed, it would have seemed logical for von Paulus to fight his way out while his troops still had some vigor. The Fuehrer had lost his grasp of reality, however, and began to clutch at straws. He accepted Goering's promise that the Luftwaffe could supply the 6th Army and decided to keep the 6th Army rolled up in a "hedgehog" before Stalingrad, to await the 1943 offensive that could rescue them.

Colonel-General von Richthofen, Commander in Chief of the Luftwaffe 4th Air Fleet, although proclaiming the plan "stark staring madness," proceeded to put it into effect.[65] He had around 320 Ju-52 and Ju-86 transports at Tazinskaya, or "Tazi," and about 190 He-111 bombers at Morosovskaya, or "Moro." The Ju-52, the lumbering "good old auntie," had long been the transport workhorse of the Luftwaffe. It was a three-engine monoplane with a cruising speed of 150 mph and a range of 250 to 800 miles, depending on the load-fuel ratio. The Ju-86 carried an even smaller load. Since it was 140 miles from "Tazi" to the Pitomik airfield in the "*Kessel*," neither transport could trade off much fuel for freight. The He-111 was a twin-engine bomber which cruised at 225 mph and could haul two tons of freight 760 miles.

Right from the start, the resupply operation was the victim not only of the shortage of adequate transport but of the weather as well, and the planes had to stand down for days on end. Although Goering had promised to deliver 600 tons a day, the high-point of the airlift came when 700 tons were delivered between 19 and 21 December—that is, 700 tons for all three days together! Then the Russians took both "Tazi" and "Moro," and the German transports had to travel 200 miles between their new bases and Pitomik. During the whole operation the VVS made life miserable for the lumbering transports, forcing them to fly in formations of forty or fifty with fighter escort, which made loading and unloading

on the tiny Pitomik field a real problem.[66] The VVS even sent *Shturmovik* formations against the German airfields to destroy transports on the ground. One such raid, on 9 January 1943, hit the Sal'sk airfield and destroyed seventy-two aircraft.[67]

The Red Army overran Pitomik on 16 January, and the auxiliary airfield at Gumrak was seized on 21 January. The remnants of von Paulus' 6th Army were taken prisoner by the end of January. Between 24 November 1942 and 31 January 1943, in the space of a little over two months, the air lift had cost the Luftwaffe 266 Ju-52s, 165 He-111s, 42 Ju-86s, 9 Fw-200s, 7 He-177s, and one Ju-290—a total of 490 planes, which includes only transport losses.[68] Even worse, the image of the Luftwaffe as an irresistible force was shattered irreparably.

The Soviet claims are much higher. They have the Luftwaffe in the defense of Stalingrad up to 23 November 1942 losing 2,100 planes and between 19 November 1942 and February 1943 losing 3,000 more. Between 22 June 1941 and 30 June 1942, the German losses in aircraft came to 14,700, if one believes the Russians.[69] Needless to say, German figures are quite different, some 2,951 planes lost and 1,997 damaged between 22 June 1941 and 8 April 1942.[70]

In spite of the enormous disparities in claims, there can be little doubt that by February 1943 the VVS was the mightier of the two air forces. The number of air armies had been increased; *Stavka* had ten air corps in its reserve; and the air effort was now synchronized—General Novikov, head of VVS, as a representative of *Stavka* coordinated the activities of Frontal Aviation, ADD, and the fighter element of PVO. During 1941–1942 the Soviet aircraft industry delivered 33,857 planes to the VVS, while the German aircraft industry, including plants in the satellite nations, came up with only 20,857.[71]

Stalingrad was not only a definite watershed in the relationship between the Luftwaffe and the VVS, but the turning point in the Great Patriotic War as a whole. The German military machine in the east was on the defensive after the catastrophe on the Don and Volga. The German counterattacks later in the war were feeble things compared to the *blitzkrieg* encirclements of 1941 and 1942. Nevertheless, the Germans had by no means reached the end of their rope. Soviet offensives after Stalingrad outran their logistical support and resulted in Red Army units becoming dispersed as well as exhausted. Provided with this opportunity, the German commander, von Manstein—for once given a relatively free hand by Hitler—launched counteroffensives that stunned the Russians and regained Kharkov. Von Manstein's counterstroke, however, was the last demonstration of the German free-wheeling use of armor and air power in deep penetration and envelopment, for the battle of Kursk in the summer of 1943 would destroy the *Wehrmacht's* initiative and most of its aircraft and tanks.

The Kursk salient, a protusion of the Soviet front north of Kharkov and south of Orel, was a tempting target for a German offensive in the summer of 1943. The Russians, aware through their intelligence of the German plans, filled the bulge with guns and tanks, and *Stavka* sent Zhukov and Vasilevsky to coordinate the defense of the area. The 2nd, 5th, and 16th air armies, plus two PVO fighter divisions (about 3,000 aircraft), were assigned to the Voronezh and Central *fronts* in the Kursk area. In addition those *fronts* could call upon the aircraft of the four adjacent *fronts* and upon *Stavka* reserves. Two-thirds of the Luftwaffe's aircraft on the Russian front were allocated to the Kursk offensive, which the Germans called *Operation Zitadelle*, some 2,000 planes in all (1,200 bombers, 600 fighters, 100 dive-bombers, and 150 reconnaissance machines).[72]

As both sides built up their forces through May and June, the main activity was in the air. In early May Soviet aircraft attacked German airfields in an effort to destroy Luftwaffe planes on the ground, a strategy so well taught them by the Germans in 1941. While they were assaulting German airfields, German bombers were running almost nightly missions against the Soviet military-industrial plants at Gorki, Saratov, and Yaroslavl. This "modest campaign was to remain the only German attempt at attacking Soviet industry."[73]

Kursk is best known as the greatest tank battle of World War II, but it was also an air battle of no small proportions. The two sides together fielded some 5,000 aircraft; and at one stage in the battle, the German offensive in the Belgorod area against the Voronezh *front*, over 2,000 aircraft were operating in an area of 12 by 37 miles, and air battles often involved 100 to 150 planes.[74] Soviet numerical superiority prevailed. As one German writer puts it:

> The German efforts to regain air superiority during the summer 1943 offensive had no continued or full successes. After the last German attacks in the Kursk salient had failed in the autumn of 1943, the Russians definitely ruled the air.[75]

The difficulty the historian faces in trying to deal with aircraft losses on either side can be illustrated by several examples of so-called "official" figures on the battle of Kursk. According to Novikov and Kozhevnikov, the Soviet airmen made 118,000 sorties and destroyed in the air and on the ground some 3,700 German aircraft.[76] But General Plocher, citing "official" figures, has the Luftwaffe 1st Air Division alone at the battle of the Orel bulge flying "37,421 missions, achieving 1,733 aerial victories, of which 1,671 were accomplished by fighters alone, with the loss of only sixty-four German aircraft."[77]

The Russian counteroffensive drove the Germans back over the Dnieper River, and in the late fall of 1943 von Manstein had a 450-mile front to protect, with some of his infantry and Panzer divisions down to

regimental strength. To make things worse, Hitler was back to his old policy of "yield not an inch." With the VVS in control of the air and with the German ground forces frozen into an immobile defensive stance, the chief German asset, flexibility in strategy and tactics, was gone.

During the last half of 1943, the German Army in the east was deteriorating as rapidly as the Soviet forces were building; they now outmanned and out-gunned the Germans by large ratios, had a superiority in tanks, and had gained control of the air.[78] For example, in the three months immediately after the defeat at Kursk, von Manstein's forces received only 33,000 men to replace the 133,000 casualties in the Ukraine.[79] An overwhelming superiority enabled the Red Army to push forward on all fronts, from the Baltic down to the Balkans.

With regard to the air war, the VVS was not only getting more planes, but also better ones. The Yak-9, which made its first appearance over Stalingrad in the winter of 1942–1943, was being used in 1944 not only as an interceptor, but also as a ground attack plane and a fighter-bomber. In mid-1943 Yakovlev increased its fuel capacity, giving the Yak-9D (*dal'niy*, long-range) a range of 870 miles. Its range was extended even further in 1944 as the Yak-9DD (*dal'nyy deystviya*, long-range operations) could fly from the Ukraine to Italy, a distance of 1,120 miles. This plane, with a top speed of 380 mph, was used as an escort for the American B–24 and B–17 bombers in their shuttle-bombing runs.[80] The Petlyakov Pe-2 also underwent improvements throughout the war. When the new German Me-109G appeared on the Russian front in early 1943, the Pe-2 was souped up with an M–105PF engine which could develop over 1,200 hp.[81]

The Yak-3 (replacing the Yak-1 on the production lines in the summer of 1943) poured into the VVS inventory in 1944. A 400-mph fighter, it was a match for the Me-109G and the Focke-Wulf Fw-190. The Lavochkin La-7, which went into series production in the summer of 1944, had a top speed of 420 mph and was especially designed to cope with the Fw-190.[82]

Even the German advantage of skilled and combat-hardened pilots had been dissipated by 1944. The murderous losses suffered by the Luftwaffe necessitated the use of newly fledged fliers. The VVS, however, was fairly wallowing in trained pilots by 1944. An even more important factor helped the Soviets gain control of the air in 1944, and that was the diversion of the best German interceptors to Western Europe to try to cope with the growing intensity of the Anglo-American air raids on the Reich and the invasions of Fortress Europe. Obviously, the Luftwaffe's resources were stretched too thin to be effective on any of the many fronts that had developed by 1944. The German bombers had to confine their activities to night operations since they had practically no fighter

cover for daytime activities. Attempts to regain the initiative on the Eastern front, either on the ground or in the air, were bound to fail.

By early 1945 the Russians were poised to administer the *coup de grace* to their Nazi foes. On the Soviet-German front they had 11 air armies with a total of over 15,000 aircraft against the Luftwaffe's 1,875 planes.[83] The VVS's overwhelming edge over the Luftwaffe was dramatically illustrated when Rudenko's 16th Air Army grew to over 2,500 aircraft in January 1945, giving him more than a 20-to-1 superiority over his opponent, while Krasovsky's 2nd Air Army grew to 2,588 aircraft.[84] In Janaury 1945 the Red Army smashed into Poland and began its march on Berlin at the rate of twelve to fourteen miles a day. In the attack on Berlin in April 1945, the VVS was able to concentrate 7,500 of its 15,540 aircraft against the pitiful remnants of the once proud Luftwaffe. The Soviet claim of 1,132 German planes shot down in the battle for Berlin may be dubious, but there can be no doubt about who controlled the air over that city.[85]

War Against Japan, 1945

Once Germany had surrendered, the Soviets were free to enter the conflict against Japan. Until the Yalta Conference in February 1945, Stalin wanted no part of a two-front war, since the Russo-Japanese Neutrality Pact of 13 April 1941 allowed him to concentrate his forces in the west and draw down on forces in the east. With Germany on the ropes, however, Stalin at Yalta agreed "that in two or three months after Germany has surrendered and the war in Europe has terminated the Soviet Union shall enter the war against Japan . . . ."[86]

The build-up of Soviet forces in the Far East began soon after the Yalta meeting. According to Japanese intelligence, by June a daily average of ten troop trains and five munitions trains arrived in the Far East. The Japanese estimated that between April and the end of July, the Soviets increased their strength in the Far East from 850,000 to 1,600,000 troops, 1,300 to 4,500 tanks, and 3,500 to 6,500 aircraft.[87] General John Deane, military attaché to Moscow, gives slightly different figures: 1,500,000 men, 3,000 tanks, and 5,000 aircraft;[88] while the Soviet figures for their forces in that area on 9 August 1945 were 1,577,725 troops, 3,704 tanks, and 5,368 aircraft, of which 4,807 were combat planes.[89] These forces faced a total Japanese opposition in Manchuria, Inner Mongolia, Korea, and the Kurile Islands of about a million men, 1,215 tanks, 1,800 aircraft, and 6,700 guns and mortars.[90] The Japanese forces and their Mongolian and Manchukuoan allies were the residue left behind when the Japanese high command pulled out the best cadre to send to other fronts.

The Soviet offensive, commanded by Marshall A. M. Vasilevsky, began on 9 August and called for all three *fronts* to push into Manchuria, with the main thrust plunging through the Greater Khingan Mountains toward Changchun and Mukden. Soviet tank forces penetrated some 250 miles into Manchuria by 15 August, their greatest problem not Japanese resistance but fuel for their machines. By 19 August the Japanese Kwantung Army had arranged surrender terms with Vasilevsky.

Air operations played a minor role in the August campaign in the Far East. The VVS flew only 14,030 combat sorites and 7,427 noncombat missions, partly because the weather was so awful between 11 and 20 August. About a fourth of the sorties were reconnaissance, but the most important contribution of the air force to the campaign was the hauling of supplies and men. The transports carried 2,777 tons of POL, 16,497 men, and 2,000 tons of munitions and other materiel.[91] The Japanese planes opposing the VVS were obsolete, the best having been siphoned off to oppose the American drive across the Pacific. The Japanese fighters, Type 97 and Type 1 (Nakajima fighters "Nate" and "Oscar") were 60 to 100 mph slower than the Soviet La-9s and La-7s, while the Mitsubishi bombers were 100 mph slower than the Pe-2s and Tu-2s.[92]

Despite the fact that the Red Army was attacking a badly demoralized Kwantung Army, the speed of the armored and motorized forces, the closely synchronized air support, and the business-like way in which the whole operation was carried out, all testify to lessons well-learned on the German front during four years of hard campaigning. The comparison between the smoothly running military machine that plunged into Manchuria, Northern China, and Korea on 9 August 1945 and the bewildered Red Army that had faced the Germans on 22 June 1941 was a vivid demonstration of how well Soviet commanders had been trained in the murderously effective school of combat in four years.

An Analysis of Soviet Air Power in the Great Patriotic War

If the statistics of the air war in Russia are debatable, evaluations of how well or how poorly the VVS and the Luftwaffe fought the air war are even more at variance. But for all that, the writer dealing with the Russo-German air war must try to show that all the trees he has described do total a forest.

Although the VVS took a murderous licking in the summer and fall of 1941, probably losing around 10,000 planes, a high percentage of these were destroyed on the ground and thus did not entail the loss of pilots and navigators. This factor was to loom large in favor of the Soviets when aircraft did become available in respectable numbers in 1942 since it was easier to replace a plane than a trained pilot. By the spring of 1942 the Soviet aviation industry was rolling out enough aircraft to put the VVS

back in business. In addition, by November 1942 the Allies had delivered 3,000 planes to the Russians.[93]

During the Great Patriotic War, the Soviet aircraft industry turned out 125,000 planes, while the Germans produced only 100,000 between 1941 and the middle of 1945. The Soviets, moreover, had only one front to supply, while the Germans were using large numbers of their aircraft in the Mediterranean theater and in defending the Reich against British and American bombers. By 1943 the Luftwaffe was reducing the number of aircraft in Russia to supply the needs of the Mediterranean and home fronts. This left the Eastern front with a relative scarcity of planes, many of which were obsolete.

Some German historians of the air war in Russia regard the decision not to build, or at least to give a low priority to the building of, a four-engine bomber as a fatal mistake. As early as the Battle of Britain in the summer and fall of 1940, the lack of a long-range bomber was one of the deciding factors in the outcome. If German aircraft had been able to range far and wide over all of the United Kingdom and also out to sea along the supply routes, the RAF would have had to disperse its interceptors and radar so widely as to be almost ineffective. The limited range of the German aircraft restricted their attacks to a definite area, one that could be adequately covered by British radar and interceptors.

The situation in Russia in 1941 and 1942 is grist to the mill of these *ex post facto* students of strategic air warfare. In 1941 the target, in their opinion, should have been the railroads crammed with eastbound trains loaded with dismantled aircraft plants and skilled workers. But Hitler's Barbarossa directive forbade the diversion of aircraft for the destruction of Soviet industry until the battle was won on the ground with close air support. In 1942 the ideal target was the Soviet aircraft industry, newly established in its eastern locale, but within range of the Luftwaffe planes since the *Wehrmacht* was still pushing forward. The best way to shut off the flow of aircraft to the VVS would have been to hit the source of supply, the aircraft plants.

It was not until June 1943, however, that Luftwaffe bombers began any strategic bombing of Soviet industrial targets. Between 4 and 21 June the "strategic" bombing force of the Luftwaffe, Air Corps IV, flew 993 sorties and released 1,538 tons of bombs on a tank factory in Gorki, a synthetic rubber plant in Yaroslavl, and an oil refinery in Saratov.[94] Although the Germans came up with some grandiose plans in 1944 and 1945 for hitting Soviet industry, especially the power plants in the Volga-Moscow region, the June 1943 raids constituted the only serious German "onslaught" against the Soviet defense industry.

The main reason for the poor bombing performance of the Luftwaffe in Russia was the lack of a decent strategic bomber. The bombers used

in Russia, the He-111 and the Ju-88, had a combat radius of around 600 miles with a one-ton bomb load. Both were too slow for other than night operations even in the Eastern theater.[95] Furthermore, German bomber strength in Russia never exceeded 600 planes, and by early 1943 many of those had been expended on close support of the ground forces, as well as being used as a transport force in the airlifts into the Demyansk "pocket" and the Stalingrad "Kessel." The great hope of German strategic bombing enthusiasts was the He-177 four-engine bomber. But it never lived up to its advance billing, and the dozen or so used in the Stalingrad airlift marked its only appearance in the Russo-German War.[96]

The Soviet ADD, although entitled "long-range aviation," did very little strategic bombing. Of the nearly four million sorties flown by all components of Soviet aviation, less than 7 percent could be termed "strategic bombing," even after stretching that term outrageously.[97] Because of the nature of the war in Russia—enormous forces engaged in ground operations—close support of those operations and very short-range bombing was the order of the day. "Strategic bombing" usually referred to attacks a few miles beyond the Forward Edge of the Battle Area (FEBA).

Instead of the long-range bomber, the dive-bomber was the air weapon par excellence on the Eastern front. In the German case, as early as 1936 the emphasis was on the Ju-87 *Stuka,* and *all* German bombers were to be designed with a dive-bombing capability (even the thirty-ton He-177), a requirement that precluded any effective strategic-bomber design. As long as the Luftwaffe was carrying out *blitzkrieg* operations in restricted areas such as Poland and the Low Countries against feeble opposition, the slow and lumbering *Stukas* were effective, especially against armored forces, communications, and even streams of refugees. But when air superiority went to the enemy, as in Russia after the middle of 1943, the Ju-87 became a sitting duck for the faster Soviet aircraft, particularly when the *Stuka* was coming out of a dive.

The Soviets were as enthusiastic about the dive-bomber as were the Germans. The Il-2 *Shturmovik* was a better assault plane than the *Stuka.* As Yakovlev put it, the fact that the best Soviet planes were designed in the late 1930s and early 1940s rather than in the early 1930s, as were the German planes, meant that they had more potential for improvement since the state of the art was developing rapidly. The addition of a rear gunner in the *Shturmovik* took care of its main weakness—attack from the rear when in a dive or coming out of one. The Il-2 was probably the best assault plane in World War II.

The large role played by the *Stuka* and the *Shturmovik* is proof positive of the main emphasis in the Russo-German air war—close support of the ground forces. As one German historian put it: ". . . strategic

air warfare played no role in Germany's campaign against Soviet Russia."[98] But he might well have added that the Soviet campaign was just as weak on the strategic air side as was the German. According to Soviet statistics, 47 percent of the sorties flown by VVS and ADD were for close air support. There was no urgent need, however, for the Russians to go in for strategic air warfare. The partisans were busy interdicting a good deal of the German rail and truck traffic in Russia, and the American and British bombers were working over the Reich home front itself by 1943. This allowed the Russians to concentrate their air on supporting the ground forces.

Another Luftwaffe deficiency helped the Russians enormously, namely, the shortage of transport planes. The main German transport, from the involvement in the Spanish Civil War in 1936 until the end of World War II, was the Ju-52, a three-engine relatively light and definitely slow monoplane. Even that was not produced in sufficient numbers to serve all the Luftwaffe air fleets. As it was also the main trainer in German flying schools, the output of pilots was constantly hampered when the air fleets requisitioned both Ju-52s and instructors to fly them during the frequent emergencies.[99] The fact that the Ju-52 was the transport workhorse for such a long period would seem to demonstrate an obtuseness on the part of the Luftwaffe high command about the value of air transport, especially in an area as vast as Russia. The disastrous attempt to air lift supplies into the Stalingrad "*Kessel*" seems to have had little influence on the thinking of the Luftwaffe high command during the last three years of the war.

Without going all the way with the favorite gambit of Germans writing about the air war in Russia—namely piling most of the blame of Hitler from 1942 on—there is some fire amidst all that smoke. Hitler was a ground force oriented leader and, with some exceptions, left aviation to the Commander in Chief of the Luftwaffe, *Reichsmarschall* Herman Goering. Goering, in turn, because of his "supinity" and "frivolous insouciance," left most of the direction to successive incumbents of the office of Chief of the General Staff of the Luftwaffe, especially *Generaloberst* Jeschonnek, who held the job between February 1939 and 19 August 1943.[100] Jeschonnek was incapable of questioning an order or an opinion expressed by Hitler, however potentially disastrous it might be. Moreover, as Goering's stock with the Fuehrer declined, the more the *Reichsmarschall* acquiesced in the latter's decisions and even tried to placate him by promising more than he could deliver, the Stalingrad airlift being a case in point.

Stalin, however, was an aviation buff, taking an intense interest in design and production even before the war. His interest extended to the VVS's command structure and the procurement of its machines, and one

of his outstanding designers, Yakovlev, gives him high marks as knowledgeable in things aeronautical. Like his top commanders, Stalin grew as a military figure during the war; and, although prone to botch things up in 1941 and early 1942, he eventually assembled a capable staff in the *Stavka,* whose advice he listened to before making decisions. Despite Khrushchev's claim that Stalin plotted strategical operations on a schoolboy's globe, most of the testimony of those close to him on the *Stavka* portray him as keenly interested in, and knowledgeable about, the military situation at the front. It is hard to visualize Stalin as relying on his "intuition" or consulting an astrologer.

Soviet aviation in the Great Patriotic War was sustained by an expanding industrial infrastructure and transportation system able to operate without German interference.[101] It had the advantage of fighting on only one front, while the Luftwaffe was forced to siphon off its best aircraft to put a defensive roof over the Reich from 1943 forward and to furnish air support for a doomed effort in the Mediterranean area. Due to good prewar planning and the efforts of tne civilian-party organization, the *Osoaviakhim,* the VVS never suffered from a shortage of pilots as did the Luftwaffe in the last two years of the war. Over and above all else, however, it was the productive capacity of the Soviet aviation industry that enabled the VVS to gain air superiority in the second half of the war—it simply swamped the Luftwaffe under a flood of first-rate aircraft.

Notes

1. *Istoriya velikoy otechestvennoy voyna Sovetskogo Soyuza 1941–1945.* (The History of the Great Fatherland War of the Soviet Union, 1941–1945) Moscow, Veonnoe Izdatel'stvo Ministerstva Oborony Soyuza SSR, 1960, Vol 1, p. 90. This is the nearest thing to a definitive work that the Soviets have produced on the Second World War. It is a six volume cooperative effort published between 1960 and 1965. Referred to hereafter as *Ist. Velik, Otech, Voyn. 1941–45.*

2. *Aviatstroitel'*, No. 6 (June 1933), pp. 1–2 as cited in *The Soviet Aircraft Industry* (Chapel Hill, North Carolina: Institute for Research in Social Science, 1955), p. 6.

3. *Ist. Velik. Otech. Voyn. 1941–45*, Vol. I, p. 65.

4. *Fortune*, August 1937, pp. 70–77.

5. *The Soviet Aircraft Industry*, pp. 13–14.

6. *Aviatsiya i Kosmonavtika*, No. 10 (October 1973), p. 23.

7. *Ibid.*, No. 11 (November 1973), p. 22 and No. 12 (December 1973), p. 24.

8. Soviet designations for engines are as confused as those for aircraft. The "M" stands for the Russian "motor," the same as in English; "AM" for Aleksandr Mikulin, "Sh" or "ASH" for Arkadiy Shvetsov, and "VK" for Vladimir Klimov. In the early period only the "M" was used and it applied to foreign as well as indigenously produced engines.

9. *Aviatsiya i Kosmonavtika*, No. 1 (January 1974), p. 23.

10. Nowara, H. and G. Duval, *Russian Civil and Military Aircraft, 1884–1969* (London: Fountain Press, 1971), pp. 107–110; *Aviatsiya i Kosmonavtika, No. 2 (February 1974), pp. 22–23.*

11. *Aviatsiya i Kosmonavtika*, No. 5 (May 1974), pp. 22–23.

12. Schwabedissen, W. Generalleutnant, *The Russian Air Force in the Eyes of German Commanders* (Air University: USAF Historical Division, 1960), p. 26.

13. A good brief account in John Erickson, *The Soviet High Command* (New York: St. Martin's Press, 1962), pp. 241–44.

14. *Ist. Velik. Otech. Voyn. 1941–1945*, Vol. I, p. 113.

15. *Japanese Special Studies on Manchuria* (Washington: Office of the Chief of Military History, Department of the Army, 1956), Vol. XIII, p. 53.

16. The best account of the Soviet involvement in the Sino-Japanese War is Gordon Pickler's unpublished doctoral dissertation, "United States and the Chinese Nationalist Air Force, 1931–49," Florida State University.

17. Soviet historians refer to the engagement as "the Battle of Lake Khasan." A detailed account is given in *Ist. Velik. Otech. Voyn. 1941–1945.* Vol. I, pp. 231–37. The Japanese call it "the Chengkufeng Incident."

18. *Japanese Studies on Manchuria.* Vol XI, Part 3, Book A. "Small Wars and Border Problems: The Changkufeng Incident," pp. 120–121. The Japanese claim that the Russians employed 27 infantry battalions, 100 pieces of artillery, 20 tanks, and a sizeable number of aircraft. *Ibid.*, pp. 115–117.

19. The Japanese refer to the conflict as the "Nomonhan Incident," while the Soviets call it the "Khalkhin-Gol Incident." The best account representing the Japanese point of view is in the two-volume work: *Japanese Studies in Manchuria*, Vol. XI, Part 3, Books A and B, "Small Wars and Border Problems: The Nomonhan Incident." This work also includes an English translation of a Soviet account: S. N. Shishkin, *Khalkhin-Gol* (Moscow: Military Publishing House, 1954). The most recent Soviet effort is in *Ist. Velik. Otech. Voyn. 1941–1945.* Vol I, pp. 236–245. Also see Erickson, *op. cit.*, pp. 517–23 and 532–37.

20. Erickson, *Soviet High Command*, pp. 505–506.

21. *Ibid.*, pp. 500–501.

22. Asher Lee, *The German Air Force* (New York: Harpers, 1946), pp. 45–48; *Ist. Velik. Otech. Voyn: 1941–1945*, Vol I, pp. 201–203.

23. Eloise Engle and Lauri Paananen, *The Winter War* (New York: Scribners, 1973), p. 62.

24. *The Memoirs of Marshal Zhukov* (New York: Delacorte Press, 1971), p. 203.

25. *Ibid.*

26. A. I. Shakurin, "Aviatsionnaya Promyshlennost' Nakanune Velikoy Otechestvennoy Voyny" (The Aviation Industry on the Eve of the Great Fatherland War), *Voprosy Istorii*, No. 2, 1974, pp. 81–99.

27. Jean Alexander, *Russian Aircraft Since 1940* (London: Putnam, 1975), pp. 295–304; *Aviatsiya i' Kosmonavtika*, No. 10 (October 1974), p. 27.

28. Alexander, *op. cit.*, pp. 86–93.

29. Alexander, *op. cit.*, pp. 193–95; the figures giving the total production of Soviet aircraft during the Russo-German War found in Alexander coincide perfectly with those given by Yakovlev in a table on p. 55 of his *Fifty Years of Soviet Aircraft Construction* (translated for NASA by the Israel Program for Scientific Translations), Washington, D.C., n.d.

30. Alexander, *op. cit.*, pp. 421–24; *Aviatsiya i Kosmonavtika*, No. 11 (November 1974), pp. 24–25.

31. Yakovlev, *op cit.*, p. 55.

32. *Ibid.*, pp. 45–46.

33 Shakurin, "Aviatsionnaya Promyshlennost' Nakanune Velikoy Otechestvennoy Voyny," *Voprosy Istorii*, No. 2 (February 1974), p. 83.

34. Zhukov, in his memoirs, says the Red Army received 17,745 combat planes, including 3,719 of the latest types, between January 1939 and 22 June 1941, a little over 7,000 aircraft a year. Zhukov, *Memoirs*, p. 201.

35. Text of "Case Barbarossa" in *Blitzkrieg to Defeat: Hitler's War Directives, 1934–1945*. Edited, with an Introduction and Commentary by H. R. Trevor-Roper (New York: Holt, Rinehart, and Winston, 1964), pp. 49–52.

36. Erickson, *The Soviet High Command*, p. 593; in *Ist. Velik. Otech. Voyn. 1941–45*, Vol. II, p. 16, it is stated that in the first day the *Luftwaffe* attacked 66 airdromes along the frontier on which were parked the newest types of fighters and some 1,500 were destroyed either on the ground or in air combat.

37. Aleksandr Yakovlev, *The Aim of a Lifetime* (translation of *Tsel' Zhizni* by Vladimir Vezey) (Moscow: Progress Publishers, 1972), pp. 133–134. Yakovlev, as a leading aircraft designer and as Deputy Commissar of the Aircraft Industry, was in a good position to observe the VVS during the Great Patriotic War.

38. Generalleutnant Herman Plocher, *The German Air Force Versus Russia, 1941* (Air University: USAF Historical Division, 1965), p. 41.

39. *The Soviet Air Force in World War II*, edited by Ray Wagner and translated by Leland Fetzer (New York: Doubleday, 1973), p. 35.

40. Plocher, *op. cit.*, p. 41.

41. Up to March 1942, the Soviet long-range bombing force was called *Dal'nyaya bombardirovochnaya aviatsiya* (Long-Range Bombardment Aviation), or DBA; up to December 1944 it was named *Aviatsiya dal'nego deystviya* (Aviation of Long-Range Operations), or ADD; from then until 1946 it was the 18th Air Army, and from 1946 on it has been designated simply *Dal'nyy Aviatsiya* (Long-Range Aviation), or DA. The "long-range" part of the designation, whether for DBA, ADD, or the 18th Air Army, was until 1945 a relative term since the inventory included more medium-and short-range bombers than long-range ones. *See* A. Tsykin, "Taktika Dal'ney Bombardirovochnoy Aviatsii v Letne-Osenney Kampanii (1941 goda)" (Tactics of Long-Range Bombardment Aviation in the Summer-Fall Campaign [1941]), *Voenno-Istoricheskiy Zhurnal*, No. 12 (Decmeber 1971), p. 65.

42. Plocher, *op. cit.*, p. 42.

43. Paul Carell, *Hitler Moves East, 1941–1943*, translated by Ewald Osers (Boston: Little, Brown, 1964), p. 127; in *Ist. Velik. Otech. Voyn. 1941–45*, Vol. II, p. 111, the Soviet authors claim that they had only 677,085 troops on the Southwestern Front, after the battle some 150,541 remained, thus making the German figure absurd.

44. *Soviet Air Force in World War II*, pp. 60–63.

45. Plocher, *op. cit.*, p. 127.

46. The German figures are probably exaggerated; the various Soviet sources differ considerably on the extent of the losses in the Vyazma-Bryansk debacle—but all give much lower figures than do the Germans. *See* Alexander Werth, *Russia At War, 1941–1945* (New York: Dutton, 1964), pp. 230–231 for Russian estimates. Erickson (*The Road to Stalingrad* New York: Harper & Row, 1975), Vol. I, p. 219 points out that since the Russians could only muster 90,000 men in the Mozhaisk defense sector, the main defense line after the debacle, the Soviet losses must have been desperate as they had 800,000 men when the battle began.

47. *Soviet Air Force in World War II*, p. 67.

48. Asher Lee, *The German Air Force*, p. 117.

49. Mikhaylovskiy, G. and I. Vyrodov, "Vysshie organy rukhovodstva voynoy," (Higher Organs of Wartime Command), *Voenno-istoricheskiy zhurnal*, No. 4 (April 1978); see Chart of command structure for World War II on p. 25.

50. Kozhevnikov, M., "Koordinatsiya deystviy VVS predstavitelyami Stavki VGK po aviatsii," (Coordination of VVS operations by the representatives of Stavka VGK for aviation), *Voenno-istoricheskiy zhurnal*, No. 2 (February 1974), p. 32.

51. Albert Seaton, *The Battle for Moscow, 1941–1942* (New York: Stein and Day, 1971), chapter 4.

52. J. T. Greenwood, "The Great Patriotic War, 1941–1945," in R. Higham and J. Kipp (eds), *Soviet Aviation and Air Power: A Historical View* (Boulder, Colorado: Westview Press, 1977), p. 21. Erich von Manstein *Lost Victories* (Chicago: Regenery, 1958), p. 632, puts the aircraft reinforcements from the East at 1,500.

53. *Soviet Air Force in World War II*, p. 79.

54. *Ibid.*

55. Zhukov, *Memoirs*, pp. 337–338.

56. *Ist. Velik. Otech. Voyn., 1941–45*, Vol. VI, pp. 45–46.

57. Alexander, *op. cit.*, p. 4 and 7.

58. See Kozhevnikov, M., "Rozhdenenie vozdushnykh armiy," (Birth of the Air Armies), *Voenno-istoricheskiy zhurnal*, No. 2 (September 1972), pp. 68–72 for details. A translation of this article by J. Waddell can be found in *Aerospace Historian*, June 1975, pp. 73–76.

59. Greenwood. *Loc. cit.*, p. 89.

60. The best account of the fierce struggle within the city is in Marshal V. I. Chuikov, *Nachalo puti* (Moscow: 1959), English translation by Harold Silver, *The Battle for Stalingrad* (New York: Holt, Rinehart, and Winston), 1964. Marshal A. I. Yeremenko, Chuikov's superior, as commander of the Stalingrad Front, describes the battle as seen from headquarters in his book, *Stalingrad* (Moscow: 1961).

61. *Soviet Air Force in World War II*, pp. 103–4.

62. Novikov and Kozhevnikov, *loc. cit.*, p. 27.

63. A Novikov and M. Kozhevnikov, "Bor'ba za strategicheskoe gospodstvo v vozdukhe," (The Struggle for Strategic Command of the air), *Voenno-istoricheskiy zhurnal*, No. 3 (March 1972), p. 26; Alexander, *op. cit.*, pp. 168–170.

64. Alexander, *op. cit.*, pp. 426–429.

65. Cajus Bekker, *The Luftwaffe War Diaries*, translated by F. Ziegler (London: Macdonald, 1964), p. 278.

66. *Ibid.*, pp. 283–85.

67. Novikov and Kozhevnikov, *loc. cit.*, p. 28.

68. Bekker, *op. cit.*, p. 294.

69. *Soviet Air Force in World War II*, p. 110.

70. Bekker, *op. cit.*, Appendix 14, p. 377.

71. *Soviet Air Force in World War II*, pp. 114–117.

72. *Soviet Air Force in World War II*, pp. 164–165; Novikov and Kozhevnikov, *loc. cit.*, p. 29; Plocher, *The German Air Force Versus Russia, 1943*, pp. 75–83. Plocher gives 1,830 operational aircraft as the total employment for *Zitadelle*.

73. Oleg Hoeffding, *German Air Attacks Against Industry and Railroads in Russia, 1941–1945* (Santa Monica, Cal: Rand, RM-6206-PR, 1970), p. v.

74. *Soviet Air Force in World War II*, p. 174.

75. Schwabedissen, *The Russian Air Force in the Eyes of German Commanders*, p. 168.

76. *Loc. cit.*, p. 29.

77. *The German Air Force Versus Russia, 1943*, p. 105.

78. According to the Soviets, *Ist. Velik. Otech. Voyn. 1941–45*, Vol. V, p. 467, the Red Army only increased 11 percent in manpower during 1943, but increased 80 percent in guns, 33 percent in tanks, and 100 percent in aircraft.

79. Alan Clark, *Barbarossa: The Russo-German Conflict 1941–45* (New York: Morrow, 1965), p. 370.

80. Alexander, *op. cit.*, pp. 426–29.

81. *Ibid.*, pp. 299–300.

82. *Ibid.*, pp. 430–33 and 172–73.

83. From January 1944 to January 1945 Russia's inventory of aircraft went from 8,800 to over 15,000. Greenwood, *loc. cit.*, pp. 118–119.

84. *Ibid.*, p. 119.

85. *Soviet Air Force in World War II*, p. 361.

86. Text of the "Agreement Concerning the Entry of the Soviet Union into the War Against Japan, signed at Yalta February 11, 1945" in Max Beloff, *Soviet Policy in the Far East, 1944–1951* (London: Oxford University Press, 1953), p. 25.

87. *Japanese Special Studies on Manchuria*, Vol. XIII, "Study of Strategical and Tactical Peculiarities of Far Eastern Russia and the Soviet Far Eastern Forces," pp. 111–112.

88. John R. Deane, *The Strange Alliance* (New York: Viking, 1947), p. 248.

89. Raymond Garthoff, "Soviet Intervention in Manchuria, 1945–1946," *Orbis*, Vol. X, No. 2 (Summer 1966), p. 527.

90. *Ibid.; Ist. Velik. Otech. Voyn. 1941–45*, Vol. V, p. 548.

91. Garthoff, *loc. cit.*, p. 531.

92. *Soviet Air Force in World War II*, p. 368.

93. Robert A. Kilmarx, *A History of Soviet Air Power* (New York: Praeger, 1962), p. 184. Soviet historians tend to downgrade U.S. Lend-Lease in general and aircraft in particular. During the Great Patriotic War, the U.S. delivered 14,018 aircraft to the USSR. Robert H. Jones, *The Roads to Russia: United States Lend-Lease to the Soviet Union* (Norman, Okla.: University of Oklahoma Press, 1969), Appendix A, Table II.

94. O. Hoeffding, *German Air Attacks Against Industry and Railroads in Russia, 1941–1945*, pp. 25–28.

95. *Ibid.*, p. 16.

96. *Ibid.*, pp. 17 and 18–21.

97. Oleg Hoeffding, *Soviet Interdiction Operations, 1941–1945*(Santa Monica, Cal: RAND R-556-PR, 1970), p. 5; Greenwood, *loc. cit.*, pp. 130–131.

98. Richard Suchenwirth, *Historical Turning Points in the German Air Force War Effort* Air University: USAF Historical Division, 1959), p. 77.

99. *Ibid.*, pp. 20–27; Suchenwirth says the two old fighter pilots, Goering and Jeschonnek, had a distaste for transport pilots, pp. 3–4.

100. Hoeffding, *German Attacks . . .*, p. 8.

101. Schabedissen, *op. cit.*, p. 389.

HIGHER COMMAND AND LEADERSHIP IN THE GERMAN LUFTWAFFE, 1935–1945

HORST BOOG

It is, I believe, a common experience that those who have lost a war are usually more critical of themselves than those who came out of it as victors. I shall, therefore, not concentrate on the well-known attributes of the Luttwaffe, among which must be included its able application of such general operational principles as that of the interior line, of the concentration of forces at decisive places, and of surprise and successful cooperation with the land forces. Neither shall I deal with acts of bravery nor with the generally high morale and fighting spirit of the Luftwaffe. Rather, I shall focus on a number of special facets of Luftwaffe command and leadership thinking* in the broadest sense which, in my opinion, proved to be decisive causes for the loss of the war in general and the air war in particular. (This does not mean that without this faulty command thinking the Second World War would have been won by Hitler. But it would have been more difficult to defeat him and the Luftwaffe.) I shall first describe these patterns of command thinking, then analyze the consequences which they produced, and, finally, consider the origins of this method of thinking. Let me say at the outset that these traits can be discerned most clearly in the attitudes and pattern of thought of Luftwaffe general staff officers who were educated and trained at the Air War Academy (*Luftkriegsakademie*). They can also be found in Luftwaffe field manuals.

FIVE SPECIAL TRAITS OF LUFTWAFFE COMMAND THINKING

Concentration on Purely Military Matters

One of the most characteristic traits of Luftwaffe command thinking was its concentration on purely military matters. The humanistic model of the highly and universally educated individual able to reach decisions independently, as well as the principle of the universal assignability of

*Ed. note: The author uses this phrase to indicate general and specific Luftwaffe attitudes and patterns of thought. His emphasis is on a particular "mind-set" that developed among senior Luftwaffe officers.

the general staff officer continued to exist only in theory. About 70 to 80 percent of the available time in the curricula of the Air War Academy was reserved for military subjects. For the most part, technical subjects, like armament, economics, and industrial operations, factory organization, and mechanics, among others, had already been deleted in peacetime. They were not resurrected during the war. Also eliminated were subjects of a general nature, such as foreign aviation developments, foreign languages, and sciences. Military history was taught only to illustrate operational and tactical problems. It did not examine the interdependence among politics, economics, and warfare at the level of grand strategy—an interdependence which would have been obvious to officers studying the American Civil War. The Armed Forces Academy (*Wehrmachtakademie*), which was supposed to train a few select general staff officers in grand strategy, was closed completely three years after its establishment. Interestingly enough, the comprehensive subject of "air warfare" did not exist at the Air War Academy. Although in war such comprehensive knowledge was needed to determine the timely change from air attack to air defense, or vice versa, and to arrive at a realistic relationship between aims and means, air attack and air defence were taught separately.

During the war, this truncated course of study suffered further reduction. Instead of general or universal training and education, the Air War Academy concentrated on the elements of routine staff work, especially the method of issuance of orders. The original aim, to train future chiefs of general staffs, was expressly renounced in the last years of the war. This overall reduction of topics reached its climax in 1943 when the Luftwaffe leadership decided that a thorough introduction of the problems of higher command and higher operational thinking was no longer possible.[1] The understanding of the outside world with its various problems and of broad strategic issues became increasingly difficult for the Luftwaffe general staff officer. Consequently, he had unclear conceptions about overall conditions overseas and about the potential of foreign war industries, and did not have the background to deal with questions exceeding the operational scope of the European theaters of war. For example, when Hitler asked his immediate entourage about the location of Pearl Harbor after it had been attacked by the Japanese, none of the officers, including the Luftwaffe representatives, knew exactly where it was situated.

Suffering under the stress of a continuous load of staff work, general staff officers who later rose to important command and staff positions did not develop a broad, strategic view of the war situation. Field Marshal von Richthofen was a good example of this limited view. Von Richthofen had received the typical military technical and academic training and was a master in the field of close air support of the Army. Yet his personal

diary contains hardly any indication that he attempted to understand the war situation as a whole. The dangers arising from this narrow-mindedness were recognized toward the latter part of the war, and the courses at the Air War Academy were extended to broaden the outlook of the general staff officer candidates. These endeavors came too late to have any effect.

There were shortcomings not only in the field of education, knowledge, and capabilities, but also with respect to the level of general experience necessary to support the principle of universal assignability. A shortage of time and personnel as well as the growing demand for hard-to-obtain specialized knowledge and capabilities blocked transfers between different occupational careers and prevented officers from becoming familiar with the other service branches and the problems of other theaters of the war. When the Luftwaffe curtailed the routine rotation between staff and troop assignments, it led first to an estrangement between general staff officers and troop officers and finally to an open critique of Goering and his General Staff by highly decorated fighter commanders. Troop assignments of general staff officers proved to be too short, and transfers from the A2, or signal communications, to another activity were well nigh impossible. Transfers from the A3 (operations) to the A4 (materiel) branch were greatly disliked for many reasons.

Specialization was the natural consequence of these problems and, in view of the pressure of time, certainly the most effective way of getting results from general staff officers quickly. This reduction of the scope of experience is illustrated in an order whereby the general staff candidates, after having passed the Air War Academy, were to be sent back to their original units for a probationary period. (In practice, factors such as the urgent needs of other units sometimes determined these assignments.) Provided only limited opportunity for reassignment, staff officers remained largely unaware that conditions and Luftwaffe missions in the various theaters of the war were different. When the Luftwaffe eliminated the requirement that a portion of the General Staff's membership be combat pilots, it further reduced that staff's familiarization with the diverse dimensions of aerial warfare. This caused Field Marshal Milch to complain that the Luftwaffe High Command was not able to think in appropriate dimensions. The more the ideal of universal assignability became a fiction, the more the general staff officer candidate of the Luftwaffe became a specialist in a very limited field determined largely by his branch of service. As a result, the comprehensive view which was in such high demand became progressively harder to attain.

This development met the particular requirements of the individual service branches. Grand strategy being the exclusive domain of Hitler,

they did not need the strategist, with whom they could do little; they needed the manager possessing special knowledge, even though he was no longer exchangeable. Under these circumstances, the training of general staff officers in the understanding of the overall interdependence among the economy, armament, enemy situation, technology, grand strategy, and warfare had to suffer.

Finally, another type of specialization occurred increasingly during the war years due to the criteria used for selection and promotion of officers. Hitler and Luftwaffe General Staff Chief Jeschonnek demanded young higher commanders[2] for whom the general staff officer's career was to be nothing more than a stepping stone to advancement. In their view, a Luftwaffe general staff officer should not so much distinguish himself by his education and knowledge, but rather prove his qualities by showing courage, bravery, and resolution. These attributes represented pre-industrial values and were influenced by the Social Darwinism of the National-Socialist ideology. The growing importance of physical and psychological values corresponded to the general endeavour of the German armed forces, toward the end of the war, to mobilize the last mental and ideological energies in compensation for the lack of material and personnel strength. (It is astonishing that the general staff officer training at the Air War Academy could be kept free from ideological indoctrination almost until the end of the war. Even after the attempt on Hitler's life on 20 July 1944, the commander of the Academy refused to introduce what he called mass-psychological indoctrination into the curriculum for the training of general staff officers.[3])

Overemphasis on Tactics and Operations

The Luftwaffe leadership's narrow view was encouraged by an education system that overemphasized tactics and operations at the expense of other fields such as logistics, intelligence, technology and signal communications, training, and transportation. This second trait was sometimes called "*Ia-Denken*," or A3-thinking, since the German *Ia*—or operations officer position—corresponds roughly to the American A3 position. It was manifested in the distribution of available instructional time to the different subjects during the general staff training courses as well as in the assignments of general staff candidates during the probationary year. The four basic tactical subjects of air attack, air defense, land and sea warfare were allocated 38 to 50 percent of the instructional time. Together with military history—which was primarily the history of tactics—and war games, these subjects received 44 to 66 percent of available instruction hours. Only 12 to 21 percent of the hours were allocated to support functions, ranging from intelligence, quartermaster and signal communication services, to navigational, photo and mapping service. So, at the most, the support services were given merely two-fifths of the time

of the basic tactical subjects. Intelligence, in fact, disappeared completely from the curriculum of the Air War Academy during the war.

The preference given to the tactical and operational side becomes even more obvious on examining the assignments of the general staff candidates during their probationary year after leaving the Academy. Although from 1935 onward, the first Chief of the Luftwaffe General Staff, Wever, and his successors had repeatedly pointed out the necessity for an adequate knowledge of logistics by general staff officers and had warned against an underestimation of this field, assignments of general staff candidates to operations positions dominated until the end of the war. This was contrary to the practice in the Army. Usually more than one-half of the successful candidates at the Air War Academy, and above all the most qualified of them, were sent to assignments as operations officers. Assignments to the intelligence service were rare during the war and ranked far behind even those of the quartermaster service. General Staff candidates strove for an operations career as the most distinguished of all the general staff careers because it could lead to the position of Chief of General Staff.

To a certain degree, the higher value given to the operations positions was justified. This was the place where all the results of the other command activities were transformed into command decisions. As the former Chief of the German Army General Staff, Halder, put it, this was "the brain that maintained the connections within the command sphere and secured the presence of adequate forces in the right place."[4] The greater importance attributed to A3 work, therefore, cannot be wholly condemned, but the excessive emphasis on it to the point that other command activities were neglected can be criticized.

There was still another reason for the preferential treatment of the A3 service. The operations branches in troop staff organizations of the Luftwaffe contained more positions than the other branches for general staff officers. In fact, the operations branches had even more positions than those to be found in comparable Army staffs. The share of general staff officer positions in the operations sections ranged from 50 percent in air fleet staffs to 100 percent in air division staffs as compared with only 36 percent in army group staffs and 50 percent in army division staffs. While the large operations role in Luftwaffe troop staffs was justified by the greater diversification of tasks to be solved in this part of an air force staff, the question must be asked whether the other fields of command activity did not also deserve a higher share of general staff officer positions based on the various tasks they had to accomplish.

Lower Priority of Technology Compared to Tactics

A third Luftwaffe characteristic was that of according technology a much lower priority than tactics. While Wever repeatedly underlined the

equality of rank between tactics and technology, one of his successors, Jeschonnek, in 1939 rejected the opinion of his engineers that the technical superiority of an air force would be decisive. Since all European nations found themselves on one and the same level technologically, he argued, it is hardly possible to reach technical superiority for any lengthy period of time. It would be better, therefore, to stress the development of tactics so as to give the Luftwaffe a unique advantage. Yet later, slight technical advantages decided the outcome of the war in the air. Technology and tactics should have been developed concurrently.

The first step toward the devaluation of technology in the Luftwaffe General Staff was the elimination of specialized training courses for future technical general staff officers in the spring of 1938. One of the reasons for this was the assumption that technology in the Luftwaffe could be mastered by normal versatile "tactical" general staff and troop officers who would have the assistance of Luftwaffe engineers. This assumption did not prove to be correct. A second step in this direction was the gradual reduction of technical subjects in the curriculum of the Air War Academy, until, during the war, they were no longer taught. This development took place despite the fact that the importance of technology continued to be stressed in Luftwaffe manuals and directives.

Technology was never in high favour with most of the officers. The situation was symbolized at the top by Goering, who bragged about his technical ignorance. In this respect, he had something to brag about. In the Luftwaffe General Staff there was no engineer or technically and scientifically trained officer in a responsible position. As in the German Navy's earlier experience, technology and technicians were quite often treated with distain. However, it must be asked whether the original intention of the Luftwaffe to create officers of both high tactical and technical competence was sound, or, whether, from the beginning, such an objective was fallacious because of the impossibility of any individual mastering both areas.

Overemphasis on the Offensive

A fourth trait which narrowed command thinking arose from employment doctrine. Offensive assumptions shaped the Luftwaffe doctrine of air war until nearly the end of the conflict. General Wever considered the bomber to be the decisive weapon in air warfare,[5] an idea which remained in the basic Luftwaffe manual on the conduct of air war, Nr. 16, until 1945. Of course, conditioning this idea was a conviction nursed by the doctrine of land warfare and by Germany's unfavourable geostrategic situation in the middle of the European continent.

Luftwaffe officials believed that the protection of the country against air attack could only be safeguarded by the possession of a sufficiently

large buffer zone. By itself, this idea of a buffer zone did not involve aggression and should not be confused with Hitler's policy of aggression, even though both had the same effect in the end. Nevertheless, this concept implicitly required the conquest of sufficient territory once a war had broken out. It was advocated by Hitler, who was influenced by the geopolitical ideas of Professor Haushofer as well as by responsible Luftwaffe commanders and general staff officers. The latter were not air-minded enough yet to imagine that the homeland could also be protected from hostile attack by building up a strong fighter defense force. As in other countries, a conviction that there was no effective means of defense against air raids also nourished the emphasis on offense. For example, at the Air War Academy, 16 to 21 percent of available instruction time was devoted to the subject of air attack while air defense was accorded only half that amount, a ratio which went unchanged until the last months of the war.

Furthermore, this offensive emphasis was clear in the selection of candidates for the general staff officer training courses. Until the end of the war representatives of the attack weapons (bombers) dominated the selection list. In fact, officers from bomber, dive bomber, and attack units constituted between 40 and 70 percent of all candidates from the flying service arms, a percentage that was 100 percent above their proportional share. This over-representation was the logical result of the emphasis on the subject of air attack in the curriculum. In contrast, fighter pilots, whose function was largely defensive, were under-represented. Although they composed on the average about 40 percent of all Luftwaffe air crews, they generally received 17 percent of the staff officer training school assignments allocated to air-crew members. On many occasions their percentage was closer to zero. Although this detrimental situation was recognized late in the war, it could not be changed because of the heavy losses of the fighter arm. This unequal representation at the Air War Academy was a conscious policy of the General Staff and not a matter of pure chance.

Narrow View of the Luftwaffe Mission

A final trait of Luftwaffe command thinking was the narrow view of its "mission." Although the idea of the necessity of strategic air warfare always existed in Luftwaffe doctrine—at least implicitly—the concept of a cooperative air force prevailed. This meant that offensive thought was not interpreted according to the theories of Douhet but was oriented toward land warfare. The experiences of the First World War were a primary cause for this emphasis: the successes of German flying units were predominantly in ground support operations, whereas attempts to carry on strategic air warfare with dirigibles and giant bombers had proved futile. Since there was neither an independent air force nor an air arm

in Germany after 1919, the concept of an air force as an auxiliary weapon of the army persisted. Further, in the small army left to Germany after the Treaty of Versailles, officers with flight experience filled only the lower ranks, largely because of their youth, while army officers filled the more responsible and influential higher staff officer and general officer positions. Moreover, most of the higher ranking officers with air experience in the later Luftwaffe had been commanders of fighter squadrons or reconnaissance units during the First World War; none of them had experience in commanding larger air forces or in conducting strategic air warfare.

The knowledge that Germany's material resources were rather limited and that far-reaching bomber attacks would bring results only after a long and indefinite time (as proven in the Spanish and Sino-Japanese Wars of the 1930s) strengthened the preference for the so-called "operative" and cooperative air war. This approach promised to bring about faster successes in conjunction with armored thrusts and other operations of the Army. Considerations of economy and inadequate aiming devices for horizontal bombing furthered the development of the dive bomber. The increase in that airplane's weight caused by its extra equipment and fittings shortened its range and encouraged preparation for aerial warfare over medium distances in support of army operations.

Most interestingly and significantly, the concept of "strategic air warfare" did not exist in Luftwaffe doctrine. While a number of German journalists wrote as if the Luftwaffe were a Douhetan instrument, its leaders instead concentrated on the ground cooperation mission. Although they considered strategic bombing a legitimate air force task, they did nothing until 1943 to develop the concept. (During the 1930s, Luftwaffe planners emphasized interdiction, or indirect cooperation with ground forces. Because they initially thought close air support would be very difficult, they did not begin to refine the tactics for this mission until shortly before the war.) Only after having learned from Allied strategic air operations that it was better to destroy enemy tanks and planes at the places where they were produced, rather than at the front, did the Luftwaffe undertake a belated and unsuccessful strategic air campaign against industrial centers and electric power plants in the Soviet Union in 1944–1945.

CONSEQUENCES OF THESE TRAITS

Organization of the German Air Force High Command

The restriction of Luftwaffe command thinking to purely military matters and the preponderance of the operational sphere of command over the supporting sectors directly affected the organization of the German Air Force High Command. None of the other branches of the Ger-

man armed forces changed its high command organization as frequently as the Luftwaffe. The reasons for this were manifold. At first, there was the lack of operational experience within this young branch, which had come into existence only in 1935. Another factor was the difficulty of combining in the best possible way tactics with technology, which was far more important in the Air Force than in the Army.

Other very important reasons for the frequent organizational changes include the personal, political, and functional rivalries at the top. Goering, the domineering and selfish, vain and indolent Commander in Chief of the Air Force, followed the example of Hitler in his use of the principle of "*divide et impera*" in order to secure his position. He remained at odds with Milch, his very capable and ambitious but "civilian" Secretary of State for Aviation (*Staatssekretar der Luftfahrt*). Furthermore, Milch struggled continuously with the Air Force General Staff, which declined to recognize this "political" superior. Milch's conflict with Ernst Udet, Director-General of Air Armament (*Generalluftzeugmeister*), was part of the larger struggle between the former and Goering because Goering played Udet off against Milch. Hitler also played his part in the game, helping to prevent the enforcement of necessary organizational and operational measures and a clear separation of the military from the ministerial functions. In this way he was able to keep Goering, his old companion and designated successor, in his office as Reich Minister of Aviation and Commander in Chief of the Air Force in spite of the fact that his incompetence as a military leader soon became obvious. Hitler tolerated the on-going personal feuds in accordance with the "*divide et impera*" principle as a constituent element of his regime.

Above all, however, the top organization of the Luftwaffe had been streamlined to conform to the immediate requirements of a short war. Later, changes were required because this streamlined organization proved to be insufficient for the growing demands of the subsequent long war. The fact that the German Air Force had used up seven chiefs of its General Staff in ten years demonstrates these conditions in the German Air Force High Command. So, too, do the suicides of the Chief of the General Staff, Jeschonnek, and the Director-General of Air Armament, Udet.

The organization of the Luftwaffe High Command developed in four phases in peace and war. In the first one all branches of the Air Ministry were subordinated to Secretary of State Milch who correlated and controlled all the command functions necessary for the establishment of the Luftwaffe. This central control was necessary during the initial phase of the establishment of the Luftwaffe and was indeed very effective because Milch was an able and strong personality. Although he was not very easy to get along with, he took care of practically everything of importance

in the Luftwaffe; and, unlike most Luftwaffe officers, he possessed a wide knowledge of economic, technological, and industrial matters. His abilities and the high esteem Hitler had for him aroused Goering's envy. Milch's less than satisfactory military knowledge, experience, and leadership (from the officers' point of view), and at times his rather high-handed manner of dealing with the Air Force General Staff, intensified Goering's opposition to him.

As a result, in a second phase, lasting from the summer of 1937 to early 1939, Milch temporarily lost his overwhelming influence within the Air Force as well as his position as deputy to Goering. At the same time, the Air Force General Staff became more influential and narrower in its outlook. Thus, purely military concerns began to prevail in the top organization even though the establishment of the Luftwaffe had not yet been completed. This was reflected in the reduction of the General Staff to something akin to Goering's personal military operations staff. While the reputation of the General Staff within the Luftwaffe command hierarchy was increased by its direct subordination under the Commander in Chief, the staff abandoned to the unreliable Goering its claim to comprehensive command responsibility. Since he lacked the determination of Milch, Goering commanded only nominally, and the centralized control of the Luftwaffe became increasingly weak.

In order to arrive at a more effective short war operational command structure, the General Staff confined itself voluntarily to those command functions that were absolutely indispensable from a military point of view. The narrowness of the organization's perspective reached its zenith at the beginning of World War II, when Jeschonnek, the Chief of the Luftwaffe General Staff, jettisoned as "ballast" and unnecessary for the immediate purposes of air operations the training, signal communications, and medical inspectorates as well as the civilian air defense staff. The other General Staff inspectorates had previously been abandoned to the Director of Training (*Chef des Ausbildunswesens*), who was responsible to Secretary of State Milch. Jeschonnek also separated his headquarters from the office of the Luftwaffe Quartermaster General, a man whom he did not like. In addition to other problems, this meant a disruption between the Luftwaffe operations and logistics sections. The Chief of the General Staff now took over the office of the Chief of the Luftwaffe Operations Staff and concentrated wholly on the tactical and operational side of the air war. For the anticipated short war, and in the brief campaigns of the first year of the war, this organization proved quite effective. For the long war that soon took shape, however, it proved a failure.

Yet no major changes took place in the senior organization of the Air Force during the third phase, which lasted from 1939 to 1943–1944.

Nor was there any change in the position of the General Staff as Goering's personal staff of operational assistants. On the other hand, by 1939 Milch had regained the function of deputy to Goering and had become Inspector-General of the Air Force. By the end of 1941 he had also become Director-General of Air Armament, thereby further consolidating his position. Only in operational matters did the Chief of the General Staff report directly to the Commander in Chief of the Air Force. In all other respects, he first had to inform the Secretary of State before seeing the Commander in Chief. These circumstances again stirred up the animosity between Milch and the Chief of the General Staff. In addition, Hitler's fundamental order of 11 January 1940, which forbade anybody from receiving more information than he needed for the execution of his orders, severed the vital collaboration between the Chief of the General Staff and the Secretary of State for Aviation/Director-General of Air Armament. The order affected other sectors of Luftwaffe command even more significantly.

Meanwhile, the General Staff became increasingly aware that a long war called for a command organization that suited the various demands of such a war, including economic, technological, and industrial requirements. Accordingly, the scope of responsibility of the Chief of the General Staff widened to become the germ of a comprehensive command organization of the Luftwaffe. Yet this organization did not appear because of Goering's ineffectiveness and lack of responsibility and because of the division of the top organization between the two rivals, the Chief of the General Staff and the Secretary of State.

Under Korten, the Chief of the Air Force General Staff, and Koller, his chief of operations, the senior organization of the Luffwaffe finally adapted to the requirements of a long war of attrition in the fourth phase during 1944 and early 1945. Continual reorganizations characterized this period. Not before the last days of the war was an optimum scheme found, and then mostly on paper.

On 5 February 1944, the Chief of the General Staff, who, unlike the Secretary of State, had been signing "by order of" the Commander in Chief until then and had not been "acting for" him, received the authority of a deputy of the Commander in Chief for all military and operational matters. He was thus placed on an equal footing with Goering's other two deputies: Lorzer, his friend and newly appointed personnel chief or, as he was soon to be designated, Chief of Personnel and National Socialist Conduct of the Air Force (*Chef der Personellen Rüstung und Nationalsozialistischen Führung der Luftwaffe*), and Milch, the Secretary of State for Aviation and Inspector-General of the Air Force. The latter's official duties had not yet been confined to ministerial matters alone and still comprised aviation training and the entire field of technology and air

armament. The old comprehensive designation of the Luftwaffe High Command—"The Reich Minister of Aviation and Commander-in-Chief of the Luftwaffe"—had derived from the ideological National Socialist "Leader Principle" (*Führerprinzip*) and former Prussian administrative practice. This designation was now subdivided into "High Command of the Air Force" (*Oberkommando der Luftwaffe*), comprising the Chief of the General Staff and the Chief of Personnel, and "The Reich Minister of Aviation," under which title the Secretary of State had to sign. Goering still opposed the concentration of all command functions of military relevance in the hands of either a "Chief of Air Warfare" or the Chief of the Luftwaffe General Staff. Hitler had recommended such an organizational reshuffling, but did not press Goering on the issue. As a result, the latter continued the practice of having the inspectors of the various arms report directly to him. These individuals, who played an important part in the development of tactics and aviation technology, became Goering's messengers and representatives with the troops. In effect, the Chief of the General Staff had no real authority over them. Goering, like the party itself during the last years of the war, also claimed the field of moral leadership and personnel management for himself as a high-ranking member of the National Socialist Party. He withheld these responsibilities from the Chief of the General Staff by organizing them into a separate realm for Lorzer, his friend and deputy.

A clear separation of the military from the ministerial functions occurred only when Milch was deprived of the offices of Secretary of State and Director-General for Air Armament in June/July 1944, when his function as Inspector-General of the Air Force was reduced to insignificance, and after Lorzer's position had been abolished on 8 December 1944. Only then was it possible to concentrate all of the military functions in the hands of the Chief of the General Staff. The Chief of Staff soon took over supervision of the development and procurement of aircraft, weapons, and materials, while the Speer ministry supervised production.

In March 1945 the Chief of the General Staff finally became the principal deputy to Goering and won comprehensive authority over the entire Luftwaffe, including the right to issue directives to Goering's other two deputies, the Commander of the Replacement Air Force (*Befehlshaber der Ersatz-Luftwaffe*), and the new Chief of Aviation. The Commander of the Replacement Air Force and the Chief of the General Staff constituted the "High Command of the Air Force" and were also responsible for those aspects of training and personnel replacement not handled by the Air Force Personnel Office under the Commander in Chief himself. The new Chief of Aviation (*Chef der Luftfahrt*) was responsible for the ministerial part of Goering's duties. Now the Chief of the General Staff under Goering was the responsible officer for the direction of the entire air war and of the reduced air armament sector.

This seemingly optimum solution was achieved, however, within an air force whose striking power and reputation had already been broken. In addition, the new senior organization never had a chance to function properly, because Goering's continued penchant for creating ad hoc offices directly under him produced unending confusion. Eroded by the influence of these ad hoc offices and beset with battlefield disasters, the new organizational scheme was largely stillborn. By this time, Luftwaffe high command initiative had degenerated into mere reactions to enemy initiatives. The replacement of functional considerations by the "Leader Principle" and the overwhelming force of events played their parts in paralyzing the structure of the Luftwaffe High Command. Proper operational and organizational measures had been taken too late, after having originally been directed towards the "false" (short) war.

Effect of Overemphasis on Operational Thinking

Apart from this, note again how the upper level of the Luftwaffe reflected the organization traits of its command practice and operational thinking described above. This was especially apparent in the so-called "command orientation" or "A3 thinking," i.e., the overemphasis on operations and tactics at the expense of logistics, technology, training, and other infrastructural and supporting spheres of command. Training, torn apart and removed from General Staff responsibilities until near the end of the war, received little high-level attention. Furthermore, the air transport and the quartermaster services had been degraded organizationally, and technology was not connected with the operative command from 1937 to 1944.

While the Luftwaffe took a wider view of military operations than the other armed services, the fundamental trait of concentration on its own military business was evident in the lack of integration of the Luftwaffe into the organization of the Supreme Command of the Armed Forces. Indeed, the Luftwaffe was much less integrated into the Supreme Command than the Army and Navy. This deficiency resulted, of course, from Goering's opposition to an effective supreme command of the armed forces by someone other than himself. Goering accepted directives only from Hitler and refused to subordinate the Luftwaffe to the Chief of Staff of the Supreme Command of the Armed Forces or to the Chief of the Armed Forces Operations Staff. There was no liaison officer of the Supreme Command of the Armed Forces with the Air Force High Command. The Luftwaffe representatives at the headquarters of the Supreme Command of the Armed Forces fell considerably behind those of the Army and Navy in terms of rank and number because Goering was not interested in strengthening the authority of this institution by dispatching generals to it or in having his direct contact to Hitler disturbed by high-ranking air officers there. He would do nothing that might reduce the

Luftwaffe's and his own independence in his capacity of Commander in Chief Luftwaffe. Furthermore, in the command structure of the Air Ministry, there were no top level advisory and coordinating councils or agencies to tie together air operations with the other armed services, pertinent ministries, and the scientific and industrial establishment. Such high-level planning, advisory, and controlling bodies in England and the United States as the Air Staff, the Defense Committee, the Ministerial Committee on Military Co-ordination, and the Joint Chiefs of Staff did not have places in the German Air Force command organization. Instead, the primary function of the Luftwaffe command structure was to execute orders.

The preponderance of the operating interests also diminished the chances of military success through its negative effects on the quartermaster service, on air transport, and on training, technology, and intelligence. Because it is impossible to describe these negative effects in detail here, several examples must suffice.[6]

Since specialization in the quartermaster business, for instance, could harm an officer's career, that service was not popular, and the best officers were not assigned to it. In 1942 the last Chief of the Luftwaffe Operations Staff felt degraded when, as operations officer of the Fourth Air Fleet in Russia, he was appointed quartermaster of that fleet, a position which ranked higher than that of the operations officer. According to Marshal Kesselring, the quartermaster service also had a low reputation in the General Staff. The Luftwaffe commander with Guderian's tank army confided in his diary in 1941 how much he hated all the rear services and how foreign they were to him. Not surprisingly, awards to quartermaster personnel were much less numerous than to the fighting troops. Also, personnel replacements for the supply organization had lowest priority.[7] General Henry H. Arnold, reflecting on his adversary's shortcomings, concluded that the Luftwaffe made a grave mistake by never providing for sufficient replacement of aircraft and crews.[8] The chapter on supply and replacement in Fundamental Field Manual Nr. 16 on the Conduct of Air War was never written, although this field manual went through several editions.

The mentality described here had a profound impact on the air war, as well as on the war in general, which was conducted only in accordance with operational and strategic aims and not on the basis of logistical considerations. Good examples of this were: the failure to occupy Malta, an omission which greatly disturbed the Axis supply convoys to Africa; the Luftwaffe's promise to supply the Sixth Army in Stalingrad by air, although past experiences had already proven the impossibility of an undertaking of such dimensions; and the way in which Rommel stormed forward in Africa without sufficient numbers of tanks and troops to oc-

cupy the British stronghold in the Nile Delta. Hitler fought and lost the Second World War with an inadequate understanding of logistical considerations.

The treatment of air transportation is another significant example of the neglect of logistics. No mention is made of air transport as a means of supply in the Handbook for the Luftwaffe General Staff Service of 1939. When air transportation was needed, the necessary aircraft and crews were formed ad hoc from the advanced flight training schools using Ju-52 planes. If air transportation had ranked sufficiently high organizationally, the promise of air supply for Stalingrad would not have been given so readily to Hitler by Goering and his Chief of the General Staff. Neither man understood the subject very well. An air transport command with a competent staff and sufficient authority appeared only after Stalingrad and Tunis, where the Luftwaffe had lost most of its transport planes. What is said here about air transport is also true of the signal communications service. Although the signal troops made up 20 percent of the Luftwaffe strength, their chief was only a three-star general, while the rest of the Luftwaffe included ten four-star and five five-star generals.

As Field Marshal Kesselring and the Quartermaster General of the Luftwaffe confirmed after the war, training was the stepchild of the service which adhered to the principle that the surprise strike at the beginning of an operation had to be conducted with full strength to include the maximum number of troops drawn from schools and reserves.[9] As already mentioned, training was taken from the General Staff and given to the Secretary of State in 1939. The Chief of the General Staff was more interested in maintaining large numbers in operational frontline units and less concerned with securing a sufficiently broad base of thoroughly trained crews. The training establishment was already too small at the beginning of the war. The last Chief of the Luftwaffe General Staff wrote after the war: "The number of flying units was increased at the price of a low training level and a lack of reserves."[10] General Jeschonnek once said, "First we have to beat Russia, then we can continue training."[11] The advanced training schools were frequently deprived of their flight instructors, who, along with their planes, were assigned to air transport duties. The training time was steadily shortened to the extent that a German pilot at the end of the war received less than one-third the flight training time of an American pilot. Since the training schools had too few modern combat aircraft, young pilots had very little time to become accustomed to them in their operational units. When fuel had to be saved, that saving began in the training sector. When aluminum was in short supply, the production of training aircraft was curtailed. In 1944, the recently reestablished training branch of the General Staff stated that the quantity of trainees had had a higher priority than the quality of their training.[12] As a result, more than 50 percent of flight accidents in 1944

were due to inadequate training.[13] Since non-combat aircraft losses very often were higher than those caused by enemy action, this figure takes on added significance. Actually there was a *circulus vitiosus:* the low quality training caused higher losses which increased the shortage of aircraft and diminished the allocation of combat aircraft to the schools.

Technological Ignorance

The rather low esteem among the military for technology led to the appointment of incompetent people to important positions. The best known case is that of the amiable and valiant Udet, a Bohemian, an artist and a clown in the air, but not the capable manager needed in the position of Director-General of Air Armament.[14] He rose to that post because Goering wanted to please Hitler by appointing this well-known man who was so beloved by the people. Udet appointed as his chief engineer a young man who had no experience in the mass production of aircraft and who eventually was fired. Later in the war, an unqualified officer headed the technical sector, and his deputy freely confessed that he did not understand anything about technology. Goering usually appointed highly decorated young officers as his technical consultants because he felt that bravery in combat counted more than technical knowledge and experience. Because he preferred officers instead of engineers in positions of technical importance, military persons who would not accept the word "impossible," rather than expert engineers, decided the technical questions.[15] The word of combat-experienced officers counted for more than that of the engineers, resulting in constant alterations of aircraft types and frequent delays in production.

The ignorance of responsible Luftwaffe leaders about the problems associated with aircraft development explained their conviction that technology could be directed in accordance with the military principle of order and obedience. Goering was always greatly astonished and furious when he could not quickly get the technical advances he wanted.[16] Von Richthofen reacted in like manner during his tenure as chief of the development branch in the technical office of the Luftwaffe.[17] Series production of an aircraft began before the completion of its testing phase, requiring alterations at the front and preventing many planes from becoming combat-ready. The best-known cases of this wasteful policy were those of the He-177 bomber and the Me-210 destroyer projects. The He-162 jet fighter is another example. That fighter was a brilliant engineering achievement; but because it was in mass production only three months after its conception, it failed the test of combat.

Since tactics and technology were organizationally separate, the General Staff paid very little attention to problems involving both areas and sent hardly any technical requirements to the technical office.

Goering saw to it that his General Staff concerned itself with operational matters while the technical office devoted its energies exclusively to matters in its own sphere. The lack of tactical requirements for the technologists was also due in part to Hitler's reluctance to inform the general staffs about his plans, so that the latter simply were not always in a position to issue such requirements. Hitler's policy shows that he too believed that mere orders were enough to direct industry and to shift it quickly to new programs.

Although increasing amounts of money were spent on research, the percentage expended in relation to the sums put into aircraft production steadily decreased.[18] Goering and Milch did not take much notice of this; their interest was in increasing production. They did not understand much about research and therefore could not secure the proper direction and coordination of this vital activity. The Department of Aviation Research was steadily downgraded within the Air Ministry until it was dissolved in 1942 to be replaced by an extremely inefficient Aviation Research Council.[19]

Some of the biggest blunders in the technical field were Goering's and Hitler's directives of 1940 and 1941 which cancelled all development projects that did not promise to yield results within one year. As a result, development of the first jet plane, the He-162, and the first operational jet fighter, the Me-262, was delayed and the bulk of Luftwaffe combat aircraft at the end of the war were outdated. Although aircraft factories clandestinely carried on developmental work, their technical personnel were shifted to the production side. This halt to development stemmed from ignorance of the importance of technological continuity, the need to produce as many proven weapons as possible, and Milch's hesitation to embark on entirely new projects. In this way, the Luftwaffe lost its initial qualitative advantage over enemy air forces—its only real advantage.

In this connection, a word must be said about the preference line officers enjoyed over engineers in the Luftwaffe. As in the Navy, the technologist or engineer was not considered to be on an equal footing with the line officer. Because the conception of the military value of the scientist and engineer was inadequate, most of them were drafted into the Army as ordinary infantrymen. This mistake went uncorrected until far too late. Many Luftwaffe engineers developed a mixture of inferiority and superiority feelings towards the line officers because the latter generally and socially counted more but at the same time were ignorant about technology. In contrast to the officers, the engineers had only limited opportunities for advancement despite their wide responsibilities. For example, the 18 highest-ranking engineers held ranks equivalent to a one-star general in 1945 when the Luftwaffe had 176 one-star, 101 two-

star, 57 three-star, 7 four-star, 4 five-star generals, and one Reichs Marshal. Many young engineers left their corps to join the line officer corps at reduced rank in order to improve their careers.

Low Priority Accorded Intelligence

Some remarks must be made on the relationship between operations and intelligence.[20] The latter never enjoyed the same reputation in the Luftwaffe as the former, although it can be said that intelligence work was rated higher before than during the war. The easy initial successes in the various *blitz* campaigns fostered the neglect of intelligence work, as did the disappointments later in the war, when intelligence forecasts proved to be false and spies were discovered in the Intelligence Branch of the Luftwaffe Operations Staff. The best officers of the General Staff were not assigned to intelligence work or to the related attaché posts. A number of other developments illustrate the disregard of the importance of intelligence. For example, radio intelligence remained a secret realm of the Chief of Signal Communications; technical intelligence fell under the control of the Director-General of Air Armament; and both had no organizational connection with the central Intelligence Branch of the Luftwaffe General Staff. Some seven offices in the Luftwaffe collected and/or evaluated intelligence. A comprehensive field manual for intelligence work did not even exist.

The low priority attached to intelligence resulted in fundamental blunders in assessing the intentions and capabilities of Germany's three main opponents—England, the United States, and Russia. The potentials of all three were substantially underestimated before and during the decisive initial years of the Second World War. Hitler arrived at false decisions concerning Great Britain, Russia and the United States due in part to the false assessments of his Luftwaffe's intelligence service. The predominantly military training of the intelligence officers usually led to intelligence assessments which proved correct in the narrow military sense—i.e., in regard to the location of units, the types of weapons, strength of troops, etc.—but which were mostly wrong concerning the economic, political, and moral war potential of the opponents. Intelligence officers had not received the necessary broad and pertinent education. Moreover, they tried to conduct intelligence work by themselves as a purely military matter without coordinating their efforts with economists, technicians, and scientists. The results of Luftwaffe intelligence corresponded with the low priority assigned to this field of activity.

Dominance of Offense Over Defense

The belief that effective air defense was impossible shaped the doctrine of the offensive as it evolved in the 1920s and 1930s. Most of the world's air forces shared the conviction that, since the bombers would

always get through, the best defense would be offensive operations against the centers of the enemy's war potential. This emphasis on the offensive, which had nothing to do with aggression as far as the military were concerned, appears in all pertinent manuals on air war. The decisive role of an independent fighter force as an effective means of defense and of gaining command of the air was not yet in the minds of Luftwaffe strategists. Thinking about military aviation conformed to the principles of land warfare. The unfavorable geostrategic situation of Germany encouraged military thinkers to view the conquest of sufficient buffer zones as the best defense against air attacks. The two-dimensional thinking of land warfare prevailed over the three-dimensional thinking best suited to an air force. The easy victories in the early years of the war confirmed the belief in the superiority of the air offensive over the defensive and were a major reason for the delay in creating an effective, centralized air defense system. It was not until 1943–1944 that the various local defense systems were unified into one organization covering all of German air space. This centralized air defense was but a belated reaction to the Allied strategic air offensive.

Nevertheless, the idea of the greater value of the offensive prevailed in the heads of many a Luftwaffe leader including Koller, the Chief of the Operations Staff. The land war-minded Hitler, who at that time exerted an overwhelming influence on the Luftwaffe, in contrast to his impact in the early stages of the war, was a staunch disciple of offensive air operations. He and Goering perverted the doctrine of the air offensive by repeatedly employing the fighter force in support of the land fronts (e.g., against the Allied invasion troops, the last time on 1 January 1945 in what was called operation "*Bodenplatte*"), although the precondition for attack, the control of the air over one's own territory, no longer existed. This false employment of fighters weakened the air defense of Germany, which, in the opinion of Galland, the General of Fighters, had to be strengthened to allow undisturbed industrial production. This offensive mentality produced fruitless bomber attacks on England when the air defense of the home country was at stake and prevented a timely shift in priority from bomber to fighter production. Likewise, Hitler's land war-mindedness prevented a shift in priority from the production of more and more ineffective antiaircraft guns and ammunition to fighters. For example, the aluminum for the fuses of the heavy AAA shells produced during the war would have sufficed for the production of about 40,000 additional fighters.[21] This does not mean that no AAA guns should have been constructed. They were, of course, necessary for local defense and anti-tank warfare. Yet, there were not enough of them to put up a curtain of fire, whereas perhaps 10,000 more air defense fighters would have greatly enhanced the deterrent capability of home defense. Although to a certain degree, land and sea operations required the pro-

duction of offensive aircraft, these operations withdrew resources from air defense.

The Role of the Luftwaffe: Strategic Bombing or Tactical Support?

The above observations lead to the question of whether the Luftwaffe was meant to be primarily an independent strategic air force or a force cooperating with the Army and Navy. Although it is generally known that it finally turned out to be a cooperation force, opinions differ as to whether this was the Luftwaffe's primary purpose as originally conceived.

Communist historians tend to regard the Luftwaffe primarily as a strategic and terror instrument, as they do the "capitalist" air forces. Their intent is to demonstrate how "humane" the Soviet Air Force practice of cooperation with the Army was in contrast to the "barbarian" method of the "imperialist" air forces. Those historians try to turn the deficiencies and ineffectiveness of the Soviet strategic bomber force into a virtue by saying that it was dedicated to the more "humane" mission of army cooperation.[22] This is, of course, just one facet of the ideological struggle against the "class enemy," also known as the policy of "peaceful coexistence."

According to the Fundamental Field Manual Nr. 16, the Luftwaffe had three tasks: first, to annihilate the enemy air force by attacks on its ground organization and industrial base rather than by fighting it in the air; second, to support the operations of the Army and Navy; and, third, to bomb the centers of the war potential in the rear of enemy territory. Obviously, the Luftwaffe doctrine of employment had a strategic and a cooperative component. Although this enumeration did not imply a priority for the supporting role of the Luftwaffe over its strategic role, this was in fact the case since the strategic role was to be resorted to only when there was a standstill in the land war. In corroboration of this, it is worthwhile to remember what has been said previously about the concepts of "operative" and "strategic" air warfare. Although "operative air war" was a very unclear concept, it shows the tight linkage of air war thinking with land operations. The Luftwaffe Order of Battle was not structured in accordance with independent offensive or defensive functions, but was designed to cooperate with the Army in the ratio of one air fleet to each army group. The suffering caused by the Allied strategic air campaign finally made the Luftwaffe comprehend strategic air war and compelled certain of its operational thinkers belatedly to demand—or to deplore the non-existence of—a strategic air force.

In contrast to this *de facto*, predominantly cooperative employment of the Luftwaffe, which corresponded with its doctrine, one could argue that as early as 1933 Hitler conceived the air force as a "*Risiko-Luftwaffe*

(risk air force) whose function, from the beginning, was to deter potential attackers by the menace of an indiscriminate strategic air offensive against their industries and population, thus protecting the growth of German war potential. It is quite true that in subsequent years the Luftwaffe did have the strategic task of helping Hitler extort political advantages from other countries. The plans to expand the Luftwaffe strength five-fold in 1938–1939 and to give it a considerable strategic component is taken as proof of its strategic role in Hitler's attempt to dominate the world. Finally, the Battle of Britain is considered proof of the intrinsic purpose of the Luftwaffe. None of these arguments, however, proves that the Luftwaffe was actually designed as a strategic weapon. The politicians (including Goering) assumed the risk and blackmailing roles so as to use the Luftwaffe for bluffing; Milch, in 1936, thought of it more as a co-operative weapon.

In reality, responsible Luftwaffe commanders considered their service, even in 1939, unfit for a strategic air war overseas and did not intend to build up an air force composed of a large number of strategic bombers. In their view, the proper doctrine of employment, which was greatly conditioned by Germany's geostrategic position, called for an independent air force capable of assisting the advancing ground forces, which thus would remove the imminent air threat. The first Chief of the Luftwaffe General Staff, Wever, ordered priority given to the fast medium bomber in May 1936, before his fatal accident.[23] The development of the heavy bomber had a very low priority although it was never cancelled. The decision of Goering in April 1937 to scrap the existing prototypes of strategic bombers was just the belated execution of Wever's earlier decision and was in keeping with the general opinion within the Luftwaffe that the fast medium bomber was needed more urgently than the big bomber for its potential tasks.[24] Of course, Wever had been aware of the possibilities of the long-range strategic bomber. Under the influence of the successful Allied strategic air campaign against Germany, Luftwaffe officers working for the US Historical Division glorified him after the war as the "father of the strategic thought in the Luftwaffe." But Wever was also a realist who knew what the Luftwaffe needed first in the near future. So, although Luftwaffe air doctrine was double-tracked, comprising a strategic and cooperative component, the accent lay on the latter component both in theory and, even more so, in practice. The impact of the experience of the Spanish War, combined with the doctrine of combined operations, convinced the Luftwaffe to develop a close air support corps and not a strategic bomber command. The latter was vainly envisaged only late in the war.

In summing up, one arrives at the conclusion that it was the politicians, exploiting foreign propaganda, as in the case of Guernica, who imposed a strategic disguise upon the Luftwaffe in order to deter potential

enemies. On the other hand, responsible Luftwaffe commanders shaped their weapon with a view to its prevailing cooperative tasks, strategic employment being considered impossible and unnecessary in a future war against adjacent opponents whose territories were to be conquered and not destroyed. According to doctrine, the Luftwaffe was to fight the enemy's armed forces rather than its civilian population. It was not until the brilliant victories in Poland, Norway, and France that Luftwaffe leaders, in the wake of the enthusiasm and euphoria arising from these victories against weaker opponents, forgot the negative results of previous war games and came to believe in their ability to fulfill the strategic task of bringing England to her knees independently. They bluffed themselves by their own propaganda. Of course, this explains, at least in part, their high hopes. The geostrategic situation had meanwhile changed much to Germany's advantage, and no one as yet had experienced the difficulties associated with strategic bombing operations. Had the Luftwaffe been designed as a strategic force, and had the situation of an immovable frontline with England not come so unexpectedly early, that service certainly would have developed and employed the four-engine bomber. But all this is hypothetical and not historical. It suffices to repeat that the experiences of the Spanish War indicated to the Luftwaffe leadership the importance of ground cooperation operations and that Army leaders in the late 1930s continued to pressure the Luftwaffe to maintain a strong ground support force.

German emphasis on the dive bomber also encouraged the Air Force to become a tactical rather than strategic force. The Luftwaffe developed the dive bomber because it lacked a suitable bomb-sight for horizontal attacks and because it needed an effective but cheap bombing aircraft. The dive bomber seemed to answer these needs, which led to the decision to make all bombardment aircraft dive bombers. As previously noted, the move to dive bombers increased aircraft weight and reduced range, thereby encouraging the Air Force to view its bombers principally as a ground cooperation force.

After the disappointments of the Battle of Britain, the Luftwaffe was employed mainly in the ground support role envisaged by its doctrine. The wide use of its medium bombers in close air support (especially in Russia) undermined the force. Only too late did the Luftwaffe High Command realize that the bomber force could achieve better results if used against strategic targets. But it was Hitler, the Supreme Commander of the Armed Forces as well as the Commander in Chief of the Army, who now prevented this insight from being put into practice by ordering increasing but very costly close air support. So, although the Luftwaffe doctrine for the conduct of air war provided for both a strategic and a cooperative function, the accent in doctrine and practice was on coop-

eration. It was this mode of employment from which the Luftwaffe could never free itself and which became its Verdun.

ORIGINS OF THE LUFTWAFFE'S MODE OF THINKING

Having delineated the fundamental traits of Luftwaffe command thinking and some of their consequences in practice, a word should be said in explanation of the origins of this way of thinking.

Most of the fatal consequences for the Luftwaffe can be understood in terms of its policy of extensive rather than intensive armament. Hitler pressed the armed services to reach his rearmament goals within the shortest possible time. It was the number of soldiers and aircraft in the combat units that counted, and not the thorough and time-consuming construction of a durable infrastructure or the formation of reserves. Preparations were designed for a short war against not more than one weak opponent at a time. This was the kind of war Hitler expected. The Luftwaffe's attitude toward the support and infrastructural spheres of command as well as toward technical research, training, and reserves was entirely consistent with Hitler's views on military preparation. The fiasco came when the war turned into a world war of attrition which Hitler had not expected. He had hoped to achieve his goals in Europe before the big powers in the East and West had time to rearm.

Traditional German Military Attitudes

Hitler's short war mentality was only partly to blame for the demise of Germany; traditional German military command thinking was an equally important cause of eventual disaster. In fact, the limitation of command thinking to purely military matters and the overemphasis on the operational and tactical aspects of military operations can be traced to the elder Moltke. He, unlike Clausewitz, separated politics from war and wanted no politician to interfere with the generals' responsibility for the conduct of war.[25] General Schlieffen, the Chief of the Imperial German General Staff, continued the trend toward further narrowing the theory of war to purely military aspects and developed an almost autonomous, mechanistic war plan, which ignored diplomacy in 1914.[26] The famous Schlieffen Plan was not a comprehensive war plan and did not address the political and economic aspects of war. According to General Ludendorff, who epitomized these attitudes, policy had to serve war.[27] This meant the militarization of public and political thought, a common circumstance in Germany in the 1930s. Twice in the history of the German General Staff, in the 1860s and in the 1920s and early 1930s, attempts had been made to widen the horizon of the officers selected for general staff work beyond their ordinarily good broad education and to include a solid education in the natural sciences, technology, politics, and economics.[28] But these attempts had failed, the last time because of Hitler's

accelerated rearmament program. Within these limitations were trained the general staff officers of high military competence who were later to become the responsible Luftwaffe commanders and chiefs of staffs. It needs to be added that neither Goering nor Milch had ever seen a general staff from inside because their own military experience had not exceeded the rank of captain.

Logistics was never prestigious in the German Army. As early as 1848–1849, the man who would become Emperor William I considered it the weakest part in the organization of the Prussian Army.[29] Even the famous Moktke[30] and Schlieffen[31] treated it with disdain since it was not directly operational, an attitude that would persist among later officers, especially Rommel.[32] On the other hand, because of Germany's unfavorable geostrategic situation, the priority of the offensive has always been a fundamental element in German military thinking from the era of Clausewitz[33] via Moltke[34] and Schlieffen[35] to Ludendorff[36] and Seeckt.[37] It was also a fundamental concept in the doctrine of Douhet, whose great influence on all air powers in the 1920s and 1930s already has been noted.[38]

The problem of reserves, like that of logistics, has traditionally been neglected in German military thinking. Douhet,[39] Clausewitz,[40] Moltke,[41] and Schlieffen[42] did not think much of strategic reserves because they thought that the decisive battles took place at the beginning of a war. This was also the conviction of General Jeschonnek,[43] the Luftwaffe Chief of the General Staff, who had received his general staff training in the Army. This line of thought implied a further limitation on command thinking to military operational aspects and led it into a blind alley because it neglected other possibilities of action and ended in helplessness and improvisation when the initial strike with all available forces failed.

The doctrine of air-ground cooperation did not have such a long pedigree as the other concepts mentioned above, being the consequence of the World War I and Spanish experiences. Seeckt conceived of the Luftwaffe as an auxiliary instrument for land offensives to enhance the power of the attacking armies.[44] Interdiction was to him more remunerative than strategic air bombing. It is significant that the Chief of the General Staff of the Army[45] and many a Luftwaffe general originally had come with similar experiences from the Army.

The Socio-Educational Background of Luftwaffe Senior Officers

The German military had a long history of unfamiliarity with things technological. The shabby treatment of technology and technicians in the German armed forces had deep causes which originated, as in other countries, from the social and political changes which took place during the age of industrialization. These brought about what can be called a

socio-cultural overlap. In addition to being rich, the upper bourgeois class distinguished itself from other and lower classes by a broad education in the humanities. The ruling aristocracy was still the captive of a pre-industrial way of life in which the irrational virtues of man counted more than the rational approach of the technologist. It was a special phenomenon of German social development in the decades before the First World War that the educated society endeavored to imitate the ways of thinking and behavior of the doomed ruling aristocratic class. This so-called feudalization of society and public life tied together politically the educated and wealthy bourgeoisie and the aristocracy. Both social elements stood for the continuation of the monarchical system and for aristocratic and bourgeois supremacy in society. Both were opposed to the egalitarian ideas advocated by the lower classes and feared being overthrown by the masses.

The upper class received its education predominantly at the *Humanistische Gymnasium,* the traditional type of high school stressing the humanities, whereas lower class children mostly attended a type of high school known as *Realgymnasium* or *Oberrealschule,* which placed emphasis on modern languages and the sciences. Knowledge of these fields was essential for people who did not possess wealth and had to earn their living. The long controversy about these two types of education, which was so significant for nineteenth-century Germany, was intrinsically socio-political. Kindling these quarrels was not only the disdain of the broadly-educated member of the upper class toward the more specialized and technically trained member of the lower classes but also the unwillingness of the former to allow the lower classes an increasing influence in society. Although the Army would have preferred officer candidates with a "realistic" education as offered in the *Realgymnasium* or *Oberrealschule,* it expected the graduates of the humanistic high schools to become future officers because they were considered to come from families that stood for throne, altar, and fatherland.[46]

Therefore, in order to understand the Luftwaffe attitude towards technology, it is important to take a look at the social backgrounds and education of Luftwaffe generals. One-half of the 326 Luftwaffe generals whose personal files have evidence about their education (not all the files are so informative) went through the *Humanistisches Gymnasium.* Less than one-fourth were educated at a cadet school and and about one-sixth at a *Realgymnasium* or *Oberrealschule.* The others either left high school without taking the final graduation examination or had only eight years of elementary school education (*Volksschule*). Thus, it can be said that the majority of these generals received primarily a humanistic education. Only a fraction had high school training in the sciences, and only a quarter had a mixture of scientific and military training. Most of the generals attended high school before the First World War, i.e., at a time when

the philosophies of the irrational and an authoritarian spirit ruled in the schools. The emphasis of those schools was on receptivity and obedience rather than on inquisitiveness and initiative.

As far as the social origin of the Luftwaffe generals is concerned, the Bertram Collection[47] of short biographical sketches of the 570 Luftwaffe generals reveals some interesting data. Four hundred and ninety-two of the sketches contain information on the professions of the fathers of the generals and show that more than three-quarters of them came from the educated upper middle class or from officer families. Most came from families of high ranking civil servants (136), followed by independent landowners, factory owners, merchants, physicians, apothecaries, and lawyers (131). The professions of the remainder included: military officer (91); clergyman (20); and scientist or engineer (11). There was also a large group whose fathers were low ranking civil servants (69). More than half of the fathers were in academic professions, and seventy-five fathers belonged to the nobility. In some cases, the mothers were of noble descent, and a considerable percentage of the generals were married to women of noble descent. It is well known that before World War I technological impulses rarely originated from the nobility, the army officer corps, the educated upper middle class, or the landowners. If it is assumed that the factory owners were also technicians or scientists, only a total of 83 among 492 generals' fathers had technical professions.

These statistics imply that the relatively low development of the technical approach in the Luftwaffe was also due to the non-technical origins of its leaders. This is corroborated by their regional origin. Of 547 generals whose places of birth could be identified, 200 came from east of the Elbe River, 64 from Bavaria (especially from northern Bavaria), 64 from lower Saxony/eastern Westphalia/Schleswig-Holstein, and 34 from Austria-Hungary or other regions. Thus, 362 came from regions which had little industrial development before the First World War. A minority of 185 generals came from more industrialized central and west Germany, Alsace-Lorraine, and Wurttemberg/Baden. It should be added that only 27 of the 570 Luftwaffe generals had obtained the academic degrees of a diploma engineer or of a doctor of engineering. Five more were civil engineers. Regarding the general staff officers, in March 1940 only 11 of 238 had an academic degree in engineering.

The Unique German Principle of Command

Another cause for inadequate technological understanding was the principle of command called "*Auftragstaktik*," which had been developed in the Army, where many Luftwaffe officers had first served. The "*Auftragstaktik*" allowed the independent execution of orders in accordance with the respective situation, i.e., the order did not prescribe how the

task was to be carried out but left this to the individual soldier in command. In land operations a quick adaptation to new situations by fresh decisions and orders was generally possible. This was not the case in air operations, however, where technology played a more important role. Decisions in the field of technical development and production of aircraft usually were binding on tactics and command for a longer period. Likewise, air operations, once started, could not be very easily altered. Their conduct required more planning than that of land operations because tactics rested more on technology.

Because of these technological considerations, many a Luftwaffe general, having been trained in the Army, was almost driven to despair. One of them,[48] a former student of a humanistic high school who had been the chief of the general staff of an air fleet and a higher commander for many years, wrote after the war that operational thinking and ability could no longer be regarded as prerequisites for general staff service in themselves. This was true, he claimed, because operations and tactics now depended primarily on the intentions of the Army, conditions of traffic and logistics, or on political, economic, and technological considerations of the high command rather than on such traditional elements as enemy situation, one's own intention, assessment of the situation, and decision. Command decisions in the Luftwaffe, he continued, were the result of meticulous planning based on technological factors. This process no longer allowed room for imagination and intuitive understanding of one's own and the enemy's situation. The routine of the expert had sufficed; and when the first mission was on its way, there was nothing more to be ordered or led. Along with technology, logistics also enjoyed very little esteem in his eyes because to him it seemed to require "only" organizational abilities and some technical knowledge, but no tactical thought. Important tasks, he concluded, had been transferred from the sphere of "scientific" thinking and artistic planning to the level of plain common sense, which he obviously regarded as ranking below the general staff level. Nothing had been left to the General Staff but the pursuit of technology, which had dethroned the General Staff in the Luftwaffe. It was not the General Staff that placed requirements on technology; rather the General Staff had to adapt its requirements to technical reality. Higher command had shifted from operations and tactics to organization and technology, and tactics had neglected to anticipate the technological future. (Although younger Luftwaffe officers certainly thought more along the lines of tactics *and* technology, their lower rank denied them a role in determining Luftwaffe command thinking.)

The foregoing evidence about the attitude toward technology makes it clear why, despite the great amount of technology in the young Luftwaffe, its officer corps did not immediately remold the traditional, authoritarian mode of command taken over from the Army. The evidence

also shows why the officers did not adapt that mode to technology and shape it into a modern, cooperative style of command which would have paid due recognition to special knowledge and abilities as well as to functionally correct action and discipline.

There are many other reasons for this failure. All technical functions requiring special technical knowledge were left to the Luftwaffe engineer corps, a non-military corps of civil servants in uniform who were only to serve and support the military but who had no independent command authority. On the other hand, the officers were trained for general command functions and often had no technical training or knowledge, and this sometimes led to incorrect decisions with permanent consequences. Also, as a result of the depression in the early 1930s, there was a shortage of technically skilled personnel in the Luftwaffe. During the depression, many young men shied away from technological studies. By the time the Luftwaffe engineer corps was founded in 1935, employment opportunities for technically skilled people had improved remarkably, and many of them were already working in the armament industry. Also, the National Socialist ideology of irrationalism decried the rational approach to life as "Americanism" and glorified pre-industrial values like bravery, perseverance, and faithfulness (without which, of course, no society or army could exist). Such an atmosphere was certainly not favorable to the development of a functional discipline and a cooperative style of command within the Luftwaffe which could have complemented the formal discipline and the personal authority of leaders needed in combat.

The Impact of the "Leader Principle"

In the final analysis, the development of a cooperative style of higher command which could accommodate modern technology was impaired by the "Leader principle" (*Führerprinzip*). In the words of Hitler, this required absolute authority from above and unconditional obedience from below. This principle took to extremes the military maxim of order and obedience, which previously had not excluded a certain amount of sober argumentation in the decision-making process nor required the expediency of resignation or transfer in case of disagreement with decisions. Many Luftwaffe commanders, therefore, felt themselves helplessly bound to orders which they considered wrong. This was particularly so with regard to Hitler's increasing influence on the Luftwaffe and his growing habit of bypassing the General Staff and giving orders directly to the smallest units. Yet Goering loved the leader principle and, as Field Marshal Kesselring wrote after the war,[49] this principle was nursed particularly in the Luftwaffe, where it should have been out of fashion more than elsewhere.

Both Goering and Milch were in essence political leaders. Yet when Milch was in charge of air armament after Udet—at least in the field of

technological management—he encouraged discussion and consultation instead of simply issuing orders. On the other hand, the complacent, ambitious, and selfish autocrat Goering imposed the autocratic style of command upon the Luftwaffe. Only his close friends could talk to him freely; he kept other senior commanders with important missions waiting for days, or had them travel after him, or did not receive them at all. Goering, like Hitler, did not think much of general staff work. Having been revolutionaries, both hated the general staff officers for being too aloof and too sober to believe blindly in them. They thought that vesting an officer with sweeping independent powers for a certain task would solve that problem. The many special plenipotentaries whom Goering subordinated to himself were one reason why the Luftwaffe High Command gradually disintegrated. Significantly, while the command organizations of the other two armed services always bore the impersonal designation of High Command (*Oberkommando*), the Luftwaffe command organization was known under the personal designation, "The Reich Minister of Aviation and Commander-in-Chief of the Luftwaffe," until the last year of the war.

Finally, Hitler's Fundamental Order Nr. 1 of 11 January 1940 exclusively stifled the development of an adequate mode of higher leadership. Every commander had to exercise the utmost secrecy, making discussion, consultation, and coordination of efforts nearly impossible. Not even so much as a handful of Luftwaffe officers were allowed to have a full picture of the overall situation and war effort.

CONCLUSION

An inadequate and otherwise impaired higher command organization and mode of command thinking, as well as faulty leadership and personal rivalry at the top, caused the Luftwaffe's many problems, errors, and mistakes. It should be pointed out, of course, that other air forces, sometimes for similar, sometimes for other reasons, had these deficiencies, but such shortcomings were not fatal because they had sufficient resources and time to recover. Many problems, especially those of fitting technology into modern command practice, still exist in almost every air force in various disguises. I hope that it is clear, also, that it takes time to become air-minded and thus to develop a mode of command and leadership adequate to war in the air. The German Air Force being only four or, if you prefer, six years old when the war broke out, was still too young. Unlike the three main opposing Allied air forces, it was never given the time and necessary authority to get settled, to break with the army style of command, and to find its own way. The fate of the Luftwaffe proved again that one cannot fight successfully a war for which one is not organizationally and doctrinally prepared.

Notes

1. Luftkriegsakademie Ia: "Abschlussericht über den 3. Kriegslehrgang der Luftkriegsakademie Berlin-Gatow vom 1.9.1943," p. 12 ff., in: BA-MA (Bundesarchiv-Militärarchiv) RL 5/1031.

2. "Der Chef des Generalstabes der Luftwaffe Nr.740/42 vom 28.10.1942," in: BA-MA, Milch Collection, Vol. 53, p. 1075–1081.

3. Luftkriegsakademie Ia Az.: 34 Nr. 12103/44 g vom 15.9.1944: "Richtlinien für den Unterricht im 6. Kriegslehrgang 1944/45," p. 10, in: BA-MA RL 5/1032; cf. O. Wien: *Ein Leben und viermal Deutschland*, Düsseldorf (1978), pp. 437–452, and H.J. Rieckhoff: *Trumpf oder Bluff?*, Geneva (1945), p. 98.

4. Colonel General (ret.) Halder in P.Bor: *Gespräche mit Halder*, Wiesbaden, 1950, p. 57.

5. "Vortrag des Generalmajors Wever bei Eröffnung der Luftkriegsakademie und Lufttechnischen Akademie in Berlin-Gatow am 1. November 1935," in: *Die Luftwaffe. Militärgeschichtliche Aufsatzsammlung.*, ed. by Der Reichsminister der Luftfahrt und Oberbefehlshaber der Luftwaffe LA III, Vol. 1, 20. Febr. 1936, p.7.

6. Cf. also R. Suchenwirth: *Historische Wendepunkte im Kriegseinsatz der deutschen Luftwaffe*. USAF Historical Studies. MGFA Lw 35, pp. 26–39.

7. Field Marshal A. Kesselring: *Soldat bis zum letzten Tag*. Bonn 1953, S.126; cf. Rieckhoff, p. 90 ff., and "War Diary LtCol von Barsewisch," 25. Sept. 1941; see also Air Division. Control Commission for Germany, British Element: *A Study of the Supply Organization of the German Air Force 1935–1945*, June 1946, pp. 71 ff., 78 ff., 84 f.

8. General H.H. Arnold: *Global Mission*, New York (1949), p. 370.

9. Field Marshal A. Kesselring: "Die deutsche Luftwaffe," in: *Bilanz des Zweiten Weltkrieges*. Oldenburg/Hamburg (1953), p. 153 ff., and General von Seidel in his speech of 1949, in: BA-MA Lw 101/3 Part 2, p. 51 f.

10. MGFA (Militärgeschichtliches Forschungsamt) A-83, p. 24.

11. General von Seic'el, op. cit., p. 52.

12. Ia/Ausb (II A) vom 30.9.1944: Vorentwurf für eine Studie "Herabsetzung der Flugzeugverluste ohne Feindeinwirkung," in: BA-MA RL 2 II/181. Cf. *USSBS* (*United States Strategic Bombing Survey*), ed. by David MacIssac, Vol. 3, New York and London, 1976, p. 6.

13. Oberkommando der Luftwaffe—Führungsstab Ia/Ausb Nr. 999/44 g vom 11.4.1944: "Herabsetzung von Flugzeugunfällen"; Oberkommando der Luftwaffe, General der Fliegerbodenorganisation und des Flugbetriebes Gr. IV Az.52b10/gK 1010/44 vom 13.7.1944: "Die Zahl der Störungen im Flugbetrieb ohne Feindeinwirkung im Monat Mai 1944," in: BA-MA RL 2 II/181.

14. R. Suchenwirth: "Ernst Udet, Chief of the Luftwaffe Supply and Procurement," in: Suchenwirth: *Command and Leadership in the German Air Force*, USAF Historical Division, July 1969, pp. 53–111.

15. Engineer General (ret.) G. Huebner: "Wehrmacht und Technik," p. 15, in: BA-MA Lw 103/21.

16. "Besprechung des Reichsmarschalls Goering mit Vertretern der Luftfahrtindustrie über Entwicklungsfragen vom 13.9.1942," in: BA-MA Milch Collection Vol. 62, pp. 5279–5287.

17. K.H. Völker: *Die deutsche Luftwaffe 1933–1939*, Stuttgart 1967, p. 58 f.; E.L. Homze: *Arming the Luftwaffe: The Reich Air Ministry and the German Aircraft Industry 1919–1939*. University of Nebraska Press, Lincoln and London (1976), p. 86 f.

18. Homze, op. cit., pp. 28 f., 210 ff., 228, 267.

19. Letter of Ministerialdirigent Baeumker, chief of the research department in the Reich Air Ministry, to Field Marshal Milch, dated 10 January 1942, in: BA-MA Milch Collection Vol. 56, pp. 2430 f.

20. GenLt (ret.) A. Nielsen: "Die Nachrichtenbeschaffung und -auswertung für die deutsche Luftwaffenführung." MGFA Lw 17.

21. Letter Der Staatssekretär der Luftfahrt und Generalinspekteur der Luftwaffe—St.713/41 gK vom 24.10.1941 to Goering, in: BA-MA Milch Collection, Vol. 51, pp. 455 ff.; cf. W.A. Boelcke: *Deutschlands Rüstung im Zweiten Weltkrieg*, Frankfurt am Main (1969), p. 23, and R. Wagenfuehr: *Die deutsche Industrie im Kriege 1939–1945*, Berlin (1954), p. 33.

22. O. Groehler: *Geschichte des Luftkrieges 1910 bis 1970*. Militärverlag der Deutschen Demokratischen Republik, Berlin (East) 1975, pp. 135, 148 f., 150, 202.

23. Letter LC II Nr. 3201/36 vom 6.5.1936 (Copy), in: BA-MA Lw 103/50.
24. Homze, op. cit., pp. 122 f., 125, 127 f.
25. H. von Moltke: *Militärische Werke*. Hrsg. vom Grossen Generalstab. Berlin 1892–1912, Vol. II, p. 42.
26. J.L. Wallach: *Kriegstheorien. Ihre Entwicklung im 19. und 20.Jahrhundert*, Frankfurt am Main 1972, p.93, 95 f., 133.
27. E. Ludendorff: *Kriegführung und Politik*, Berlin 1922, p. 23.
28. Cf. D. Bald: *Der deutsche Generalstab 1859–1939, Reform und Restauration in Ausbildung und Bildung. Schriftenreihe Innere Führung, Reihe Ausbildung und Bildung*, Heft 28. Hrsg. vom Bundesministerium der Verteidigung, Führungsstab der Streitkräfte I 15, 1977, p. 37 ff., 87 ff., and General (ret.) H. Speidel: "Generalstab und Bildung," in: *Militärgeschichte, Militärwissenschaft und Konfliktforschung. Eine Festschrift für Werner Hahlweg. . ., hrsg. von Dermot Bradley und Ulrich Marwedel. Osnabrueck 1977, pp. 383–396.*
29. *M. van Creveld: Supplying War. Logistics from Wallenstein to Patton.* Cambridge University Press, Cambridge, London, New York, Melbourne (1977), p. 78.
30. Ibid., pp. 96, 105, 107 f.
31. Ibid., pp. 117 f., 138.
32. Ibid., pp. 181–201; cf. D. Irving: *Rommel*, London 1978.
33. C. von Clausewitz: *Hinterlassene Werke*, Vol. 5, Berlin 1858, p. 176 (cited after J.L. Wallach, op. cit., p. 57 and 58).
34. H. von Moltke, op. cit. Vol. IV, S. 227 f.
35. Cf. J.L. Wallach, op. cit., p. 114.
36. E. Ludendorff: *Der totale Krieg*, München 1935, p. 79.
37. Cf. D. Bald, op. cit., pp. 69, 84.
38. G. Douhet: *Luftherrschaft*. Deutsch von Rittmeister a.D. Roland E. Strunk, Berlin (1935), pp. 22 f., 69, 82; cf. J.L. Wallach, op. cit., p. 339 f.
39. G. Douhet, op. cit., pp. 43, 80, 82.
40. C. von Clausewitz: *Vom Kriege*. Hrsg. von W. Hahlweg, Bonn (1973), p. 399.
41. H. von Moltke, op. cit., Vol. III, 2, p. 211.
42. A. von Schlieffen: *Cannae*, Berlin 1925, pp. 280, 315.
43. Generalstab 1. Abteilung Nr. 1643/37 gk (Ia) vom 25.10.1937: "Stellungnahme zum Organisationsvorschlag Oberstleutnant Kammhuber," gez.: Jeschonnek, in: BA-MA RL 2 III/4.
44. Cf. H. von Seeckt: *Gedanken eines Soldaten*, Berlin 1929, pp. 93–100.
45. Nachlass General Schlemm, file 1, p. 3. MGFA.
46. Cf. M. Messerschmidt. "Militar und Schule in der wilhelminischen Zeit," in *Militargeschichtliche Mitteilungen*, 1/1978, pp. 51–76.
47. K. Bertram: Kurbiografien der Generale der deutschen Luftwaffe (not yet published).
48. General (ret.) Wilh. Speidel: "Gedanken über den deutschen Generalstab." Landsberg/Lech 1949 (unpublished), MGFA MS Nr. P-031a 26 Part I, pp. 53 f., 72, 73, 79; "Der Weg zum Generalstab. Auswahl, Erziehung und Ausbildung des deutschen Generalstabsoffiziers." Landsberg/Lech 1950 (unpublished), MGFA MS Nr. P-031a 26 Part II, pp. 34, 92 f.
49. Field Marshal A. Kesselring: "Der Generalstab des deutschen Heeres. Mit einem Anhang: Berührungspunkte des Heeres-Generalstabes mit dem Luftwaffen-Generalstab." BA-MA Lw 101/11, p. 182.

COMMENTARY

ALFRED GOLDBERG

The history of the air war from 1939 to 1945 is important because it is the vital link between the past and future of air warfare. It was the culmination of all past experience, a climactic event, and a decisive test of the role of air power. It foreshadowed much of the future, particularly through the great technological advances, and it still has much bearing on the problems and issues confronting air forces and governments today.

A major purpose of this session is to provide a basis and a perspective for a comparative historical analysis of the World War II air forces and the air war. My primary purpose, while commenting on the papers we have heard and drawing some comparisons with the Anglo-American air forces and their experience, is to indicate important subjects for further exploration by scholars. The organizers of this conference have spoken of the scant scholarly attention paid to the history of military aviation and of the poor state of substantive scholarship in military aviation. I have examined some of the literature on the history of the air war and World War II and agree that there is much important work still to be done.

Fortunately, all of the papers presented here today served my purpose well. In touching on many of the most important issues of the air war, they have revealed some of the most important deficiencies in coverage and interpretation that remain to be remedied by historians.

First and foremost among the subjects I propose for further historical research, and one that has been mentioned by all of the papers here today, is logistics in its many and varied aspects. The most striking differences between the winners and the losers in the war was their attitude toward, and their execution of, logistical functions. The difference in attitude was fundamental and decisive. Mr. Boog's paper on the Luftwaffe properly stressed the far-reaching effects of the "short war" syndrome on the fate of the Luftwaffe. Mr. Coox might have done the same thing with the Japanese, although, to be sure, with the latter a short war was a hope rather than an expectation. By contrast, the victors—the British, the Americans, the Russians—all recognized from the beginning the probability of a long war of attrition and the enormous logistical requirements that would ensue. It is true that the British and the Russians, defeated

in the early stages of the war, had little choice but to prepare for the long haul. The Americans profited from their experience. The Germans waited until 1942 and later, and the Japanese until 1943, to begin a genuine mobilization of their resources. By then, it was too late for both of them. Their early victories had lulled them into a false sense of security and optimism.

It is remarkable that the Germans and Japanese fought as long and as well as they did during the last three years of the war, for they were utterly overmatched. The margin of difference in the air war was greater than generally realized. Anglo-American and Russian output of combat crews and aircraft dwarfed German production in the period 1943–1945. In 1944, the United States produced two and one-half times as many planes as Germany. But this is not the true measure of the difference, because the ratio in airframe weight—a far truer measure of production—was more than six to one. The Ford Willow Run plant alone produced more than one-half as much airframe weight as the whole German aircraft industry in 1944 and about as much as the whole Japanese aircraft industry. The story is the same in engines and in combat crews. The German and Japanese air forces were done in by a crushing weight of men and materiel that they could not hope to match. Moreover, any qualitative edge they may have enjoyed in the early days also disappeared, and they found themselves doubly disadvantaged in the last years.

Mr. Whiting concludes his paper as follows: "Over and above all else, however, it was the productive capacity of the Soviet aviation industry that enabled the VVS [Soviet Air Force] to gain air superiority in the second half of the war—it simply swamped the Luftwaffe under a flood of first-rate aircraft." The superiority and eventually the supremacy of the Anglo-American and the Soviet air forces were made possible by the industrial victory on the home front, and, I might add, the achievement of the training establishments was as impressive in scale as was the production triumph. Under conditions of modern war on the scale of World War II, it is production that makes all possible and, more especially, production in time to count. The Germans and Japanese were front runners at the beginning because they had the production when it counted. But they could not stay the course because they were outclassed in resources of men, materiel, and productive capacity.

In applying the fundamental military principle of mass, logistics is the bedrock. The rhythm of the war everywhere was dependent on logistical factors that determined the timing and the mass that could be applied. The war in the east between Germany and the Soviet Union is a prime example of the operation of the logistical factor. The periods of intense combat and movement were followed by prolonged lulls to permit the logistical replenishment of forces and equipment. Liddell Hart went

to the heart of the matter when he stated in 1943 that "the large ground organization of a modern air force is its Achilles heel."

Part of logistics is the whole question of mobility, or lack of it, by the air forces and its effect on the ground and naval wars. Rapid movements back and forth, as in Russia and in western Europe, placed a great strain on the logistics and mobility of air forces. The problem of airfield construction and rehabilitation, especially in the west, was enormous. What effect, for example, did weather have on mobility and construction? What effect did the requirement for mobility have on aircraft and equipment design?

There is much that remains to be done before the full importance of logistics as the heart of the strategy and even of much of the tactics of the air war in World War II is fully recognized. It is a more difficult and complicated subject than strategy and operations, but its effects were far-reaching and eventually decisive. The U.S. Army volumes on global logistics by Leighton and Coakley and the logistical volumes on the European theatre of operation by Ruppenthal are excellent treatments, deserving of much attention and emulation by historians of the air war. The Army has also published many other volumes on the technical services and on logistics and technology. They have done the best job, I think, in this field. We need more such histories of the air war from all the combatants; but sadly, and apparently except for the Army, it is almost as difficult to get historians to write about logistics as it was in World War II to get outstanding military officers to go into logistics.

At the beginning of the logistical process, the primary impulse is technology—research, development, and testing of new weapons and munitions. Its effect on the conduct of the war has not been adequately treated, especially from a comparative standpoint. The technological competition during the war needs to be studied and presented in its full dimension. The interaction between qualitative advances and quantitative needs, or lack of it, went far toward determining the quality of the air forces. What happened to technological innovations during the war? We have heard what happened in the Japanese and German air forces. Why were some of the most promising developments neglected or subordinated? Could air forces and higher commands have done better in adjusting the shifting balance between qualitative advances and quantitative needs? A great deal remains to be done on research and development during the war and its effect on the performance of the air forces and the outcome of the air war. The technological successes and failures, particularly in Germany, are striking and directly related to the ultimate defeat.

The question of quality has to be extended to the human element also, particularly the leaders and the officer corps. Both Messrs. Boog and Coox have emphasized the organizational deficiencies stemming from

human failure within and between the military services in Germany and Japan, and their poisonous effect on logistics, on air operations, and on the conduct of war. In his excellent paper, Mr. Boog has told us enough about the sociology of the Luftwaffe officer corps for us to want more, a great deal more. It would be genuinely illuminating to have similar analyses of the officer corps of the other air forces. Since many of the wounds sustained by the German and Japanese air forces, and the Russians as well, were self-inflicted, Messrs. Boog and Coox have shown a remarkable coincidence of focus on the traits of the officer corps of these air forces.

The disdain of the Luftwaffe officers for logistics and technology mirrored like attitudes in the Army, and in the end, indeed well before the end, the German armed forces were subordinated to civilian authority (the Speer ministry) for procurement and production. The story was the same in Japan. The military, including the air forces, must share the blame for failing to understand and represent their own best interests in the delayed mobilization of the war economy. So, too, must they accept much of the blame for technological deficiencies and little credit for technological initiatives and advances. In short, the fascination of the officer corps with the wild blue yonder resulted in neglect or underestimation of most of the important and indispensable functions that had to be performed on the ground. In a sense, the German and Japanese air forces cut the ground out from under themselves. As we have already seen, the Anglo-Americans fared better; even before hostilities began, the American and British air leaders geared themselves to fighting a prolonged global war. In contrast, the German and Japanese air leaders did not grasp the full dimensions of the war until too late.

Another and related history that remains to be told is that of interservice relationships and how they affected the strategy, tactics, programs, deployment, and operations of the air forces of all of the major belligerents. The losers suffered and paid a heavy price for their failure to achieve more effective integration of the military services and operations. The shocking and ridiculous lack of cooperation between the Japanese Army and Navy air forces, indeed, the competition, duplication, and mutual suspicion mentioned several times by Mr. Coox, played no small part in their defeat. There was no effective higher authority to settle disputes between the Army and the Navy. The German record is not as bad; but here, too, political factors and factions within as well as outside the Luftwaffe made for lack of cooperation. Goering's efforts to maintain an independent role for the Luftwaffe, and especially for himself as commander, proved self-defeating and detrimental to the Luftwaffe. Hitler, the ultimate authority, was erratic and capricious and further complicated matters.

The Russian military had little choice. Stalin was watching over them, and he disposed of problems by executing his officers, both before and during the war. Inter-service rivalry and jealousy were not absent from the Anglo-American air forces, but the direction provided by higher authorities worked more effectively than it did in Germany and Japan to resolve issues before they did too much damage. Moreover, the political and military leaders were more successful in subordinating personal, service, and political interest to the larger aims of the war. Still, a fair study of the relationships between the U.S. Army Air Forces and the U.S. Navy would surely reveal an intense competition and rivalry between the two in many areas.

Another and great deficiency in writing about the war, and not only the air war, has been the absence until recently of scholarly volumes on the roles of intelligence in its many forms. The forthcoming volumes on intelligence by the British cabinet office historians will help greatly, as will the recent volume on German intelligence by David Kahn, but they are not focused specifically on the air war. What contributions did intelligence make to the waging of the air war? We know something about economic intelligence, target intelligence, and tactical and photographic reconnaissance; but we have few analyses and interpretations of these phases. Still other phases—estimates of enemy orders of battle, intentions, technical intelligence—are even less well known.

Why were there such great deficiencies in air intelligence during the war? Why didn't the Germans do better? Why were the Russians so poor? What was the real effect of ULTRA and other systems on air operations? How does one measure the effect of information and estimates, which were almost always tentative and uncertain, at high levels of aggregation or even at lower tactical levels? It is a difficult subject to tackle; but it cannot be ignored if we are to fully understand what happened and why in the larger context of the air war—indeed, in the still larger context of the war as a whole. Now that a great deal more material is becoming available, I believe that a great many scholars will begin to write on the subject.

Let me conclude this wish-list with one more promising area of research unremarked upon by any of the papers. One of the greatest deficiencies in histories of the air war is the neglect of the air role in anti-submarine warfare—not a minor consideration at the present time. Both land-based and sea-based air were paramount in anti-submarine warfare in World War II and have been since. It seems fair to say that earlier concentration on the use of air and anti-submarine warfare could have aborted the submarine menace in the Atlantic earlier, perhaps much earlier. Who is to say that the admirals were wrong—I suspect most of the Air Forces would, and did—when they urged that the big bombers

of the RAF and the AAF be used against the submarines in 1942? The attrition rate would have been small, and the bombers could have been converted for bombing operations in 1943. What would have been the effect of containing the German U-boats a year earlier, in May and June of 1942 instead of 1943? Here is a subject worthy of a great deal more investigation and analysis.

There are many other subjects awaiting further research. Where, for instance, are the biographies of the great air leaders of the war? What effect did doctrine really have? Mr. Boog's final conclusion is that the fate of the Luftwaffe proved again that one cannot fight a war for which one is not prepared theoretically. I should like very much to see this proposition tested and expanded on by research. Because a large literature does exist on the subject of strategic bombing, I have chosen to bring to your attention other subjects deserving of scholarly efforts. Still, I cannot resist pointing out that the last word has not been said on the subject of strategic bombing, believe it or not.

The eventual outcome of the historical work that I have been suggesting ought to be a much better integration of the major institutional elements we have been discussing—logistics, training, operations organization, intelligence—into larger syntheses of the individual air forces, into comparative studies of all the combatant air forces, and into a relationship with the overall theme of World War II. We now have chiefly fragments, one dimensional histories, that cannot present the air war in broader and more interactive dimensions. We have much to do, and we ought to get on with it.

AN ADDED COMMENT:

ULTRA AND THE AIR WAR IN EUROPE AND AFRICA

HAROLD C. DEUTSCH

Estimates of ULTRA's effectiveness in influencing the course and outcome of World War II in Europe furnish topics for continuing debate. In the half decade since Gustave Bertrand and F. W. Winterbotham cleared the way to new approaches to many basic problems of the conflict, these assessments have fluctuated considerably. This is least true of the air war, whose encounters, easily defined in time and space, facilitate a close association of the course of events with the role of intelligence media. Each massive release to date of British official documents has lent greater emphasis to the closeness of this association. A major factor which goes far to explain the constancy of this relationship is that the newly hatched Luftwaffe, little mindful of tradition and time-honored ways, was less bound than its sister services by good habits of security observance. Sloppiness in radio communication that was closely monitored by the British often furnished insights on aspects of land and sea warfare at times when army and navy messages could not be read.

In the face of some claims that ULTRA's part in the Battle of Britain was negligible, newest insights indicate that, in fact, it may have provided the margin between victory and defeat. It was, of course, only one of the three scientific media that helped to determine the battle, the others being radar and the mastery of *Knickebein*, the German system of pinpointing targets by the use of intersecting radio beams. The latter, however, was itself one of ULTRA's many children in that the key to its existence was provided by ULTRA signals. As against radar, which could only discern the pattern of German air approach after Goering's planes were actually in the air, ULTRA might delineate that pattern a day or two earlier. Thus the very first massive Luftwaffe attack ("Eagle Day," 15 August 1940), was countered effectively because Air Chief Marshal Dowding could allocate his slender fighter resources to defend the seven airfields that ULTRA had established as targets.

The Battle of the Atlantic, in which victory was vital if there were ever to be a return to the Western continent, is, with the possible exception of the Normandy landing itself, probably that string of encounters in which ULTRA was most decisive. There is no need to detail here the essential role of air power in the later stages of that battle and how much it meant to guide its operations insightfully rather than blindly.

For a glance at ULTRA's part in the great bomber offensive against Germany, one need only cite the day-to-day knowledge of the order of

battle and operational doctrines of the German air defense system. When later, during the invasion, the German airdromes in France became the chief targets, their location, defenses, and fighter strength, and detailed information on the rate and degree of recovery from assault were aspects vital to Allied success.

The Mediterranean story, if anything, demonstrates even more emphatically ULTRA's central role in the effective use of air power. It had most to do with the wrecking of Rommel's maritime communications, where the airplane performed the most essential function once the routing of supply ships, notably tankers, had been clearly established. The last hope for the *Wehrmacht's* resistance in Tunisia died when the huge *Gigant* transports, thrown in in final desperation, were located and destroyed through ULTRA's discernments.

All in all, the wedding between Allied air power and this intelligence medium may be called the firmest and most fruitful union of this type known to World War II in Europe.

IV

WORLD WAR II: AMERICAN AIR LEADERSHIP

A large addition to the oral history of air power came out of this session on air leadership, a topic of unending interest at an air force academy. The most famous American bomber leader of all, General Curtis E. LeMay; an outstanding fighter leader, General O. P. Weyland; and a pioneering leader of carrier aviation, Vice-Admiral William Martin, are now retired from military service; but, as these pages will attest, they still are larger than life. The chairman for so potent a session had to be an historian of the first rank, and, fortunately, Doctor Forrest C. Pogue, the Director of the Eisenhower Institute for Historical Research, was available for the assignment.

To provide a common departure point for this session, the Chief of Air Force History, Major General John W. Huston, himself a professionally trained historian, presented his estimate of the leadership qualities of General H. H. Arnold, the senior American airman of World War II. Incredibly, no satisfactory biography of Arnold is yet available; so, General Huston's paper is very timely.

Anticipating the repeated remarks by speakers throughout the symposium about the need for biographies of most of the developers of American air power, and of the Air Force in particular, the symposium committee asked Doctor Pogue to do double duty as commentator as well as chairman. As commentator, he was to offer the distilled wisdom of his vast experience as historian and biographer to those who, hopefully, would take on the work of researching and writing the biographies. His remarks were so helpful that the editors invited him to expand them for this volume.

THE WARTIME LEADERSHIP OF "HAP" ARNOLD

MAJOR GENERAL JOHN W. HUSTON, USAF

My task is to assess the wartime leadership of General H. H. Arnold, one of the few major American World War II leaders for whom there is no biography in print, and the officer conceded by most Americans to have been the immediate father of today's United States Air Force.

My only experience with General Arnold dates from 1944 when, returning from a combat mission in a B-17, I was surprised to find the General visiting the base where our aircraft had been assigned to permit consolidated maintenance of some new navigation equipment. We were unaccustomed to speaking with general officers, whom we considered minor deities, but his friendly manner quickly put us at relative ease. His questions were the routine ones generals ask: our ages, hometowns, and number of missions flown. He then quickly zeroed in on the new bombing/navigation equipment, asking rather detailed questions about range, reliability, and maintenance problems. The meeting was not unlike his visit a year earlier to crews in North Africa as described in the Brereton diaries.[1]

Not much more from that brief meeting can be recalled or included in today's analysis about General Arnold by this then nineteen-year-old navigator. My remarks are based instead on an assessment of his papers, those of his closest associates, and Arnold's letters to his wife, which recently have been acquired by my office.

Arnold, the son of a stern, humorless physician, was born in 1886 in a suburb of mainline Philadelphia. The elder Arnold, after a brief stint with a National Guard regiment in the Spanish-American War, hoped to realize a vicarious military involvement when Henry entered West Point in 1903. Henry was a better-than-average student academically and graduated in the upper third of the class of 1907. However, his tendency to accumulate demerits put him in the bottom quarter of the class in discipline.

This analysis of Arnold's career would be simpler if he could be said to have had an early undying interest in aviation, but the record does not reflect this. The first recorded comment by Arnold on the new aerial

phenomenon is a letter to his mother written in 1906 from West Point:

> The fellow [Bleriot] that sailed around the Eifel Tower in an airship went up in a balloon here today and there was a pretty big crowd to see him off. I don't know why he selected this place for his ascension but he did. The balloon was about 25 feet in diameter almost a sphere. He inflated it with illuminating gas. After going up he went due north and was still going north last I saw of him.[2]

Given Arnold's casual comment on the balloon ascension, it is not surprising that aviation was his fourth choice of careers in the military. Upon graduation from West Point he requested assignment to the cavalry but, instead, was ordered to the Philippines as an infantry officer where he mapped portions of the difficult Luzon terrain. Three years later, attracted by the prospects of promotion to first lieutenant, he took the qualifying examination for the Ordnance Department. Before the results of the test reached Arnold, he had volunteered for flight training with the Wright Brothers at Dayton, Ohio.

Not long after, having accumulated three hours and forty-eight minutes in the air, Arnold won his wings, and he became, along with Lt Tommy Milling, one of two military pilots in the United States Army.[3] During the next year of flying from his base at College Park, Maryland, Arnold doubled for the leading man as a stunt flyer in two motion pictures and established an altitude record of 6,540 feet in a Model B Wright biplane, a feat which earned him the first Mackay Trophy, awarded annually thereafter for the most meritorious accomplishment in military aviation. A series of crashes by friends in late 1912, along with a near disaster of his own over Fort Riley, Kansas, led to a request from Arnold for a month's leave to reconsider his future in this new endeavor. He did not fly again until four years later, a facet of his life which needs assessment beyond the scope of this paper.

Accompanied by his new bride, the former Eleanor Pool of Philadelphia, he was reassigned to the Philippines in the winter of 1913–1914 and served for two years with the 13th Infantry. There he worked with another Army lieutenant, George C. Marshall, whom Arnold described as the "main guy" who told "colonels where to take their regiments and what to do with them" but since everyone agreed "that he had the ability to handle the situation . . . there is no hard feeling."[4] In the winter of 1915–1916, en route home from his second Philippine tour, Arnold accepted a War Department offer to return to duty in the Aviation Section, again attracted by the promise of promotion, this time to rank of captain. Brief service in New York and California preceded assignment to the Panama Canal Zone in early 1917, where he organized the Seventh Aero Squadron; but two months later he was recalled to Washington, where he headed the Information Office of the Aviation Section of the Signal Corps. His meteoric six-week rise from the rank of captain to the distinction of being the youngest colonel in the United States Army did not

dampen his enthusiasm for overseas combat duty. His persistent request for relief from procurement and training responsibilities was finally rewarded, but illness and hospitalization en route to France prevented his service in combat prior to the war's end.

In the postwar years, Arnold, now reduced to his permanent rank of major, commanded Rockwell Field, San Diego. In 1924–1925, he attended the Army Industrial College in Washington and afterwards was the Information Officer for the Air Service. In the aftermath of the Billy Mitchell affair, Arnold was relieved of his Washington duties and was, in the words of the press, "exiled" to Fort Riley, Kansas, in early 1926.[5] Attendance at the Command and General Staff School in Fort Leavenworth in 1928–1929 probably marked the end of his exile and was followed by duty in Dayton, Ohio. In early 1931, after having been promoted to lieutenant colonel, he commanded March Field, California, for the next four years. Capitalizing on his proximity to the growing and powerful entertainment industry centered in Hollywood, Arnold availed himself of every opportunity to develop rapport with motion picture stars and producers, soliciting the support of their relatively new medium in promoting an understanding of the Air Corps. His friendship with Dr. Theodore von Karman of California Institute of Technology, which would have a significant later impact on Arnold and the United States Air Force, dated from this period. The responsibility for establishing and operating a Civilian Conservation Camp at March Field in May 1933 became Arnold's and one which he later recalled as extremely beneficial since officers, possibly including himself, "who had never before thought about anything very seriously, except flying an airplane, suddenly found themselves faced with administrative and human relations problems."[6]

Although the short-lived Air Mail experiment was dubbed a fiasco by most of the press, Arnold was convinced that it had been beneficial since it provided experience for "combat flying, bad weather flying, night flying . . . made it possible to get the latest navigation and night-flying instruments in our planes."[7]

Summoned from a well-earned vacation with his wife after the Air Mail experiment, Arnold reported to Wright Field to plan and lead the flight of B–10 bombers from Washington to Alaska and return. Although its successful completion brought Arnold an invitation to the White House, earned him his second Mackay Trophy, and certainly influenced his promotion to brigadier general and his assignment as commander of the first wing of the newly constituted General Headquarters Air Force, to Arnold it was "only another job."[8]

Early in 1936, Arnold was transferred to Washington as Assistant Chief of the Air Corps. The untimely death of his chief, Major General Oscar Westover, in a plane crash in September 1938, saw Arnold elevated

to the position of Chief, the same day the Munich Pact was signed by Neville Chamberlain. It is in this role that his leadership will be examined today.

Professor James MacGregor Burns, in a volume recently published, defines leadership as "inducing followers to act for certain goals that represent the values and the motivations—the wants and the needs, the aspirations and expectations—of both leaders and followers."[9] Doctor Pogue will agree, I trust, that the leadership qualities of the desk-bound may differ markedly from those exhibited by the combat leaders here today, such as Generals LeMay and Weyland and Admiral Martin. One author, writing in the official Army history, opines: "Some of the greatest generals in World War II, far from striking the classic posture of the man on horseback, issued their military orders from the quiet of their desks and fought their decisive battles at conference tables."[10] Arnold was of this genre.

In assessing Arnold's leadership, his institutional relations with the Army, and his personal and professional dealings with his superior and friend, George Marshall, as well as with President Roosevelt, deserve examination.

In all of his writings, both official and personal, there is never a hint that Arnold considered himself anything but an Army officer. This is not surprising since, by the time of Pearl Harbor, he had worn the khaki for more than thirty-four years following his graduation from West Point. His covert as well as his overt efforts in behalf of Billy Mitchell in the 1920s were aimed at the creation of a separate air arm within the Army structure. By the mid-1930s, however, in his testimony before the Howell and McSwain Committees of 1935, he recommended against a separate air arm.[11] His efforts during the bulk of World War II aimed towards the eventual future sovereignty of an air arm, but he realized as early as 1940 that a combination of a lack of White House support, Navy and Army opposition, and leadership and staff inexperience within the Air Corps, to say nothing of the size of the task which might face Americans if they were drawn into the war, precluded effective separation. For the most part, he worked within the system, although he was not averse, like most successful leaders, to moulding, agitating, or reinterpreting the system when it best suited his purposes.

Not all within the Air Corps shared Arnold's caution, and no doubt many disagreed with his February 1939 testimony before the Senate Committee on Military Affairs in which he recommended against any significant organizational change.[12] In June 1940, Arnold could write that "at this minute it looks to me as if it might be a serious mistake to change the existing set-up."[13] The compromise changes of October 1940 appeared satisfactory to Arnold, who asked critics, many of them inside

the air arm, to support the view "that the present organization be given an opportunity to prove itself before any more readjustments are made."[14] The various structural changes which followed until the March 1942 reorganization all exemplified Arnold's willingness to continue within the organization of the Army.

A major reason for Arnold's relative contentment within the Army was the mutual respect, rapport, and confidence which he enjoyed with George C. Marshall, the Army Chief of Staff since 1 September 1939. Arnold described Marshall as "one of the most potent forces behind the development of American Air Power";[15] and even though Arnold felt that Marshall "needed plenty of indoctrination about the air facts of life,"[16] their friendship and professional respect dating back to service together in 1914 in the Philippines deepened throughout the war. Marshall ceded increasing authority to the airman, giving the Army Air Forces what one historian has termed "dominion status" in the Army commonwealth.[17] Arnold's diary, maintained during his many overseas trips and hitherto unexploited by historians, cites numerous occasions when he and friend George Marshall, declining the ubiquitous staff cars made available to generals in wartime, chose instead to walk and talk out the problems of the day's deliberations, occasionally walking four or more miles.[18] Only when Arnold appeared to disregard professional medical advice was Marshall known to use harsh words with the airman, such as his comment in the spring of 1945 that the Chief of Staff of the Army had "little hope that [you] can continue your wasteful expenditure of physical strength and nervous energy."[19]

The relationship was one in which Arnold was always certain to defer to the statutory lines of authority but did not shrink from a candid exchange of views before the final decision was reached. After 1943, the authorization for the Army Air Forces to take directly to the Joint Chiefs of Staff (JCS) any matter "which the Commanding General, Army Air Forces desires to transmit directly to the Joint Chiefs of Staff in his capacity as a member of that committee" had Marshall's assent.[20] "It was clear enough," Craven and Cate have written, "that Arnold himself could act on his own, and that coordination with OPD and other War Department agencies was ever becoming more of a question of mere courtesy."[21]

Arnold's respect for Marshall was reciprocated, and the Chief of Staff accorded Arnold the highest accolade in Marshall's lexicon—"always loyal."[22] Their relationship was the source of some disagreements between Arnold and his staff. Although the Air Staff might well be right on a given issue, Arnold knew that, if he followed his staff's advice, he would "lose Marshall," a difficult position for any effective leader.[23]

Arnold's relations with his Commander in Chief, President Franklin D. Roosevelt, did not begin auspiciously. General Arnold laments in his memoirs about the eight days' lag between Westover's tragic death and his being named Chief of the Air Corps. Part of the delay, Arnold felt, was due to the slanderous gossip concerning his alleged intemperate use of liquor.[24]

The publicity surrounding the January 1939 crash involving a member of a French aircraft purchasing commission in California brought to light the fact that procurement of aircraft was being handled not by the War Department, either civilian or military, but by the Secretary of the Treasury, Henry Morgenthau, who seldom declined an opportunity to expand his influence and that of his Cabinet Department. Ensuing Congressional hearings resulted in a White House meeting at which Arnold, and almost all present, clearly understood that the President was directing the Chief of the Army Air Corps to accept Treasury control over aircraft procurement for France and Great Britain or face assignment to Guam, an unlikely residence for a major general in 1939.[25]

Arnold's tenuous relations with Morgenthau continued throughout the bulk of the war, but the air force leader adroitly counterbalanced this antagonism with extremely amicable relations with Harry Hopkins, another major influence on FDR. Hopkins is credited with suggesting to FDR that both Arnold and Marshall be invited to accompany the President to the Argentia Conference in September 1939. From that time on, by Arnold's attendance at Combined Chiefs of Staff meetings, Roosevelt at least tacitly recognized the relative autonomy of the air arm.[26] Yalta was the only major conference not attended by Arnold, who was then recuperating from his second heart attack.

Rarely did FDR consider air power issues without soliciting comments from Arnold, whose relations with the President improved to the point where bantering took place between them. In this case, Arnold's friendly, outgoing personality contrasted sharply with Marshall's innate reserve. Marshall's bristling at being called "George" by the President (only once, according to Marshall, did this happen) is particularly revealing, while Arnold appeared to be extremely pleased to be addressed as "Hap" after emerging from the White House doghouse in September 1941.[27] FDR's dabbling in military matters did not cause difficult problems for Arnold or the staff, although on one occasion Arnold felt compelled to refuse FDR's request that he take Elliott Roosevelt on the mission to China immediately after the Casablanca Conference.[28] Most of Arnold's frequent correspondence with the President tended to indulge the Commander in Chief's penchant for details ranging from aircraft performance to trivia.[29]

In dealing with the United States Navy during World War II, Arnold did not have smooth relations, as Navy leaders charged that his preoccupation with proving the value of strategic bombing by allocating the bulk of four-engine bomber aircraft and other resources for action against Germany relegated the Navy's needs to an impossibly low priority. The charges by the Navy that Arnold was choosing easy targets in Europe and failing to bomb the heavily-defended submarine pens and support facilities have little basis in fact, but resulted from the bitter division in 1942 between Arnold and Admiral Ernest J. King over the allocation of resources for the antisubmarine effort, as well as its command and control.[30] Arnold's success in getting himself named as the executive agent for the Twentieth Air Force, which reported directly to the JCS, was a coup for the aviator which stemmed from his frustrations at being drawn into the MacArthur-Nimitz quarrel in the Pacific. Admiral McCain's recommendation in 1943 that "General Arnold be given four stars and placed in command of all our forces in Hell" may be an accurate description of some naval officers' feelings.[31]

General Arnold did not enjoy a reputation within the Air Staff as a superior administrator. Yet the Air Staff probably did not merit inclusion in Sir John Dill's December 1941 comment after his arrival in Washington that the "whole organization [JCS and Presidential staff] belongs to the days of George Washington."[32] In spite of General Kuter's two articles[33] to the contrary, the records of the National Archives and the Library of Congress show generally effective utilization of his staff by Arnold. Adherence to established lines of authority prevailed, particularly when staff agencies met his standards for timely and adequate responses. Arnold is neither the first general (nor the last, I suspect) to lament that "my staff never tells me anything." General Kuter's recollection of Arnold accosting startled air officers in the corridors of the Munitions Building or Pentagon and assigning them tasks regardless of their knowledge of the subject makes for good "war stories" and probably did happen, but this habit may well have masked what James MacGregor Burns termed Arnold's "flair for organization and management."[34]

Although Burns' statement may be overly generous concerning organization, it is not wide of the mark on management. Arnold valued a quick response, and staff officers as well as field commanders who contented themselves with the explanation that the appointed task could not be accomplished found themselves quickly suspect, if not reassigned. Arnold rotated promising officers between combat and Washington assignments, not only to enhance their wartime effectiveness in either role but to provide a nucleus of postwar leadership for what he hoped would be a separate air force. He appreciated, however, the important distinction that "it does not follow that a man who is an excellent commander in the field will be an equally excellent office man."[35] Particularly illu-

minating in regards to Arnold's leadership of his staff is this December 1945 excerpt from his valedictory to his close friend Tooey Spaatz, who had been named to succeed him. Arnold wrote:

> The success of the Army Air Forces during the World War II period was due to its aggressiveness. At this writing many things have occurred which indicate that we are losing our aggressiveness. We are asking permission to do things which formerly we never did. Perhaps we are building up historical alibis rather than taking action which would enable us to get things done. Historical alibis are fine and may prevent us from making mistakes but in the meantime, time is passing without getting results.[36]

In his relations with his staff, Arnold's comment in *Global Mission* that he "frequently overruled my experts"[37] is probably accurate. He took pride in the establishment (over the reluctance of his staff) of the civilian flying school program which permitted expansion from the production of 750 pilots per year to more than 100,000. Other projects which had less than lukewarm support from the staff were creation of the Air Transport Command and establishment of an Officer Candidate School at Miami Beach in the luxury hotels emptied by the war. Incidentally, by directly commissioning civilians to help with the wartime buildup, Arnold showed his willingness to use any asset to accomplish his task. His comment that a smart civilian could be transformed into a successful staff officer whereas a dumb career officer could contribute little was reflected in his efforts to procure personnel from a wide range of backgrounds.[38]

Responsiveness as well as effectiveness were probably the key attributes demanded by Arnold of his subordinates in both staff and line positions. General LeMay did not know Arnold well as late as early 1945, but he appreciated along with Norstad and others that "if you don't get results, you'll be fired."[39] Generals "Possum" Hansell, K. B. Wolfe, and others produced too little, too late, and were relieved from command.

Arnold rarely reflected for very long on a problem, whether it be in personnel, logistics, or administration. Impetuosity was one of his significant shortcomings, and he knew it. Of "Hubey" Harmon, Arnold could write in 1935: "He is just systematic enough to control my impetuousness." Even his only daughter, on announcing her impending marriage, wrote to her mother in 1937: "Please break the news gently to the Papa and don't let him get mad and raise hell."[40] Previous personal rapport and lifelong friendships did not justify lack of progress or adequate accomplishment, and Arnold's correspondence in the autumn and winter of 1943 with Eaker and also with Spaatz is ample evidence of his impatience with even his closest associates. At least one student of Arnold's leadership feels that at times he used his volatility as an "act," to goad his staff and commanders into greater accomplishments.[41] Donald Douglas has recalled that aircraft manufacturers got similar treatment.[42]

Although Arnold was constantly aware of his impetuous nature and short temper, he never was able to control his impulses fully, and some loyal, effective officers undoubtedly were summarily removed, retired, or stagnated by their Chief.

General Kuter may be indulging in hyperbole in commenting, from his very close vantage point as Arnold's Chief of the Air Staff, that

> Arnold's antagonism to the functioning of a large military staff was equaled only by his indifference to its organizational structure and procedures. His allergy to methodical and careful staff study and action was acute and chronic.[43]

In any event, the official record clearly does not support Kuter's analysis that Arnold regarded "the Air Staff not as his own personal staff, not as an extension of his personal staff, not as an extension of his own mind and will, but as an obstacle to be hurdled, to be dodged or evaded."[44] Finally, the serious historian would be on dangerous ground if he accepts General Kuter's explanations of Colonel Steve Ferson's death while briefing Arnold at a Sunday staff meeting as a reaction to Arnold's leadership or operating methods.[45]

In dealing with his commanders in the field, Arnold was almost always candid and direct. Fully using his right of direct communications, Arnold's correspondence with Spaatz, Eaker, Doolittle, Brett, Brereton, Stratemeyer, and Kenney covered every minute detail of the war, from special assignments for relatively junior officers to the broadest strategic concepts. Arnold's relationship with George Kenney in these matters is but one of many examples which could be cited.

Kenney, a combat pilot in World War I, had been Arnold's observer of events in Europe in 1939. Later, Arnold made him MacArthur's air commander, not an enviable task. Kenney, bright and articulate, constantly bombarded Arnold with detailed letters which questioned the basic "Europe first" strategy.[46] The Southwest Pacific Air Forces commander emphasized repeatedly to Arnold the difficulty of dislodging Japanese troops if they were permitted to consolidate their quick gains of 1941 and 1942 and tried to dissuade him from concentrating strategic bombing forces in Europe. Arnold dealt with Kenney in a straightforward manner and in letter after letter patiently explained the global strategy, emphasizing that "the overall strategic picture does not permit that every theatre be considered from an offensive viewpoint." Just one year after Pearl Harbor, Arnold explained to Kenney that his aim was "to keep your forces at sufficient strength to enable you to support yourself defensively and to carry out a limited offensive against the Japanese."[47]

Strategic considerations were often discussed, and Arnold urged abandonment of the "old 'island to island' theory."[48] He furnished on a regular basis a detailed accounting of the aircraft recently dispatched,

enroute, and planned for transfer to the Pacific, and candidly told Kenney that given the success of the North African campaign:

> Every hour and every airplane counts now, and any diversion from our European forces cannot appear to be justifiable. I cannot help but believe that a German collapse will permit a very rapid solution of the Japanese problem—if that collapse is not delayed too long.[49]

The historian should not delude himself that Arnold wrote each of these letters or that he did not employ his staff in their preparation and coordination. Just the same the flavor of Arnold's comments on the margins of draft correspondence and the redrafting he required clearly indicate that he normally was fully aware of the implications as well as the details of the letters he signed to his field commanders. He did not hesitate to make decisions as quickly on paper as he was reputed to make them in person, and more than one reader was informed, "Now I propose to settle this matter once and for all."[50] He was aware of the impact of his wide-ranging letters on the recipient and oftentimes spoke to his commanders of his "heckling" them, but he also consistently asked them to "give me your ideas on the situation."[51]

This candor generally sparked equal candor, and Kenney, for example, was willing to concede that "a lot of my fears expressed in previous correspondence were found to be groundless."[52] Kenney may not have been the only commander who could encourage Arnold to stay in good health "because I still need somebody to run to whenever I get into trouble."[53] Arnold's reply that "I am still operating on the basis that hard work may make some of us tired but is very seldom fatal"[54] was consistent with his leadership ethic.

The available documents do not permit an accurate assessment of the impact of ill health on Arnold's leadership. General Giles has indicated that during the last year of the war Arnold was not always in the decision-making process, but the correspondence does not support that view.[55] Incidentally, whatever impact his personal drive may have had on his heart attacks, they should not be surprising, given the general vulnerability to such attacks among male members of the Arnold family.[56]

As a strategic thinker, Arnold has not left us any significant body of writing other than his rather straightforward account in *Global Mission*. Portal, his British counterpart, insisted that "Arnold had trouble following the strategic arguments,"[57] but Henry L. Stimson, an almost day-to-day observer, felt that Arnold possessed

> vision combined with loyalty, force combined with tact, and a comprehension of the large issues of strategy which gave his word great weight in the councils of the War Department and in the Joint and Combined Chiefs of Staff.[58]

Among his colleagues, Admiral Leahy, cognizant of the difficulties which Arnold (and many others) endured with King and the U. S. Navy, wrote

that Arnold "had a splendid appreciation of what the Air Force could do and was rarely in disagreement with the other chiefs. He knew the limitations of that arm of service."[59] Even discounting the penchant of old soldiers to remember their colleagues more favorably in their memoirs than they might have been in real life, the verdict is in Arnold's favor. Harry Hopkins very often passed on to the President the results of his discussions with Arnold, many of which dealt with strategy.[60]

Arnold's belief in air power was forged from his faith in the power of strategic bombardment doctrine developed before the war at the Air Corps Tactical School. Arnold made no claim to originality and confessed that "as regards strategic bombardment, the doctrines were still Douhet's ideas modified by our own thinking in regard to pure defense."[61] Certain shortcomings in implementation developed from the failure to appreciate the need for long-range fighters to accompany the bombers and from a lack of foresight as to the technological ingenuity which could produce that fighter. Yet, if Arnold must bear a share of that blame (and part of it legitimately belongs to him, his predecessors and their staffs, as well as to Congress and the American public), the United States was not alone. England's Royal Air Force, for example, predicated its entire night bombing strategy on its lack of accompanying long-range fighters.

A realistic appreciation for the fact of life that overall strategy was planned and coordinated at least several organizational layers above him may partially explain Arnold's lack of fame as a strategic thinker. Yet, as Lt Colonel David MacIsaac has so well-documented, the Strategic Bombing Survey was undertaken to assess the results of strategic bombing.[62] Whether or not Arnold's unbounding faith in the efficacy of strategic bombing prompted him, he offered at Potsdam the most optimistic (and the most correct) forecast of the collapse of the Japanese, predicting their surrender in the month of October 1945.[63]

Arnold was, in the vernacular of the postwar period, a "hard-liner" toward the Soviet Union. Disillusioned by the Army Air Forces' frustrating experience with shuttle bombing, annoyed by the diversion—under pressure from Harriman and Hopkins—of badly needed aircraft to the Soviet Union, and vividly impressed by the outrageous behavior of the Russian troops he saw at firsthand in the Berlin area while he was at Potsdam, Arnold had serious reservations about the peaceful intentions of the Soviet Union.[64]

In dealing with the British, he worked hard to overcome difficulties with them soon after his appointment as Chief. He, like most American military leaders, was pleased that British and French orders for American aircraft in the period 1938–1940 permitted expansion of research, development and production facilities beyond what his own country's procurement plans would support. But after the fall of France, Arnold found

himself faced with the dilemma between how to permit the delivery to England of previously-ordered aircraft and, at the same time, to provide sufficient training and operational aircraft for an American air arm should the war involve the United States. He generally worked well with his British counterparts, but he never conceded any superiority to the RAF after 1942. After Pearl Harbor, Arnold fought strenuously for a separate American air arm to validate the theory of daylight strategic bombardment and resisted British efforts to incorporate American aircraft into the RAF night operations. Dilution of the bombing effort in Western Europe by the diversion of resources to North Africa and Italy further exacerbated but never seriously affected relations.[65] Generally removed from direct relations with the French, he was a Francophile in his estimates of the Gallic people.[66]

In assessing his leadership, Arnold's personal characteristics as set forth by Air Marshal Slessor are fairly close to being accurate:

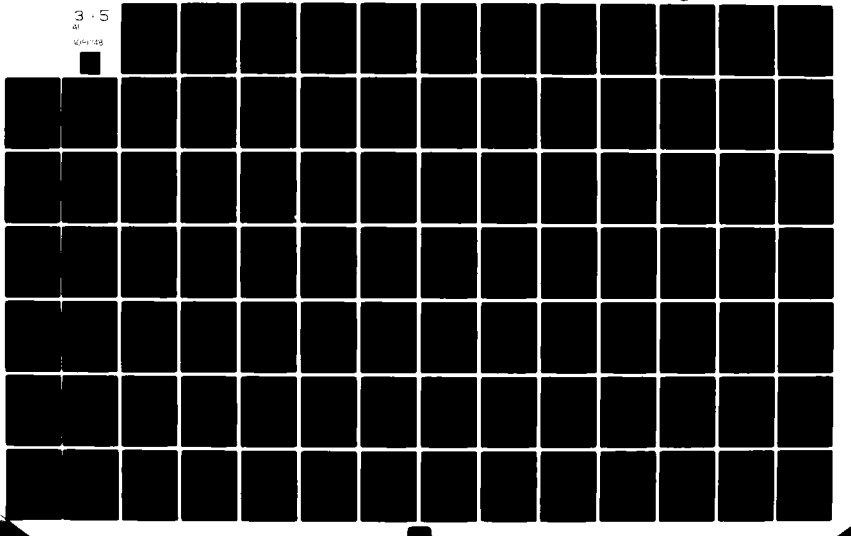
> He was transparently honest, terrifically energetic, given to unorthodox methods and, though shrewd and without many illusions, always with something of a schoolboy naivete about him. In spite of his white hair and benignly patriarchal appearance, he was a bit of a Peter Pan . . . He had lived through years of frustration which had done nothing to impair his effervescent enthusiasm or his burning faith in the future of airpower. No one could accuse him of being brilliantly clever but he was wise and had the big man's flair for putting his finger on the really important point. He would never allow anything to stand in his way once he had made up his mind.[67]

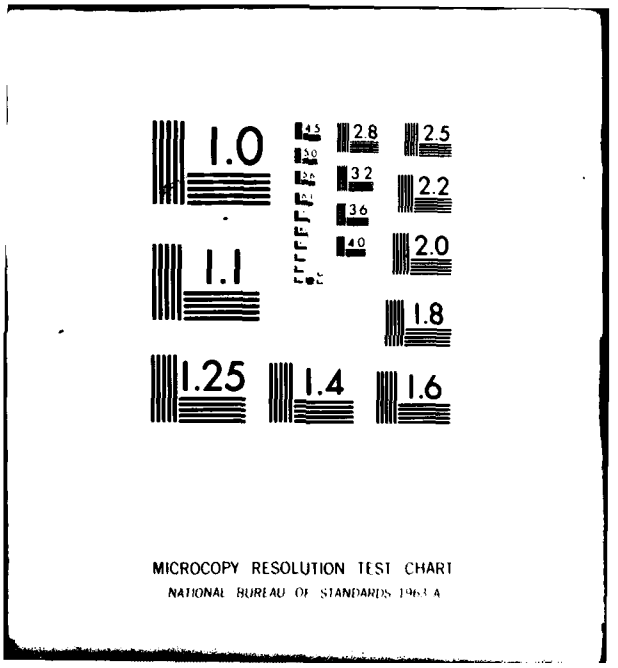
If generals are supposed to exude self-confidence, General Arnold along with General LeMay have confessed to us in writing that, as human beings, all men possess doubts. Arnold's comment to his wife, to whom he confided everything, that "I hope I am big enough to handle it"[68] is not different from Curtis LeMay's confession that "not once, during any switch of command, during any advancement in responsibility, have I ever considered that I was completely equipped for the new job at hand. Always I felt not fully qualified: needed more training, needed more information than I owned, more experience, more wisdom."[69] Neither Arnold nor General LeMay, however, ever publicized those doubts to their followers.

Arnold's sense of humor served him well, and many observers have commented on his ebullience, generally happy countenance, and ability to laugh, both at life and at himself. No authoritative account exists about the origin of his nickname "Hap," and his letters to his wife until the year 1934 were signed "Sonny," deriving from the eternally optimistic cartoon character, Sonny Jim.[70] On board the USS *Iowa* headed for Casablanca, he could record in a diary which he never thought would be read by others: "Looked for a place where sailors were not washing the deck or saluting. Found neither."[71] On the same trip he wrote, "I took the President out to see the Sphinx today—the world's 3 most silent

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people."[72] While in Brazil, he could comment, "Dropped my watch on the concrete floor and it bounced. It also stopped."[73] While in the Pacific, he recorded an incident when Americans captured Japanese troops on Iwo Jima. As Arnold recounts the story:

> The [Americans] searched the Japs again and again—found nothing but their pistols—took them. Then, not knowing what to do, took the Japs to the [Americans] tent to feed them. There was nothing but canned goods. The [Americans] tried to open the cans with a pocket knife, but with no luck. After many failures one Jap went deep inside his trousers and pulled out a knife a foot long and handed it to a group of 3 badly scared [Americans].[74]

While in the South Pacific during 1942, he recounted the incident of a ball turret which had been improvised in a B–26. In the heat of combat, the improvised mount failed, and the gun dropped, as Arnold tells it,

> and hit Zero on ring cowl. Cowl went through tail and [the Zero] disintegrated. Kenney gave gunner Purple Heart and bill for gun. Gunner asked if he could return Purple Heart and get credit on cost of gun.[75]

As important in understanding the man is the ability which Arnold possessed to laugh at himself. Once he reached the rank of general, he spoofed self-important generals and their penchant for the perquisites of office.[76] He was honest with himself and with his family and colleagues. He was a warm man with intense love and affection for his wife and family which he never failed to express in his letters to them. His human qualities, extremely important in assessing leadership, have not been captured by a biographer, but are portrayed in many examples. He commented to his wife just after being promoted to brigadier general of "how one gets tired of saying pleasant things and shaking hands,"[77] and illustrated a common dilemma as he prepared to testify before the McSwain Committee in 1935 pondering:

> . . . is it any wonder that my heart beat [sic] has jumped up and I look forward with some considerable dread as to what it is all about and what I can say and still maintain my self respect and not offend anyone.[78]

Lindbergh's account of a June 1939 meeting with Arnold described Arnold asking the then more-famous aviator, "What are you shooting at? Have you set a goal for yourself or do you just take life as it comes?" Lindbergh replied that he was not

> shooting at anything and that life was sufficiently complex in the modern times without trying to foresee its future too clearly. I [Lindbergh] said I liked to feel my way along as I lived and let life have a hand in guiding its own direction. Arnold told me he has always followed somewhat the same policy and that he, too, had never set a definite objective as his life's work.[79]

How many of us who have flown extensively have pondered Arnold's question to himself: "What makes flying so tiring? Is it the unrecognized

wear and tear on the nerves? Is there a physical strain that we don't recognize? Is it the long hours—the curtailed sleep?"[80]

No simple item or event escaped his attention, and he tells us a good deal about himself as well as a meeting of the East with the West in his comment while in India in 1943:

> Have a man Friday. He draws my bath, puts out my clothes, tells me by so doing when I put on clean ones. Lays out my uniforms, and does everything he can to keep me from thinking. I don't like it. I want to decide something and not have everything decided for me. His name is Sam. I would like nothing better than to tell him to go sell his papers and come back after I am gone, but I haven't the nerve or heart, I don't know which.[81]

Robert Lovett and others have commented on Arnold's unbounded optimism and faith in the future.[82] Although he would be the first to deny that he was a scientist, one of Arnold's major concerns and legacies to the USAF was his concern for the role of technology, research, and development in air power. As Arnold expressed it,

> I had yet another job. That was to project myself into the future; to get the best brains available, . . . and determine what steps the US should take to have the best Air Force in the world twenty years hence. What kind of Air Force must we have? What kind of equipment ought we plan for twenty years, or thirty years hence?[83]

He asked the noted scientist Theodore von Karman in September 1944 to "gather a group of scientists who will work out a blueprint for air research for the next twenty, thirty perhaps fifty years." In a chapter he entitled "The Vision of Hap Arnold," von Karman tells of his work and the resulting reports, *Toward New Horizons* and *Science: The Key to Air Supremacy*, which were submitted immediately after the war.[84] In many ways, Arnold's vision and concern for the future were as important a contribution as his build-up and development of the Army air arm during World War II.

Arnold's concern for and use of the public affairs media need further assessment. Steve Early, a fairly successful purveyor of news for Franklin Roosevelt, insisted that Arnold ran a propaganda machine on government time during the Billy Mitchell controversy, although as Chief of Information, Arnold may well have been only doing his assigned job.[85] During World War II, Arnold was keenly aware of the attractiveness of the air aspects of the war to the news media, and there are many examples of his use of the printed page and films to win understanding and supporters for strategic bombing. Hollywood friends from his days at March Field were helpful, and Arnold appreciated the gains to be made in favorable publicity in the news media. He made himself available where possible to the news media; and his overseas visits, in particular, led to frequent meetings with Lowell Thomas or other famous newspeople. Still, Arnold could not help being candid with himself when he recorded in his diary:

"News conference apparently went off OK. Dodged all of the embarrassing questions."[86] Although critics of the Army Air Forces might not agree, Arnold's correspondence shows disdain for the circus-like aspect of publicizing the return of aerial aces, and he was insistent that in their homecoming the Army Air Forces not lose sight of the transfer of knowledge to future aviators which could be accomplished by assigning returned heroes to training rather than public relations functions.[87]

Within the constraints of this meeting, it is difficult to summarize the leadership of H. H. Arnold. He contributed more than any other military man to the building of the greatest air army ever assembled. He did it in spite of physical disabilities and the character limitations which plague all mortals. He was impetuous and single-minded in many aspects of his thinking, but his diary reveals a tremendously wide range of concerns for all aspects of civilization. The bottom line, however, is that he was an effective leader. As Walter Lippman has written, "The final test of a leader is that he leaves behind him the conviction and the will to carry on."[88] Certainly the fact that many of us here are members of the United States Air Force and that we are meeting at the United States Air Force Academy is ample testimony that Arnold has passed Lippman's final test of leadership.

NOTES

1. Lewis H. Brereton, *The Brereton Diaries: The War in the Air, in the Pacific, Middle East and Europe* (New York: William Morrow and Company, 1946), January 30, 1943, 178.
2. Letter, H. H. Arnold to his mother, c. Feb. 1906, Bruce Arnold Collection, Office of Air Force History, Washington, D.C., cited hereinafter as BAC.
3. H. H. Arnold, *Global Mission* (New York: Harper and Brothers, 1949), 29.
4. Letter, H. H. Arnold to his wife, Jan. 31, 1914, BAC.
5. *Global Mission*, 122.
6. *Ibid.*, 141.
7. *Ibid.*, 144.
8. Arnold to his wife, July 29, 1934, BAC.
9. James MacGregor Burns, *Leadership* (New York: Harper and Row, 1978).
10. Ray S. Cline, *United States Army in World War II: The War Department; Washington Command Post: The Operations Division* (Washington, D.C.; Office of the Chief of Military History, 1941), 1.
11. Arnold to his wife, Nov. 8, 1934, Apr. 5, 1935, BAC.
12. Mark Skinner Watson, *United States Army in World War II: The War Department; Chief of Staff: Prewar Plans and Preparations*, (Washington, D.C.; Historical Division, Department of the Army, 1950), 286.
13. Cited in *ibid.*
14. Cited in *ibid.*, 290.
15. *Global Mission*, 163–64.
16. *Ibid.*, 163.
17. Cline, 117.
18. Diary of H. H. Arnold, Office of Air Force History, Jun. 22, Nov. 26, 1943; Sep. 14, 1944, cited hereinafter as Diary.
19. Cited in Forrest C. Pogue, *George C. Marshall*, Vol III: *Organizer of Victory, 1943–1945* (New York: The Viking Press, 1973), 72.
20. Cited in Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, Volume VI: *Men and Planes* (Chicago: The University of Chicago Press, 1955), 56.
21. *Ibid.*
22. Cited in Forrest C. Pogue, *George C. Marshall*, Vol. II: *Ordeal and Hope, 1939–1942* (New York: The Viking Press, 1966), 86.
23. Diary, Sep. 18, 1942.
24. *Global Mission*, 170.
25. John Morton Blum, ed., *From the Morgenthau Diaries*, Vol. II: *Years of Urgency, 1938–1941* (New York: Houghton Mifflin Company, 1965), p. 117 in which Morgenthau is quoted as saying: "Did Arnold get it." Arnold's more restrained account is in GM, 184–86.
26. Robert E. Sherwood, *Roosevelt and Hopkins, An Intimate History* (New York: Harper and Brothers, 1948), 317.
27. Forrest C. Pogue, *George C. Marshall*, Vol. I: *Education of a General, 1890–1939* (New York: The Viking Press, 1963), p. 323. Arnold's account is in GM, 194.
28. Letter, FDR to Ruth Goggins Roosevelt, Elliott Roosevelt, ed., *FDR, His Personal Letters, 1928–1945* (4 vols.; New York: Duell, Sloan and Pearce, 1950), Vol. III, part 2, 1395–96.
29. See for example: FDR to Arnold, Jan. 13, 1942, Arnold to FDR, Jan. 15, 1942, May 3, 1942, PSF Army Air Forces file; Arnold to FDR, Mar. 25, 1944, PSF Aviation file: Arnold to FDR, Dec. 21, 1944, PPF 8559, all in Franklin D. Roosevelt Library, Hyde Park, N.Y.
30. Sherwood, 682.
31. Quoted in Walter Johnson, ed., *The Papers of Adlai E. Stevenson* (4 vols.; Boston: Little Brown and Company, 1973), Vol II, p. 104. Arnold has some interesting comments on the Navy in Diary, Sept. 27, 1942, Jan. 19, 1943.
32. Quoted in James MacGregor Burns, *Roosevelt: The Soldier of Freedom* (New York: Harcourt Brace Jovanovich, Inc., 1970), 182.
33. General Laurence S. Kuter, USAF (Ret.), "How Hap Arnold Built the AAF," *Air Force Magazine*, (September, 1973), 88–93; "The General vs. The Establishment: General

H. H. Arnold and the Air Staff," *Aerospace Historian*, XXI (Winter/December, 1974), 185–89.

34. Burns, *Roosevelt*, 183. For a different view from Kuter's, see USAF, Oral History Interview with Lt Gen Fred M. Dean, Office of Air Force History, Washington, D.C.
35. Memorandum, Arnold to Spaatz, Dec. 6, 1945, Office of Air Force History, Washington, D.C. Cited hereinafter as Arnold Letters.
36. *Ibid.*
37. *Global Mission*, 180.
38. *Ibid.*, 292.
39. Cited in Curtis E. LeMay and McKinlay Kantor, *Mission with LeMay: My Story* (Garden City, N.Y.: Doubleday, 1965), 347.
40. Letter, Arnold to his wife, Nov. 10, 1935, Lois Arnold to her mother, Nov. 22, 1937, BAC.
41. Interview with Mr. Dewitt S. Copp, Manchester, New Hampshire, August 22, 1978.
42. Donald Douglas, Oral History Interview, Reminiscences of Associates of H. H. Arnold, Columbia University, New York.
43. Kuter, *op. cit.*, *Air Force Magazine*, 89.
44. Kuter, *op. cit.*, *Aerospace Historian*, 185.
45. *Ibid.*, 188.
46. Lieutenant General George C. Kenney to Arnold, Oct. 24, 1942; Feb. 11, Apr. 21, Sept. 26, 1944; Feb. 10, 1945; Arnold to Kenney, Dec. 6, 1942; Feb. 11, Feb. 26, Mar. 21, May 14, Oct. 31, 1944; Mar. 3, 1945. Copies in Office of Air Force History, Washington, D.C., Arnold Letters.
47. Arnold to Kenney, Dec. 6, 1942, Arnold Letters.
48. *Ibid.*
49. *Ibid.*
50. Arnold to Kenney, Feb. 26, 1944, Arnold Letters.
51. *Ibid.*, Mar. 21, 1944.
52. Kenney to Arnold, Feb. 10, 1945, Arnold Letters.
53. *Ibid.*
54. Arnold to Kenney, Mar. 3, 1945, Arnold Letters.
55. Lt. General Barney Giles, Oral History Interview, Reminiscences of Associates of H. H. Arnold, Columbia University; see Arnold's marginalia on letter, Kenney to Arnold, Feb. 10, 1945, Arnold Letters.
56. Interview with Col. Wm. Bruce Arnold, USAF (Ret.), Washington, D.C., Aug. 16, 1978.
57. Quoted in Pogue, III, 7.
58. Henry L. Stimson and McGeorge Bundy, *On Active Service in Peace and War* (New York: Harper and Brothers, 1947), 661.
59. William D. Leahy, *I Was There: The Personal Story of the Chief of Staff to President Roosevelt and Truman Based on His Notes and Diaries Made at the Time* (New York: McGraw Hill Book Company, 1950), 104.
60. See for example, Sherwood, 681–82.
61. *Global Mission*, 149.
62. David MacIsaac, *Strategic Bombing in World War Two: The Story of the United States Strategic Bombing Survey* (New York: Garland Publishing, Inc., 1976).
63. *Ibid.*
64. Diary, Sept. 11, 1944, July 16, 18, 19, 23, 1945.
65. Diary, June 13, 14, 1944.
66. Diary, June 12, 19, 1944, July 12, 1945.
67. Sir John Slessor, *The Central Blue: The Autobiography of Sir John Slessor, Marshall of the RAF* (New York: Frederick A. Praeger, 1957), 326–27.
68. Arnold to his wife, Feb. 13, 1917, BAC.
69. LeMay, *op. cit.*, 433.
70. Interview with Mrs. Carl Spaatz, Aug. 30, 1978.
71. Diary, May 15, 1943.
72. Diary, Nov. 24, 1943.
73. Diary, Feb. 17, 1943.
74. Diary, Jun. 15, 1945.
75. *Ibid.*
76. Arnold to his wife, Sept. 18, 27, 1935, BAC.

77. Arnold to his wife, Sept. 18, 1935, BAC.
78. Arnold to his wife, Apr. 4, 1935, BAC.
79. Charles A. Lindbergh, *The Wartime Journal of Charles A. Lindbergh* (New York: Harcourt, Brace Jovanovich, 1970), June 7, 1939, 209.
80. Diary, Feb. 15, 1943.
81. Diary, July 21, 1943.
82. Robert Lovett, Oral History Interview, Reminiscences of Associates of H. H. Arnold. Columbia University.
83. *Global Mission*, 532.
84. Theodore von Karman with Lee Edson, *The Wind and Beyond: Theodore von Karman, Pioneer in Aviation and Pathfinder in Space* (Boston: Little Brown and Company, 1967), 267–307.
85. Blum, *op. cit.*, 118–19.
86. Diary, April 5, 1945; Sept. 4, 1945.
87. Arnold to Kenney, Mar. 21, 1944, May 14, 1944, Arnold Letters.
88. Walter Lippman, *New York Herald Tribune*, April 14, 1945.

THE PERCEPTIONS OF THREE MAKERS OF AIR POWER HISTORY

GENERAL CURTIS E. LEMAY, USAF (RET)
GENERAL O. P. WEYLAND, USAF (RET)
VICE-ADMIRAL WILLIAM I. MARTIN, USN (RET)

General LeMay:

Initially, I thought I might try to define leadership in the short time I had, and I was particularly interested in the quote that General Huston had in his very fine paper on General Arnold quoting Professor Burns, whom I do not know. Burns suggests that leadership is inducing followers to act for certain goals that represent the values and motivations, wants and needs, and aspirations and expectations of both leaders and followers; and the genius of leadership lies in the manner in which the leaders act on their own and their followers' values and motivations. Leadership, unlike naked power wielding, is thus inseparable from the followers' needs and goals. Now, that's a nice, scholarly definition. It's got a lot of three and four syllable words in it, and I can't get it off with one breath; but it seems, on the face of it, to be adequate.

I would suggest, however, that Professor Burns wasn't in the Eighth Air Force in the early days over in England. If he were, he'd probably want to change the wording somewhat. Looking back to those days, I'm sure we all had goals and aspirations—one of them was to win the war. But we didn't think any of us would be around to see that day. It was a long time in the future before we'd get the airplanes built and the people trained and the necessary forces over there to do the job.

This definition sounds a little bit like all of us leaders were geniuses, and we had gotten the idea over to our troops, and everybody was eager and happy to go do the job. Well, I know at least one leader, and I'm sure there were several more around, who were something less than enthusiastic about taking 50 bombers and going to Germany against 700 German fighters. I'm sure that if a lot of the crews thought about winning the war, it wasn't very often; their basic goal and aspiration was to try to stay alive, which is a little different definition than the one I just read. In spite of the unsatisfactory situation that existed, however, no bomber mission was ever turned back by enemy action, which indicates to me that leadership in Eighth Air Force was alive and healthy, but probably operating under a simplified definition.

So I'm not going to try to define leadership. I think that if I can point out a couple of good examples of what I considered outstanding leadership, it might stir your minds to some questions that we might answer during the question period.

First, a couple of examples on General Arnold that I don't think General Huston stressed enough in his very fine paper. I think one of General Arnold's great accomplishments in leadership was to build an air force that consisted of about 1,200 officers, active and reserves on active duty, and 10,000 men to a force of two and a half million and put them in the field. The battles that he had to wage in the Pentagon to get the resources allocated to equip a force of this size were tremendous. The most important one was getting adopted the command system that we had in the Pacific, where strategic air power was taken out from under the theater commanders and operated directly under the Joint Chiefs of Staff.

All these things made a real impression on me, and I knew then what a great accomplishment it was, but I really didn't know *how* great until I went through the mill in the Joint Chiefs of Staff and fought battles of lesser magnitude down there. At any rate, these accomplishments served a real purpose in leadership. They motivated me to try to accomplish something with what he provided me to fight in the field.

Another example of General Arnold's ability to motivate: when he visited us over in Guam late in the spring of 1945, one of the questions after we'd given him a briefing on what we were doing was, "When's the war going to end?" He told us he asked that same question every place he visited. Well, we'd already made up our minds that we ought to try to end the war before the invasion of Japan, which we knew was November 1st, but I told him we'd been too busy to come up with an exact date. If he'd give me thirty minutes, I'd get one. So I sent the Plans, Intelligence, and Operations officers off and said, "Get the target list and tell me when we're going to run out of major targets." As I remember, the date was the first of September. (I see in General Huston's paper, he cheated on us a little bit and made it the first of October when he got back to Washington.) That also motivated us to get busy and see that we did what we said we were going to do.

I think that it's perfectly obvious that if you're going to try to define leadership, you'd better have a lot of definitions. I think there's probably one for every level of leadership. The type that General Arnold provided is one; and the type of field commander and a commander of lesser units in combat is something else again, and it would probably require slightly different modifications.

If I had to come up with one word to define leadership, I would say "responsibility." If a leader hasn't a highly developed sense of respon-

sibility, he can't really be a top leader. That means that you really feel that you have a responsibility for carrying out the job that you're supposed to do and, not only that, to go beyond that and come up with other things that should be done to accomplish the overall goal besides those that you've just been ordered to do.

I came from a generation of people in the Air Force who didn't go to the schools that you now have scattered around the countryside. Before the war broke out, I was too young to go to any of the schools we then had in existence, the main one of which was the Air Corps Tactical School and the next one of which was the Army Command and Staff College. After the war I was too old and too high ranking to go. So I finished my thirty-six years in the Army and the Air Force uneducated in my profession. I did pick up a few things along the way, however, mostly by trial and error. As I met and worked with people, a great number of them had an influence on what I did when I got into command positions: General Andrews, General Spaatz, General Eaker, and a lot of other people. I think the most outstanding one was the first bomb group commander I had when I transferred from fighters to bombers at Langley Field—Colonel Robert Olds. He taught me more in thirty days than I had learned in the previous seven years that I had been in the service.

This education came about a little bit by accident. My assignment then was operations officer of one of the squadrons in the group, and the group operations officer had fallen ill from some malady and he was out for about a month; and I was called over to the group to fill in as group operations officer. The operations office was out in front of the hangars on the ground floor, and Colonel Old's office was right upstairs above it. Well, the first thing I learned was that the day would probably be more peaceful if I were in my chair down there when he came to work in the morning—and that wasn't at 8 o'clock when everybody else came to work. Colonel Olds always stopped by the desk on his way upstairs, and he always had a few questions for me, like, "What's the weather in San Antonio this morning?" "I don't know, Sir." "Well, you ought to know; your airplanes will fly that far." Or, "How many airplanes are in commission this morning?" Well, I didn't know that until along about 9 o'clock when the engineering officer came in with a note, having gotten the report from the squadrons that such and such airplanes were in commission. I found out I better have that before 9 o'clock. Then, such things as, "How many practice bombs are in the dump?" "How much gasoline you got and how many hours can you fly on your supplies?" And a thousand and one other questions every morning, just like clockwork, as he came to work. Then after he'd asked these few questions, he'd proceed to give me ten days' work to do that day and go on upstairs. At the end of thirty days, I was pretty far behind. But it dawned on me for

the first time what I was in uniform for and what I should have been doing that I hadn't been doing for the last seven years.

Now I'm firmly convinced that leaders are not born, they're educated, trained, and made, as in every other profession. Certainly, you have to have the normal attributes that a normal human being has. If a man is born with only one leg, he certainly is not going to win the 100 yard dash in the Olympic Games. But if he has two legs and a normal physique and build and he works at it hard enough, he can at least make a reasonable showing. This is true of leaders.

All of you cadets are now starting out here and will have opportunities to get yourself educated to be a leader, and the road should be a lot easier than for some of the rest of us who had to learn our lessons, sometimes, at the cost of the lives of some of our people.

General Weyland:

As you know, my combat experience was predominantly in the area of tactical air operations. Tactical air, as you all know, is the air element of joint and combined operations, which consist from time to time of air, ground, and, occasionally, sea forces. These are normally set up under a joint or a combined commander, depending upon whether foreign forces are involved or not. Now, as was mentioned by earlier speakers, World War I saw the emergence of air power. In this period, air power involved mainly reconnaissance as the best utilization of the airplane and was predominantly tactical, and the bombing and fighting that were done in World War I were primarily tactical in nature. Air power achieved its stature in World War II, where we had very large forces indeed and had Allied forces as well as American forces involved.

The surface forces had long years of service and history prior to the emergence of air power. Also, when in combat, they normally had the largest aggregate manpower involved. Consequently, with these joint and combined forces, the senior services, with their larger manpower involved, generally inherited the joint or combined leadership in the field. Emerging air power generally took a second place. We eventually got along, however.

Some of these ground commanders were not always enamoured of the emerging, dynamic, and increasingly dominant young upstart service. Nevertheless, there were a number of surface commanders—ground commanders predominantly, and generally the most successful—who were pretty far-seeing and who appreciated the rapidly increasing potential of air power as a war-winning member of the armed forces. The most provincial looked upon air power merely as a useful adjunct to their own individual services.

I'd like to mention a few of those surface, predominantly Army, commanders whose understanding leadership had a lot to do with the successful emergence and the ultimate dominance of air-space power in war. General Marshall was very broadminded and got along very well with General Arnold, as you have been told. There was General Eisenhower, who became the Supreme Commander in Europe; there was General Bradley, who was the senior American ground commander in Europe. And I must mention General Patton because I loved the old guy. I considered him the best field army commander that the world has ever seen. Then, of course, there are people like John Hull and General MacArthur out in the Far East, with whom I later became associated during the Korean War, and who was a character unto himself.

Now to mention a few from the UK [United Kingdom]. The outstanding one was the Prime Minister, Mr. Churchill. He considered himself a naval person, I've heard. And there was Mountbatten; Alexander, whom I did not know; and Field Marshal Montgomery. Whether you like him or not, he was a brilliant soldier and had quite an impact, I think, on the emergence and proper employment of air power. All of these commanders, American and British, had considerable influence on the evolution and emergence of air power and consequently its leaders.

Having mentioned some early ground leaders and their influence in the development of air power, I'd like to mention a few early air leaders. There was Frank Lahm, Oscar Westover and Benny Foulois, with whom everybody is familiar, who had a tremendous influence on the development of air power. We had a fellow named Horace Hickham, who would have been a dandy. He was really a wonderful officer, but he came to an untimely death in an aircraft accident. (I know he was good, because he gave me the best chewing out I've ever had in my life.) Then there was Frank Andrews, another one who would have been one of the top air force people, and he was at the time he was killed. I served under him in Panama when World War II started, and he was a dandy. He loved to fly airplanes, and he didn't always fly them very cautiously. Consequently, he bumped into an ice mountain up in Iceland. Otherwise, he would have been undoubtedly one of our greatest leaders in World War II and subsequently. Then we had many others of whom you have heard and know and who had a profound influence on our development. George Kenney and Ennis Whitehead were great tactical airmen. Ira Eaker, who is sitting back here, contributed mightily, especially to thinking, as he still does.

Apropos the thinking in the Air Force, I'd like to mention the old Air Corps Tactical School. Unlike Curt LeMay, I was privileged to go to the Air Corps Tactical School, the think tank of the emerging air force. There was a guy there named Hoyt Vandenberg, now gone. "Poss"

Hansell was there, and Larry Kuter, and many others. They were thinking way ahead and certainly had a tremendous influence on the evolution of air power, whether strategic, tactical, or otherwise. And those of us who did attend that school owe a great debt of gratitude to the people down at Maxwell Field back in the 1930s who were postulating what air power could and should be in the future.

Among the British airmen of note, there was the father of the Royal Flying Corps and the Royal Air Force, Air Marshal Lord Trenchard, who was a wonderful guy and who had a tremendous influence on the development of the RCAF [Royal Canadian Air Force] and concomitantly on the development of the American air forces. On the tactical side, there was Portal, who was the head of the British Air Force. There was Air Marshal Tedder, who was associated with Field Marshal Montgomery in Africa; they jointly developed much of the tactical air doctrine which we adopted later on and, I like to think, improved. Finally, one of the great British tactical air commanders was a fellow named "Mary" Coningham.

I'd like to close by quoting some of the great commanders on the importance of air power. General Eisenhower stated, "Battle experience proved that control of the air, the prerequisite to the conduct of ground operations in any given area, was gained most economically by the employment of air forces operating under a single commander."

Field Marshal Montgomery, whether you like him or not, is a great guy to quote insofar as air matters are concerned. "Air power," he declared,

> is becoming the decisive factor in warfare. We must, therefore, get organized accordingly. What we must do now is organize the command and control of our air forces so as to retain the greatest degree of flexibility, centralizing command in the highest commander who can effectively exercise that command so he can wield the available air forces in a theater of war as one mighty weapon.

Our chairman, Doctor Pogue, said that he certainly expected me to quote General Patton, so I close with a story about Patton. While he was in North Africa, General Patton's association with the air apparently wasn't too happy, and he came up to England with a rather low opinion, I suspect, of air power. Nobody particularly envied me my position of working with General Patton in the forthcoming combat on the Continent. My fighters and recce had become old pros by that time, however, and they were pretty doggoned good. So while his troops were being assembled in Great Britain, I took General Patton around and visited all of our units. To make a long story short, he learned what military precision is all about, and he began to appreciate at that time what air power really was. He would attend briefings and debriefings, and he discovered that we had a real professional air force in England that could support

him and anything else that had to be done in the invasion and the subsequent operations on the Continent.

When the invasion was made by the American First Army and the British armies, General Patton and I were supposed to be secret; we had led the Germans, hopefully, to believe that we were going to make a main invasion someplace else. Well, finally we moved across and were all set for the breakout that did occur. His tanks still had bulldozers on them, and my fighter bombers were primarily still operating from England; but he started an armoured column south on a road. One afternoon he went down to visit them, and he came back very, very jubilant. In his high, rather squeaky voice that he had when he was rather excited, he said, "Opie, come on over." So I went on over. "How about a drink?" he said. Well, I did'nt say no. Then he described what had happened down on this highway. He said the only thing that was holding up his troops was a whole bunch of dead Germans and enemy artillery, horses, trucks—materiel that fighter bombers had beat up on the roads. His tanks had to pause and bulldoze them off the roads so they could advance. He was pretty jubilant about that, and he envisioned our very early arrival in Berlin and things of that nature. To make a long story short again, it wasn't very long before that quart of bourbon had disappeared, and this mutual respect which we had achieved back in England ripened into a very warm and undying friendship. And he became a very devout advocate of air power. If he'd been about ten or twenty years younger, I'm sure he would have been an airman.

Admiral Martin:

We are nearing the end of our second day, but it has only become fully clear to me how exactly outnumbered this sailor is. To bolster my courage, I've been trying to project myself in a reverse sort of way into the frame of mind of a Marine Corps ditty which used to taunt us very junior naval officers in the 1930s. It went something like this: "Ten thousand gobs laid down their swabs to lick one sick Marine."

It seems that almost everyone in naval aviation, past and present, agrees that the most important elements of leadership in World War II were those exhibited by a comparatively youthful group, the air group commanders and squadron commanders and a few others even younger. There are reasons for this which I will deal with later. At this point, it would be appropriate to mention two factors that were important to the wartime successes of these young leaders. One factor influenced the quality of leadership found in flyers engaged in combat. The other greatly affected the results of exercising good leadership in war. The active Navy flyers of World War II had a distinguished heritage to live up to, a heritage established by the founding fathers of naval aviation. William

Moffett and Joseph Reeves, for example, were tough, resolute, inspiring, outspoken, ever eager to experiment. John Towers, naval aviator number 3, and James Forrestal, naval aviator number 154, were brilliant administrative reformers who were intensely dedicated to naval aviation, receptive to new ideas.

In the high command was Ernest J. King, hard as nails, profane, and uncompromising. Soon after the United States entered World War II, he was designated Commander in Chief, United States Fleet, and Chief of Naval Operations. Upon assuming this highest naval command, he was heard to remark, "When the shooting started, they wanted an SOB, so they sent for me"—or words to that effect!

In the fleet commands we had William F. Halsey, Marc Mitscher, and John S. McCain. "Bull" Halsey—gruff, exuberant, aggressive, all fighter; consequently, not overly meticulous in planning. "Slew" McCain—fearless, aggressive, personally pleasant, but also profane, occasionally hotheaded, as evidenced by his comments about General "Hap" Arnold. Pete Mitscher, quiet, soft-spoken, slight of build, but tough and wiry, a leader's leader commanding the respect of all naval aviators. Among the air task group commanders we had Arthur W. Radford, Forrest C. Sherman, Alfred E. Montgomery, J. J. Clark, John W. Reeves, Gerald Bogan, Ralph E. Davison.

I believe a thumbnail description of these admirals serves to make the point that no two leaders come from the same mold. "Raddie" Radford—tough minded leader under stress, quiet, calm, decisive, serious, highly respected. "Fightin' Freddie" Sherman—explosive, zealous, demanding, irritable, a superb tactician who loved a good fight, liked to take risks. "Monty" Montgomery—impatient, sarcastic, irascible except in battle, when he was calm and thoughtful, not popular, but respected. "Jocko" Clark—loud, boisterous, hard-hitting taskmaster, inspiring confidence up and down; Cherokee Indian blood contributed to a fighting spirit; tough, unrelenting advocate of do-it-yourself. "Black Jack" Reeves—tough, fiery, impatient, feared by many, but those who knew him well knew of his deep compassion. Jerry Bogan—outspoken, smart, tenacious in combat, loved a scrap, a thorough teacher. Dave Davison—highly intelligent, articulate, well-read, friendly manner, fun loving, and a smooth tactician.

Those were the superiors of our young leaders. Note the wide variety of characteristics, qualities, traits, and personalities. No two were alike, yet all of them were effective in combat situations, some more than others. Many were emulated by our young leaders. Each admiral left his imprint on the air group and squadron commanders who carried out his orders and brought him the results of their actions in combat, bringing also lessons learned, and in effect, formulating new doctrine, discarding

the ineffective procedures, and initiating imaginative tactics to be tested in subsequent combat missions.

A vital factor in the success of naval aviation has been a partnership between the Navy and private industry—the aircraft and ordnance manufacturers, the weapons system developers, the ship builders who were willing to go along with the bizarre idea of installing an airfield on a ship's hull with a hangar in its bowels. Even the greatest of air leaders cannot be successful in combat unless he is provided adequate aircraft and weapons systems. Therefore, let us not overlook our leaders in aeronautical design and the leaders in aviation industry who produced quality products in prodigious quantities.

At the beginning of World War II, the Navy's inventory of aircraft included slightly more than 1,700 fixed wing, plus a handful of lighter-than-air, vehicles. At the end of 1945, only five years later, the Navy's inventory recorded more than 40,000 aircraft on hand, a staggering achievement in industrial development, especially when viewed in light of other wartime production simultaneously in progress. The task for naval aeronautical engineers was to develop aircraft uniquely configured to serve the Navy's at-sea mission. Navy personnel worked in a day-to-day liaison with private industry to develop a variety of aircraft which enhanced naval capabilities, aircraft which embodied totally new flight and weapons system technologies to serve fleet warfare requirements throughout the oceans of the world.

We have looked at two important factors which undergirded our young flyers: seniors who set inspiring examples, and the strong support of a Navy and aircraft industry partnership which provided superior tools of war. But why was the leadership position of these young flyers considered to be more important than others in World War II aviation? Here are some of the reasons. They were the principal protectors of the fleet from enemy air, surface, and subsurface threats. They were the fleet's principal offensive means to seek out and destroy the enemy wherever he could be found. Remember, too, the commencement of World War II found naval aviation with untried doctrine and untested tactics. The naval air war of World War II was a new experience. It could not be preplanned and pre-programmed as professional football teams plan for next Sunday's rival. Throughout the war, air group and squadron commanders, men in their late 20s and early 30s, continually were rewriting doctrine, redesigning tactics, and injecting imaginative new ideas for improving combat results or to meet new, unpredictable situations. As senior staff positions and many senior aircraft carrier billets were filled by graduates of the air groups after the first year of the war, the momentum of every aspect of fleet carrier operations picked up.

Let us now take a little closer look at these young leaders. What are the desirable qualities of leadership? Do the leadership qualities desired of a young officer in time of war differ from the qualities we expect of them in times of peace? Let us consider what one fleet commander wrote as guidance to young officers who asked him what was expected of them if they were to attain outstanding fitness reports, something that you worry about primarily in peacetime. He gave them this list:

1. **Achievements:** The outstanding officer produces results. Many are industrious; the true measure is effectiveness of the work.
2. **Ability to make decisions**, closely allied with achievement: The officer must learn to evaluate information, analyze the problem, and integrate the two into a sound and incisive decision.
3. **Breadth of vision:** An effective officer must bring to his profession a knowledge of all the political, social, scientific, economic and military factors which impinge upon his service.
4. **Imagination:** Imagination and its companion virtue—initiative—are vital.
5. **Knowledge of one's own job:** This is easily described and difficult to achieve. It means a complete mastery of a job and a detailed knowledge of all its responsibilities, including those of one's subordinates.
6. **Manner of performance:** There are four general approaches to getting a job done. The officer can do it himself, drive others to do it, inspire others to do it, or combine those three in the optimum manner. The outstanding leader knows himself, his job, his men, and the immediate situation, and he knows how to combine those approaches to solve best the problems at hand.
7. **Teamwork:** Individual accomplishment is important, but teamwork—cooperation and a willingness to contribute more than one's share—is vital.
8. **Personal behavior:** The spectrum of this quality is so wide that it cannot be easily condensed. Suffice it to say that no military officer should be in a position of responsibility if his entire behavior pattern does not reflect absolute integrity and honor.
9. **Physical endurance:** Outstanding achievement is physically arduous. An officer must have the physical capability to remain mentally alert through long hours of hard work.
10. **Sense of humor:** Really a matter of keeping everything in the proper perspective, of being able to distinguish between the important and the trivial.
11. **Being a good shipmate:** In achieving the growth described in this check off list, an officer must not lose sight of his relationships with others. One can only be effective through others. You can't go it alone.

In adapting the above list to a wartime situation, it is necessary to say something about courage. Since courage flows from devotion and

consecration, let me close with the words of, to me, the greatest naval leader of our time, Arleigh Burke:

> Experience has brought me a full appreciation of the prize cargo a man can hoist aboard. To this beloved Navy I do commend: love of country, overshadowing all other loves, including service, family, and the sea; individual desire to excel, not for aggrandizement of self, but to increase the excellence of the Navy; devotion, perhaps consecration, to personal integrity in oneself, in one's service, in one's country; courage to stand for principle, regardless of efforts to dilute this courage through compromise or evasion.

Perhaps you would agree with me that these qualities are as valid today as they were when they were written over twenty-five years ago.

DISCUSSION

David Schoenbaum (University of Iowa) asked the panelists what kinds of problems face cadets of this institution that are significantly different from their own experiences and what they have done that they would not want to repeat.

General LeMay: As I understand your question, you are asking what were some of my experiences and were there any of them I wouldn't want to repeat. The answer is, yes, a lot of them. I think the main experience that I wouldn't want to repeat is the war experience that I had. That experience was, I think, responsible for my actions and the actions of the people I gathered around me in building up the Strategic Air Command after the war.

There is nothing worse that I've found in life than going into battle ill-prepared or not prepared at all, and that was our case. We suspected some four or five months before it came that we would be in war shortly. This was a horrible experience to go through, because I was operations officer at the group at that time, and the questions in my mind were what am I going to do and what should I be doing now to get ready for war? I had a newly formed group which didn't have all the people in it. We only had a few airplanes, not much in the way of equipment and supplies, no place to bomb, and no bombs. It was a pretty horrifying experience to go through, trying to get ready to fight without anything to get ready with.

Even a few months later on, when we were actually at war and I was given command of a bomb group, it consisted almost 100 percent of inexperienced people. I had one major, who had been commissioned from the rank of master sergeant, an administrative clerk, and he was my group adjutant. I had two pilots, besides myself, who had flown B–17s before, and we three had to check off the other pilots, who came directly from single engine school. The armament officer was an ex-Marine corporal who had been in the trouble down in Nicaragua with the Marines and who had been a captain in the Nicaragua National Guard for awhile. He knew something about machine guns, so he was my ordnance officer. My prize was a first lieutenant who had been a line chief in B–17s as a tech sergeant.

The navigators I got two weeks before we went overseas. They had had one ride in a B–17 before they navigated across the Atlantic; the first time half of them had seen the Atlantic was when they navigated across it. The bombardiers had never dropped a live bomb. They'd dropped some practice bombs over a desert on a nice white circle you could see for fifty miles, something entirely different from trying to find a factory in the midst of a built-up area in the industrial haze of Europe. The gunners had been to gunnery school, supposedly, but they had never

fired a gun from an airplane. I got them one ride in a B–17 to shoot the machine guns out the rear waist gun position at the desert as we went by.

We never got to fly formation until we got to England. The first day we could fly I got up in formation, and it was a complete debacle. The next flight, I got up in the top turret on the radio and positioned each one of them, and the gaggle that I had around me approached the formation I wanted to fly. The third time we flew, we went across the Channel. That was our start into combat.

Things got better as the training program got organized and proceeded, but we never did catch up. Every theater had to have a combat crew replacement center to bring new people up to date on the latest things we were doing because the war was moving too fast for them to keep up in the training program back home.

I hope no American has to go through the exercise again, and that was my hope when I took over command of Strategic Air Command in 1948—that we could build a force that would be so strong, so professional, so well equipped, that no one would dare attack us. That's what kept us working seventy to ninety hours a week for the ten years that I was in the Command, and I think most of them are still doing it now.

Brigadier General Tom Gregory (Mobilization Augmentee to the Deputy Chief of Staff/Logistics at Headquarters Military Airlift Command) asked if leadership, once learned, became ingrained, or if leadership skills could be lost either temporarily or permanently?

General LeMay: If leadership's once obtained, can it be lost? Well, I suppose it can become rusty. I never had a chance to get rusty on it because I was in the operational and command end of the game most of the time except for the unpleasant tours I had in the Pentagon. I think it probably can get rusty, but it is probably like riding a bicycle; once you learn the procedures, I don't think you forget them. You may forget some of the technical points and things of that sort that would enhance your leadership, but the basic principles I think stick with you pretty well.

Admiral Martin: I completely agree with you, General. I believe that leadership is something that improves with age, and this has been true of the great leaders I've known. They have grown greater, even the ones in retirement are still leading in their areas as civilians. I think that it's possible for you to lose it temporarily through illness or emotional distress and that sort of thing. But I believe it's something, as the General says, like riding a bicycle; if you have it, and if you have the proper exposure, which the young men at this establishment would have, I think it will grow; and the normal thing is for it to grow and grow and grow.

Chet B. Snow (Military Airlift Wing at Travis Air Force Base) asked General Huston what lessons we can learn from General Arnold's career on dealing with the problem of

dual leadership in the military and civilian spheres.

General Huston: First of all, there is an appreciation that it does exist and that in the American system the final decision is made by civilians. The military leader must say, "This is what we think, and up to a point we'll argue as forcibly and as logically as we can for that; but once that decision is made, we'll salute smartly and carry it out to the best of our abilities." It's a rather simplistic answer, and a very obvious one; but I think if you look at General Arnold's career, you'll see he believed in this idea, and, more importantly, he practiced it.

Cadet Anthony Taijeron inquired of General LeMay: "What do you believe is the primary problem that my generation faces in the military today, and how do you propose we go about attacking it?"

General LeMay: Well, your generation has quite a few problems. I guess like all old men throughout the ages, we think the world's gone to hell in a hand basket. Sticking to the military problem, I think that we haven't provided an adequate national defense for the country, and I believe that we haven't yet evolved to the point where we can do without an adequate defense, To me the only sure way of keeping out of war is being so stong that no one dares to attack you. I think we have the capability and resources to do this. We seem to lack the will. So, from that standpoint, to me your primary problem is to provide an adequate defense of the country to keep us out of war. The only way to do that that I know of is to get the true story of the situation to the people. I have great faith in the American electorate. If they get the facts, they usually come up with the right answer at the ballot box. It is very difficult to get the facts and the true story out to the American people at the present time, but it can be done.

An example that I always give on the subject occurred right after I came back from Europe and took over SAC, which we started to build back up again because we got a good scare from the Russians. One of my chores was to convince the then-majority leader of the Senate, Lyndon Johnson, that we needed a pay raise in order to attract people into the service and to keep people in the service after we had trained them. I had trouble cornering him so that I could tell him my story, but finally ran him down on the ranch in Texas over a weekend. First thing I had to do was go out and do a little electioneering with a couple of "kits," as he called them, in a station wagon. Each kit contained a bottle of bourbon and some ice, and so forth. But I finally got him around the swimming pool on Sunday morning, and I gave him the story.

He said, "LeMay, I agree with you. You've got a good case and you do need a pay raise, but you haven't got a prayer of getting it now. You couldn't get it through the Military Affairs Committee; and even if you did, you couldn't get through the Appropriations Committee; and even

if you got it through there, you couldn't get it on the floor because you couldn't get it through the Rules Committee. Even if we passed it, the President would probably veto it, so you haven't got a prayer."

So I went home, and about two weeks later Arthur Godfrey was throwing a tea party on Sunday morning. I just happened to be there and got Godfrey on the job. He gave Senator Johnson the story and got the same answer. So he said, "Well, Senator, you say we've got a good story. If you were in our position, what would you do?" And Johnson replied, "Well, if you can get grass roots support, we might be able to get something done." And Godfrey said, "What do you mean—letters to the Congress?" "Yes, that's one way." And Godfrey said, "Get braced, you are going to get some letters." At the time he was operating a radio program at 10 o'clock every morning. All the gals, while they were doing the morning chores, ironing and washing the dishes, and so forth , listened to Godfrey. And he gave them the story. Three months later we had a pay bill, which the leader of the Senate had said was impossible.

One man did it with a radio program. Of course, he couldn't do that in this day and age because then he was putting out a live radio program; by the time his show went off the air, he had five vice presidents in CBS whose sole duty was to audit his tapes before they went on the air. So the job can be done, but not by one man now. A lot of people have to get onto it. You've got to get the story to the voters, and I think the people in this country want an adequate defense; and that is not a No. 2 defense.

Cadet Vance Skarstedt asked General LeMay how well we understood the Japanese and their concept of war and how much moral considerations affected his decisions regarding the bombing of Japan.

General LeMay: Well, first of all, I certainly wasn't an expert on the Japanese. Prior to the war we had practically a non-existent intelligence system. So I personally consider that I knew nothing about the Japanese except that they were pretty tough fighters and they did consider a defeated enemy even worse than a dog and treated them as such. I had respect for them as an enemy, but not much respect for them as a people. Killing Japanese didn't bother me very much at that time. It was getting the war over that bothered me. So I wasn't worried particularly about how many people we killed in getting the job done. I suppose if I had lost the war, I would have been tried as a war criminal. Fortunately, we were on the winning side. Incidentally, everybody bemoans the fact that we dropped the atomic bomb and killed a lot of people at Hiroshima and Nagosaki. That I guess is immoral; but nobody says anything about the incendiary attacks on every industrial city in Japan, and the first attack on Tokyo killed more people than the atomic bomb did. Apparently, that was all right.

Anyway, at the time we were fighting, we considered we were fighting for our existence, our life, and more or less ethical problems weren't of primary concern to me, although I didn't discard them completely. For instance, we had to drop leaflets on Japan along with the bombs. This was not a very popular pasttime with my troops. They would rather drop bombs than leaflets. Well, as long as we had to drop them, we decided to drop some of our own. So I found out what the lead time was in getting some leaflets printed up back in Hawaii and then in canisters out to Guam; and I looked at the target list and the progress we were making, and I picked out ten cities we were going to hit down the road a little bit. Then, we printed up leaflets that, in effect, said, "Look, Mr. Japanese Citizen, we are at war with your country. We are not particularly at war with the Japanese people, per se, but your leadership has got you into this mess, and you are going to be in danger. We are going to destroy the industrial areas of your city. We advise you to seek safety and leave." So, after we hit the first four cities, the rest of them evacuated to a large extent. I expected them to put antiaircraft around the cities in large numbers, but they didn't. I talked to one of the officers who went in with the strategic bomb survey after the war, and he said that in those particular towns they had an over-abundance of fire engines. One about every 100 yards in the street, burned up along with everything else.

I guess the direct answer to your question is, yes, every soldier thinks something of the moral aspects of what he is doing. But all war is immoral, and if you let it bother you, you're not a good soldier.

COMMENTARY

FORREST C. POGUE

I have a three-fold mission this afternoon: to comment on General Huston's paper, to comment on points raised by the panel, and then to talk for awhile about the writing of biography.

I believe that Jack Huston in the allotted time has managed to summarize for us the great contributions of General Arnold to the development of U. S. air power and has called attention to some very important parts of his work as Commanding General of the U. S. Army Air Forces. As General Marshall's biographer, I was pleased to see Huston's views on the importance of the close relationship between Marshall and Arnold. A friendship which began in the Philippines before World War I was strengthened during the war years. General Marshall stressed to me the loyalty that he found in his dealings with the airman. When faced by public demands early in the war for a separate air force, General Marshall pointed out to General Arnold that the air force at that time lacked the requisite number of trained staff officers to man a separate headquarters. Instead he gave great autonomy to Arnold and allowed him to develop his own guidelines for promotions, decorations, and the like. He continually urged Arnold to watch his health and chided him after the first heart attack on the necessity of taking his duties more easily. Arnold pushed the development of air forces, but worked within the Army. He made full use of his special relationship with Marshall.

At the great conferences, Arnold usually followed the Marshall line. He spoke up firmly for air operations, but fitted his plans into the overall U. S. strategic picture. Air Chief Marshal Portal, in speaking of Arnold, said that he was less effective in Combined Chiefs of Staff meetings than the other American members. But he noted that Arnold vigorously defended the American air forces' view. Although he preferred to keep his main effort in the European Theater in accordance with the Europe First commitment, Arnold managed to strengthen air activities in the Pacific. It was not necessary for him to take the lead in great conferences because, as General Huston has noted, Marshall often strongly made his case for him. It is not always clear whether his tendency to remain relatively quiet in some of the conferences was due to his desire to follow Marshall's lead or to a feeling of some inadequacy in debating with the British repre-

sentatives. This point is one of several that the biographer of Arnold must deal with in a definitive work. A most important point is the fact that Arnold managed to differ with the British on points of strategy without antagonizing them, as Admiral King sometimes did.

Incidentally, General LeMay's comment on Arnold's request for an estimate on the end of the war recalls an incident concerning that date. I am not certain whether he accepted this as absolutely accurate because he made a bet with General Hastings Ismay, Churchill's chief of staff in the Ministry of Defence, in which he was not as optimistic as Ismay. When I interviewed Ismay in 1946, he called to my attention a plastic case which Arnold had sent him containing coins or a bill (Note to historians: you should always make notes on matters like this and not trust to memory as I can't recall which this was after more than thirty years) and words somewhat like the following: "Dear Pug, Thank God I can pay this now."

General Huston has made a strong case for Arnold's handling of public relations in the development of public support for the air forces and in the building of service morale and esprit. His earlier experience after World War I in this field was expanded into a very vital element of his command.

Arnold early recognized the very crucial role that research and development had in the growth of air power. To a greater extent than his contemporaries, he called into the service of the air force outside research agencies and laid the groundwork for extremely important work in this sector in the independent Department of the Air Force.

General Huston has made crystal clear that we should not wait any longer to get started on a truly definitive biography of one who contributed so much to the winning of victory in World War II. General Arnold's *Global Mission*, while valuable for light shed on his early career and on some of his thinking, is clearly subject to errors in fact and interpretation. General Huston's paper has drawn on material that has not been used before. Arnold's definitive biography is high on any list of needed volumes on World War II.

It is always stimulating to have a panel on a topic of this type which includes public figures who have had a share in the events of which historians write. The three speakers played crucial roles in air fighting in World War II and after. All of us, I am sure, have been interested to hear their views on the making of combat leaders. The three have called the roll of great air leaders of our time and have noted qualities of leadership they possessed and strengths and weaknesses that they noted in the educational process. I was interested to hear General LeMay stress that leaders were made and not born and realize how much harder it is

to find the answer for the development of each leader when one cannot hide behind the easy answer, "He was a born genius." That saves so much bother. I hear continually from readers of my Marshall volumes, "but how was this man developed, what special training did he have, what person or events or series of events molded him?" The difficulty of finding this from staff papers or memoranda underlines the importance of talking as soon as possible to those who served with these men and who may have an inkling of why they were willing to serve under such a leader and how that leader inspired them to greater effort and performance.

Al Hurley asked particularly that I talk about the process and problems of writing the biographies of great military leaders.

Last year a friend of mine who had completed some months before a project of interviewing in depth an aged woman who was one of the leaders of the woman suffrage movement came to see me and said that she had been asked to write a biography of this lady, who had just died. She added, "Tell me the problems of writing a biography." I laughed and said "Perhaps the best advice is not to start it."

To those in the audience I would add, "If you decide to write, I promise you tears and fatigue and a degree of boredom for you and your friends and particularly your spouse if you have one." You will enhance your popularity with friends and especially with your wife if you do not bring up the subject of your book until asked. My wife has a game with me about how long I can speak or carry on a conversation without mentioning General Marshall.

Once that good resolution is made, you must ask, if you don't know, "Where are the papers?" Even if, as in the case of General Marshall, more than 250,000 items have been indexed and carefully filed, much must be done. There are letters which were handwritten which have to be found in other collections. There are official files that must be consulted. There are the collections of papers by acquaintances and associates and random letters in trunks in old attics. Then there are diaries by the subject of the biography or by someone who saw him often. Marshall declined to keep a diary; but he saw Secretary of War Stimson nearly every day, and Stimson kept a diary. There was seldom a day in which he failed to mention a talk with Marshall and what Marshall said. Morgenthau's diary and Forrestal's diary helped to provide additional information about Marshall's activities. I discovered by chance in an interview with an officer who studied at Fort Leavenworth with Marshall in 1906 that he had kept a rather full diary on that period and there were numerous allusions to Marshall's activities and his ability. If your subject operated on the international scene, there are archives abroad which should be examined. This task was made somewhat easier for me because

many key British papers were found in War Department or State Department or Supreme Headquarter's (Eisenhower's command) files. But there are many important materials still to be looked for. Someone wrote me the other day that he had seen recently in newly opened records in the British Public Records Office a memo in which Churchill, exasperated by the insistence of the U. S. Chiefs of Staff on the invasion of southern France, wrote Ismay to say that the U. S. Chiefs were nice fellows but were very stupid strategically. Of course, he added, we mustn't tell them that. I have found in recent months in Foreign Office records internal memoranda which throw additional light on what the British were thinking about American actions. I was able to show one British official a letter he had written to London from Washington about a talk he had with Marshall, which threw more light on Marshall's views at the time than I had found in the American files. (Of course, here one must be sure whether the British official was reporting accurately or whether Marshall was making the statement for effect. Such are the beauties of writing history and biography.)

Once a start has been made on finding the materials, the writer of contemporary biography or history should ask, "Who can I interview who could throw light on my subject's thinking or decisions or methods or work or personality?" The contemporaries of Marshall are thinned out considerably; but twenty-three years ago when I started interviewing for the biography, I was able to find boyhood playmates and a number of VMI classmates. I even was able to draw on one hundred interviews which I conducted in the 1946–1952 period for my book on Eisenhower. Many of the questions I asked the various members of the British Chiefs of Staff and the U. S. Chiefs of Staff and French leaders such as General de Gaulle and Marshal Juin and Marshal de Lattre de Tassigny were very pertinent to my later writing on Marshall. Even though many of the men of his own age are gone, it is still possible to talk with younger officers who worked at a junior level in the office of the Chief of Staff or in the Department of State or Department of Defense. The young orderlies or cooks or junior aides may not have been present when great decisions were made, but they can shed light on his activities. Two summers ago, I located a middle-aged man who as a young warrant officer had been Marshall's chief stenographer during the General's mission to China. He supplied considerable detail on the places where Marshall lived, what his working habits were like, how he handled correspondence, and the like. A year ago in November, I went to Taipei and interviewed several of Chiang Kai-shek's important political and military advisers. Two had served him as foreign ministers, one was his last defense minister, another was the surviving member of the C-C clique which had played a dominant role in the Kuomintang and had strongly opposed Marshall's policy.

At first, there is the period of acquiring and storing and indexing information. Then follows the probing period in which we try to find what made the man tick. Where did the inspiration for his career come from? How did he prepare himself (was the process deliberate or accidental)? What were the key influences in his career? What were the lessons learned from his youthful experiences or the early years of his career? What were the roads not taken, and why did he take the roads that led to the right track?

Here we also must probe the sources. Stimson's diary says constantly, "Marshall came in; he was much worried." After a time you wonder whether the entry reflects Marshall's state of mind or Stimson's. You read letters from Patton giving lavish praise and then you see in Blumenson's volumes on Patton a letter to a friend or an entry in the diary which shows a totally different point of view.

What was the man like—his strengths and weaknesses, his self-discipline, his qualities of command, his influence on people, his ability to think and to decide, his reaction to pressure? Did vanity or other weaknesses affect his thinking? Did he buckle under stress? What was his lasting effect, and of what damage or errors was he guilty? What was his role in history, or how did he create a climate favorable to new ideas and growth?

With our contemporaries, I think it is well to start as soon as possible. Many people argue to the contrary: they say that where there have been controversies, feelings of opponents will be too bitter to be valuable; if the man is still alive, many will fear to speak the whole truth. And I admit that all these problems exist. But sometimes bitter spewings of hatred may furnish excellent bases for judging the nature of the opponents. Perhaps a later biographer can get a better perspective, but there is no substitute for the careful biography that is written when memories of the events are still fresh and before many of the witnesses have evolved agreed-on conclusions to be handed out as if they were news releases. Often, when one comes upon a very sweeping or damning statement, there is time to check it out against a number of witnesses who often can furnish plausible evidence to strengthen or contradict these judgments. I have been able on occasion to say to a man, "What you are saying has been contradicted by several witnesses." Some say, "Well that is the way I remember it." Some are adamant; but enough people will say, "I must be wrong" or "I was misinformed; I was relying on hearsay." Sometimes, after my first book appeared, I would find a contemporary who would say, "I have one favorite story about Marshall" and then would proceed to ask, "Did you ever hear that." And I have sometimes replied, "The story is in my first volume. Is that where you heard it?" More often than not, they will say "I suppose it is," or, "I suppose that is where the man

who told me the story got it." It gets particularly bad when they misunderstand the point of the information and insist that they are relying on a solid source. (Of course, readers get accustomed to authors who quote several books for a paragraph without making any distinction about what each contributed to the conclusions of the paragraph. I am continually amazed to find one of my books quoted as a source for a paragraph in which the only statement I can agree with is the spelling of a name or the date of an event. In one such case, I found that the only thing the individual could have taken from my book was the fact that Marshall and another general had a meeting on a certain date. Everything else there was contrary to facts as I knew them.)

You have to try to get into a man's thinking, to try to understand what he had to work with at a given time, to find the forces that drove him and the qualities he had which attracted others or made them willing to follow. There are so many myths and misconceptions that need to be corrected. It is particularly important to seek this information when we still have among us men who made a new fighting force and helped forge its doctrines.

I think the thrust of all three of the panelists here today is the importance of great personalities in the development of the Air Force, of people who rose to high place from very different platforms and who managed to make things happen even though they didn't have the courses they might have liked to have had, even though they didn't have the training they might have liked to have had, even though they didn't have special techniques and a great many other things. I think that of all the services the Air Force should be most interested in telling that story because it is the newest and because a number of the key individuals in the development are still alive.

Being able to talk with those who made history is a great asset to the historian because he can save himself years of uncertainty, years of research, if it is possible to question the individuals themselves rather than having to interpret the written record. You can settle a lot of questions very easily. Where did you get your first inspiration? Who influenced you? When did you first learn certain principles of leadership that you brought to perfection? What did you think? In retrospect, would you do this again? Why do you think this particular thing worked? From whom did you get the suggestion?

Let me give one simple illustration. I read in the first book published about Eisenhower that he had met Marshall in 1924 when the latter stopped in the Canal Zone on the way to China. The story said that is where they met because the Marshalls spent the night with General "Fox" Conner, and Ike was Conner's aide. It turned out that they didn't meet then, and the only way I ever got it straight was to ask Eisenhower and

to ask Marshall. They both agreed that they hadn't met there. Eisenhower gave the reason. He wasn't there; he had gone home on leave. Well, I don't know how many years it would have taken, even with computers, to find that answer, but I was able to find it easily one day in Gettysburg when I asked General Eisenhower.

The problems of researching the lives of individuals are enormous because you have to deal with so many questions for which no one wrote down the answers. Often, diaries were kept and you can find them. But the diaries do not always give the information that you most want to know because the individual doesn't always want to put down the facts that you most want to know. Marshall once said that the reason he didn't keep a diary was that if it were kept right he couldn't get anything done, and that if he wanted people to think well of him he'd spend a lot of time taking out of the diary things that might not help his reputation. So he preferred to leave it up to history.

If you wait until history catches up with the legends and the myths and the misrepresentations, you are going to wait a very long time. The time lag even after you get the thing told truthfully is astonishing. I will give you three illustrations about that.

One is the myth that persists that Marshall was jumped over thirty-five or thirty-nine people when he became chief of staff. Marshall, it was true, was promoted ahead of more than thirty people, but there was a rule at that time that one had to be young enough to serve four years in that job. Once you applied that rule, there were four people ahead of *him*. So it wasn't all that big a jump. But when five or six people reviewed my book, they said that I had repeated this story and they thought it was a wonderful thing. Yet I had done everything I could to disprove it!

Another example was in an article by Johnson Hagood that came out when Marshall became chief of staff. Hagood reported that when Marshall completed the now-famous 1914 maneuver in the Philippines, General J. Franklin Bell, his boss, called on him at lunch and said, "Gentlemen, I want to present to you the greatest American soldier since Stonewall Jackson." There is no evidence that he ever said it. Marshall himself put the kibosh on it when he wrote Johnson Hagood, "I'm afraid my own mother wouldn't believe all this nonsense." And yet I still see it repeated.

Since we have neglected the Navy, I will tell you one more story. One day I was speaking at the Naval War College; and at the coffee break I was called to the telephone, and Admiral Rickover began a conversation in this way: "Why don't the people at your library know the answers to anything?" And I said, "What is it you wanted to know?" He said, "I have heard that General Marshall once told the President of

the United States that if he took a certain action, he, Marshall, would resign, and I want to use that in a book I am writing. Will you confirm it?" I said, "No, Sir." "Well, don't you know the things that happened with General Marshall?" I said, "I probably know a lot of things that didn't happen, and as far as I know, that didn't happen." "But it proves my point so beautifully," he said. And I said, "Well, if what you want is something that I can confirm, that will carry the same point, that Marshall felt that he had a right, even a duty to present to the President the Army's point of view, I can furnish you a dozen examples." And he said, "You mean you wouldn't use the story in your book?" And I said, "No, Sir."

It's bad enough to try to get rid of the myths without adding to them. And this is one of the things I want to pass on to you about the value and importance of getting on with the business of writing about the true leaders and builders of the Air Force.

V

THE SEARCH FOR MATURITY IN AMERICAN POSTWAR AIR DOCTRINE AND ORGANIZATION, 1945–1953

As the focus of the symposium shifted to the years after World War II, the nature of the papers had to change. The broad scholarly surveys of the previous sessions were no longer possible; most of the primary source materials are usually inaccessible, and the events being examined are too contemporary. The historians on the program (except for those willing to be speculative) now tended to narrow their coverage. At this point, makers of air power history used their first-hand experience to provide the necessary breadth of view. This shift in the nature of historical knowledge prompted introductory remarks by the chairman of this session on postwar strategic air doctrine, Professor Ernest May of Harvard, that were so pertinent as to deserve inclusion in this volume.

In any case, the two major papers in this session are at the forefront of the initial scholarly study of the post-World War II era. These works offer fresh information and insights, but also provide valuable guides to much recently-opened material. Both papers make clear the need to rethink previous assumptions about the years 1945–1953 by demonstrating the evolutionary nature of the searches by the new United States Air Force and its often bitter rival at this time, the United States Navy, for the proper relationship among technology, doctrine, and policy. Equally important, the papers also afford some provocative insights into how military institutions adapt to technological change.

Doctor John Greenwood, a former official historian for the Air Force, graphically presents the story of that service's effort to achieve a strategic nuclear capability and a leading place in national war plans. Mr. David Rosenberg, another young scholar and consultant to the Navy on the evolution of strategic doctrine, focuses on that service's effort to find the proper role for its aviation in the nuclear age. He concludes that the Navy's refusal to accept a simple functional distribution of strategic forces benefited the service and the nation by bringing the Navy "to focus by degrees on a problem much in the nation's future: that of limited war." Because of the seminal nature of Greenwood's and Rosenberg's papers, Chairman May gave the time originally planned for audience participation to the two historians for critiques of each other's work. Their exchange drove home the intensity of the interservice competition in the critical years under discussion.

The commentator on these papers, Lieutenant Colonel David MacIsaac, is uniquely qualified through his own ongoing research in the same rarely-studied sources. He elucidated the stumbling blocks to the enunciation of national air policy in this period and then went on to warn of the pitfalls to historians who rely too heavily on the newly available documents. In doing so, he returned to the recurring idea in the symposium that "the human element in this business is absolutely of its essence. . . ."

Time considerations forced the planners of the symposium to exclude consideration of the very significant views of air power doctrine advocated by the U.S. Army and the U.S. Marine Corps in the 1945–1953 period. The editors tried to remedy this deficiency in part by later soliciting comments on the papers in this session or on the role of air power in those years. Colonel J. E. Greenwood, USMC, Deputy Director for Marine Corps History, offered a Marine's perspective; while a pioneer Army aviator, Lieutenant General Robert Williams, USA, replied with an essay on the evolution of Army Aviation since 1945. Brigadier General

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James L. Collins, USA, Chief, Office of Military History, U.S. Army, provided a short bibliography on Army Aviation.

INTRODUCTORY REMARKS

ERNEST R. MAY

I want to suggest three ideas that I think ought to be presented at this point in the conference, and particularly in connection with this session. Two of them I can point out with the left hand, at the lighter end of the scale, departing from some points that were made by Mr. Gibbs-Smith yesterday.

First of all, you remember he talked about the Wrights and their experiments, and I was reminded irresistably of one of the early routines of Bob Newhart, which many of you may have heard. The routine involved his pretending that he was a business agent for the Wrights, and he was on the other end of the phone receiving the reports on their success at Kitty Hawk; and he said, "Well, that's great, that's just great. How far? 200 yards? Well, that's very good, but that's going to mean a lot of stops on the way to the coast."

The second note also comes from Mr. Gibbs-Smith's comments yesterday. He was talking about the importance of what might have happened if the Wrights had made their demonstration where it would have been seen by a larger number of people. That reminded me of a comment made by a doctoral student of mine, who also happens to be a very high official in the Israeli Foreign Ministry. She was arguing to me one day that, in her view, we should as historians pay a great deal more attention to the consequences of events that have *not* occurred. And her favorite illustration stems from the fact that for a period of time in Vienna, Freud lived on the same street with Herzl, the founder of the Zionist movement and in some ways the initiator of the state of Israel, but they never met. My student's comment was, "Imagine what would have happened if one day Herzl had called on his neighbor and said, 'Doctor, I have a dream."

The third observation I have to point out with the right hand because it is more somber. One of the genuine insights of Karl Marx was that history can be seen as manifesting a dialectic in which the group or groups dominant in a particular era have for short term reasons brought into being forces that were in the longer run their undoing. To protect and extend their comfort, Roman patricians created the plebian and alien legions that eventually became their masters. The knights of feudal Europe, who were the heirs of these legionnaires, fostered the armorers,

provisioners, and clerks who formed the middle class that destroyed the feudal order. Marx thought that through capitalism the middle class would create an industrial proletariat that would in turn be its nemesis. This has come to seem less and less likely; but the dialectic may be working just the same, and for all the developed states, socialist as well as capitalist. The phenomena we are examining here under a microscope may, when viewed through a telescope some centuries or maybe light years hence, look like those in Rome or feudal Europe, for what could be a more deadly enemy of civilization's concentrated and complex cities than air power as it has evolved in this nuclear era.

The three points that I want to make, then, are: first, people living in a given moment may have great difficulty in conceptualizing the implications of a new technology. The people we are talking about this morning—General Vandenberg and Admiral Nimitz, for example—may have had as much trouble imagining the emergence of the MX or the Trident or the SSX or SSNX as the Wrights would have had imagining the SUPERSAVER DC-8. Second, events that do not occur may be as important as the ones that do and may be as consequential. And third, short-run interests and long-run interests may be quite different. One of the functions of history is to put short-run judgments into the longer perspective, and that I think is what we are about this morning.

THE EMERGENCE OF THE POSTWAR STRATEGIC AIR FORCE, 1945–1953

JOHN T. GREENWOOD

When Colonel Hurley first asked me to present a paper, he emphasized that it should convey the results of my recent research in postwar Air Force records. Little did I expect that he would ask me to speak on "The Search for Maturity in American Postwar Air Doctrine and Organization—The Air Force Experience." The development of the U. S. Air Force after World War II was of such vast scope and complexity that it has yet to be dealt with in a meaningful manner. Nor will I presume to do so, but I hope to leave you with a few new details and ideas.

It is obviously impossible to discuss the entire postwar Air Force. Thus, I will limit my remarks to several facets of my work on strategic air power during the Presidency of Harry S. Truman (April 1945-January 1953). His administration marked the transition from World War II to full-blown Cold War. It also encompassed most of the "Air-Atomic Era," a period when the nation's vast superiority in atomic weapons and strategic air power's ability to deliver them apparently dominated American foreign and military policy. I said apparently because, as we shall see, the Air Force's monopoly of the means of delivery in the immediate postwar years did not translate into real military capability or the power to influence the formulation of strategic policy or plans at the national or Joint Chiefs of Staff (JCS) levels. Only after the events of 1948–1950 indicated the extent of the threat and opened the Federal purse did the Air Force's strategic capability become more real than illusory.

The Origins of the Postwar Strategic Air Force

The leaders of the U. S. Army Air Forces (USAAF) believed that the air campaigns against Germany and Japan conclusively proved the effectiveness of strategic bombing as a decisive weapon of modern warfare. They feared, however, that vested interests in the War and Navy Departments would not welcome an independent postwar Air Force as a competitor for limited defense dollars. On 19 August 1945, General Henry H. "Hap" Arnold, Commanding General, Army Air Forces (CG/AAF), wrote to General Carl A. "Tooey" Spaatz, then commanding the U. S. Army Strategic Air Forces in the Pacific (USASTAF):

> While I am naturally feeling good about peace being effected with Japan, as far as the Army Air Forces are concerned it is, I shall say, unfortunate that we were never able to launch the full power of our bombing attack with the B–29s. The power of those attacks would certainly have convinced any doubting Thomases as to the capabilities of a modern Air Force. I am afraid that from now on there will be certain people who will forget the part we have played. As a matter of fact, I see evidence of it right now in the writings of the columnists—probably inspired by interested parties.[1]

Certainly, the U. S. Navy was one of the most interested parties because it saw the Air Force as its only serious challenger for the strategic mission of being the nation's 'first line of defense,' a role the Navy considered its own, then and forever. Arnold and other air leaders believed that the Navy's position was sadly outdated in an era of modern air weapons. On 28 May 1945, Arnold wrote to General George C. Marshall, Army Chief of Staff, about the potential developments in warfare:

> Our Navy, now the strongest in the world, today can protect our shores against attack from any ambitious enemy who might challenge through the sea approaches. However, any Navy, regardless of its strength, would find itself powerless to oppose stratospheric envelopment. . . .[2]

Approaching over the desolate arctic wastes, bombers and, in the future, guided missiles could strike directly at American urban and industrial centers without interference from even the strongest naval forces. Such ideas and similar public statements only exacerbated the increasingly fractious relations between the two services that would mar Truman's Presidency and jeopardize national security on more than one occasion.[3]

The wartime advances in air power and the sudden, awesome appearance of the atomic bomb in August 1945 made a great impression on Air Force leaders. They feared the possible consequences of not maintaining an effective air force in constant readiness to defend the United States and to conduct a smashing retaliatory attack against any aggressor. The war had shown that such an operational air force could not be built swiftly, and in the future no time would be available to develop one once a war began. Because of its wartime experiences and basic concepts, the Air Force was the most persistent and vocal advocate of constant readiness, standing most clearly against the old mobilization ideas that permeated the War and Navy Departments.[4] Writing about the postwar Air Force early in September 1945, Major General Lauris Norstad, Assistant Chief of the Air Staff (AC/AS), Plans, concluded:

> The day of forming, equipping and training an Army and in particular an Air Force almost overnight is passed. Due to training specialization required and increased production problems of technical equipment, we must have sufficient strength in trained personnel and modern equipment to engage an enemy without being allowed time to build up an Air Force. In the last two wars we have fortunately been afforded up to two years to gear for war. With the character of modern warfare changed so radically in this last war, particularly by new weapons, in the next war we will be in the midst of an all-out war from the start. Our only

salvation will be in immediately available modern weapons with sufficient personnel adequately trained in their use.[5]

Neither the aviation industry's production lines nor combat air groups could be readied quickly. Thus, in concert with industry groups and air power advocates in Congress, air leaders pushed strenuously but unsuccessfully for a minimum active Air Force of seventy combat groups to assure national security. General Arnold strongly supported this strength in the Joint Chiefs of Staff discussions on the size of the permanent military establishment in the fall of 1945:

> I am convinced that any careful analysis of future world conditions will clearly show that the contributions which the Army Air Forces must make to the future security of the nation require a peacetime force of approximately 70 groups. . . .In the face of foreseeable world conditions, any greater reduction [below 400,000 men] would be at the expense of national security. The tragic possibilities inherent in long range attacks with weapons as effective as the atomic bomb require us to make plain to the Congress and the President the need for an Air Force mobilized in strength.[6]

Possibly the airmen pushed too hard, boasted too much about air power, threatened too many vested interests, and cried "wolf!" too often to a wary President and war-weary Congress and public to do their cause much good. Being generally younger than their Navy and ground Army colleagues, air leaders were frequently seen as overly pampered, promoted, and pushy plane drivers in need of some basic military discipline and humility. Actually, the braggadocio concealed a marked inferiority complex and deep-seated fear that their long-sought goal of independence would not be gained now that the war was over. Major General Frederick L. Anderson, AC/AS, Personnel, fully expressed these fears to Carl Spaatz in a letter of 17 August 1945:

> I wish to congratulate you upon proving to the world that a nation can be defeated by air power alone. . . .Regardless of our demonstrated powers, it is now evident that domination of the War Department over the Air Forces is increasing; since V-J Day the vise of control has been closing. If we do not obtain a Department of the Armed Forces, with equal representation by the Air Forces, or a separate Air Force, in the next six months, we will never have it. . . . I also feel it essential that if at all possible you should return to the United States to help us fight this battle. Ninety per cent of the work of Headquarters, Army Air Forces, in the way of planning and implementation of post-war air forces comes to naught in the War Department.

The importance of the Seventy-Group Program and Perry McCoy Smith's distortion of it in his *The Air Force Plans for Peace, 1943–1945* requires a brief digression. The plan originally emerged from War Department postwar planning in late August 1945, with the size determined by the War Department's troop basis and the exact composition by the Air Force. The 70 groups remained the centerpiece of all Air Force programs and aspirations until the Korean War expansion to 95 and then

137 wings ended all talk of the Seventy-Group Air Force, except among historians.[8]

A wide variety of postwar plans had bounced back and forth between the War Department and Air Force planners until 27 August 1945. Then, in a meeting with the AAF, the War Department General Staff (WDGS), the Operations Division (OPD), and G–3 directed a peacetime strength of 574,000 men (subsequently reduced to 400,000) and 70 air groups. Although they disagreed, the Air Force representatives could do nothing but accept this verbal directive. Accordingly, after meeting with the headquarters staff, the AC/AS, Plans, decided that with a total of only seventy groups, the retention of the previously planned forty very heavy bomb (VHB) groups of B–29s would produce an "unbalanced" postwar program. Hence, a balanced air force of twenty-five VHB and twenty-five fighter groups was selected to provide the wide range of air power needed to meet post-war requirements. The VHB element was still rather large, twenty-one groups of four B–29 squadrons (eight aircraft each) and four composite bomb groups each with one squadron of twelve SILVERPLATE B–29s modified to carry atomic bombs.[9]

On 10 September, Major General Lauris Norstad, AC/AS, Plans, spelled out the rationale for the seventy groups and the large bomber force. The relatively heavy emphasis on very heavy bombers (720 aircraft) was due to the inability to expand or replace them quickly and the need to have a strong force for the first blow. Readying stored aircraft, opening production lines, training flight and ground crews, would all take much longer for bombers than fighters if a war began. Deployments specified in the plan were mandatory, Norstad said, because "only by physically locating VHB's and ancillary air units in the proposed areas will we have operating bases available for immediate operations at all times."[10]

Their plans and worries led Air Force leaders to place heavy emphasis on the strategic force, not an unusual decision given the Air Force's marked preference for bombardment aviation. While tying its quest for independence to strategic air power, the Air Force did not neglect other air missions. The war proved that air superiority was needed for the most effective strategic air operations. This meant fighters for air superiority and bomber escort as well as air defense and support of ground forces. Whatever resources were allocated for tactical aviation, air transport, and other functions, however, the Air Force still saw strategic air operations—both offensive and defensive—as its principal mission and claim to autonomy. Everything else revolved around the strategic mission: doctrine, funds, aircraft, organization, bases, personnel, strategic planning, and technology. Speaking in October 1945, Carl Spaatz, later Com-

manding General, AAF, succinctly stated the Air Force's basic philosophy: "We have one real defense: A planned and ready air offensive."[11]

The Air Force and the Atomic Bomb

The postwar period showed the crucial impact of technology on the development of the strategic air force. Arnold and other airmen warned endlessly that modern science and technology made the United States vulnerable to devastating air attacks. In his 28 May 1945 memo to General Marshall on future warfare, Arnold outlined the reasons for the Air Force's great concern with technology and also its basic strategic concept for the future:

> It is clear that the only defense against such warfare is the ability to attack. We must, therefore, secure our nation by developing and maintaining those weapons, forces, and techniques required to pose a warning to aggressors in order to deter them from launching a modern devastating war.[12]

To the Air Force, the national security demanded that it have the most modern aerial weapons to deter an attack or else to repel it and then launch a retaliatory counterstrike. Thus, even before the dropping of the atomic bombs and the end of the war, the Air Force had linked national security, technological development, and deterrence of attack.

The atomic bomb presented the Air Force with great prospects but equally great problems. Its ominous implications led to the appointment of the officers' board of Carl Spaatz, Lieutenant General Hoyt S. Vandenberg (AC/AS, Operations, Commitments, and Requirements), and Major General Lauris Norstad (AC/AS, Plans) to evaluate the bomb's impact on the future of the Air Force. After meeting in September and October 1945, the Spaatz Board, as it was known, reported to Arnold on 23 October that the atomic bomb did not then call for changing plans for the size, composition, organization, or deployment of the AAF. The report reaffirmed the concept of the strategic air offensive and concluded the atomic bomb provided another, albeit tremendously powerful, weapon for use. The Board recommended a strong research and development program, maintenance of an effective intelligence agency, and the establishment of a special Deputy Chief of the Air Staff for Research and Development (DCAS/R&D) under Major General Curtis E. LeMay. While at work, the Board received little support from the Manhattan Project, which zealously guarded the technical details of the bomb and its production. Even the fact that the AAF was the only organization capable of delivering atomic bombs made little difference. One of LeMay's major functions—possibly his primary one—was to open channels to the Air Force for this badly needed atomic information.[13]

Air leaders believed the atomic bomb confirmed their concept of strategic bombardment. The bomb's great destructiveness—roughly four

square miles at Hiroshima and Nagasaki—made air power decisive. A concerted air-atomic attack offered the real possibility of knocking out or at least badly crippling an enemy at the start of a war. But the bomb also presented a great many problems. Two of the most critical were the dearth of reliable technical data for planning and the assimilation of the weapon within existing air doctrine and organization without disrupting the basic structure. The Air Force at first embraced the atomic bomb cautiously, even uncertainly, because it lacked sufficient knowledge of the weapon and its production rates to gauge its strategic value or logistical requirements. Due to its current and projected tactical and technical limitations, Air Force leaders did not view the atomic bomb as a panacea for all wartime contingencies and were reticent to scuttle their combat-tested organization and doctrine.[14]

In his third and final report to the Secretary of War in November 1945, Arnold concluded with a short discourse on air power and the future. The influence of atomic energy on air power was obvious, he wrote; "It had made Air Power all-important." Foreshadowing later and more elaborate strategic thinking, the AAF commander went on to say:

> . . . it must be recognized that real security against atomic weapons in the visible future will rest on our ability to take immediate offensive action with overwhelming force. It must be apparent to a potential aggressor that an attack on the United States would be immediately followed by an immensely devastating air-atomic attack on him. . . . The atomic weapon thus makes offensive and defensive Air Power in a state of immediate readiness the primary requisite of national survival.[15]

Arnold's remarks contain the different threads of what eventually became strategic nuclear deterrence: strategic air power, the atomic bomb, constant readiness, an air force in-being, and swift, devastating retaliation for aggression.

Despite their uncertainties, air leaders realized that the atomic bomb had to be integrated within the postwar Air Force before their claim was challenged. Following up the Spaatz Board's findings, Hoyt Vandenberg, and especially Brigadier General Alfred R. Maxwell and Colonel William P. Fisher of his Requirements Division, began pushing early in November for the establishment of an atomic bomb striking force based on the 509th Composite Bomb Group, the only operational atomic unit.[16] Early in December, Lieutenant General Ira C. Eaker, Deputy Commanding General, AAF, cautioned the Air Staff about designating any special unit for atomic bombing and recommended that the entire strategic force should be atomic:

> It seems to me we are very likely to find the attitude of the War Department and of Congress to be that the atomic bombing force is the only strategic air force we will require. If one wing will do the job then one wing will be the size of the strategic air force.[17]

Eaker's advice was adopted. Early in January 1946, the Air Force designated the 58th Bomb Wing and its three bomb groups, including the 509th, as its strategic atomic force, but not in name. The 58th and 509th were to form the nucleus for the conversion of the entire bomber force into the future atomic striking force. The AAF planned to convert its B–29s to carry atomic bombs as well as conventional munitions, thus enhancing their flexibility of employment.[18] Actual modification of aircraft beyond the original forty-six SILVERPLATE B–29s was slow due to security procedures and lack of funding priority. For the next several years, the 509th remained the only unit capable of atomic strikes, and even it was in sad shape. Nevertheless, the bare nucleus of the future strategic atomic air force was in existence by the time the Strategic Air Command (SAC) was established in the functional restructuring of the Air Force in March 1946.

In April 1946, a meeting was held in Headquarters Army Air Forces to determine the future structure and training of the 58th Bomb Wing and 509th Bomb Group, then readying for their roles in the atomic test series in the Pacific that summer, Operation CROSSROADS. In a memo attached to his report, Major General Earle E. Partridge, now AC/AS, Operations, summarized the basic Air Force and American policy on the employment of atomic weapons:

> Consistent with our national policy it is unlikely that we will attack any nation until we have first been attacked. In such an event, we must have available a unit trained and capable of immediate retaliation against the aggressor nation with our most destructive weapon to effect as much or more destruction than we experienced.[19]

This statement could just as well have been written yesterday at the JCS or SAC, so little has basic United States national strategic policy on the use of atomic weapons changed in the intervening years. The only real difference was that then no force existed capable of using atomic weapons if so ordered.

The lack of data on the atomic bomb represented a major obstacle to the combat development of the postwar strategic air force. Clearance and access restrictions limited training of bomb commanders, weaponeers, assembly teams, flight crews, and staffs. Few air officers had more than a rudimentary knowledge of atomic energy and the peculiar requirements and characteristics of the bomb. The lack of technical information and knowledgeable personnel hampered research and development, prevented realistic strategic air war planning, and stifled the healthy evolution of tactics.[20] On 24 September 1946, Colonel William H. "Butch" Blanchard, commanding the 509th Bomb Group at Roswell Army Airfield, New Mexico, wrote to Curt LeMay about the practical problems obstructing his progress to combat-ready status. "We have a lot of eager lads here who are chaffing at the bit to progress in the atomic

bomb business," he noted, "and I certainly believe we will make a mistake if we have to wait a year or so while someone designs and produces a big bomb for us to practice with." Although he was not overly concerned with his bombardiers' proficiency, Blanchard realized that

> . . . there are more people connected with the delivery of an atomic bomb than a bombardier. It can be said that heavy equipment handlers can be trained in a week or two, armament people can be trained in a week or two, and that hoist operators etc can be trained in a week or two. I will say to you that in two weeks to a month, we can also train pilots to be bombardiers, but we don't do it. . . . While your big thinking is in terms of a year from today, I personally see no more reason for my group to be ready a year from today, than tomorrow, in which case the two weeks necessary to train our ordnance and armament people would not be available.[21]

Three days later, Blanchard again wrote to LeMay about his problems and worries:

> Please excuse us for appearing to be a little "pushy" down here, but we are getting more and more afraid that the Air Force is losing their little toe-hold in the atomic bombing business, and our convictions force us to keep pushing.[22]

A small but major breakthrough for Air Force atomic operational readiness and planning came in the training and operations of the 509th Bomb Group during the CROSSROADS atomic tests at Bikini Atoll in June-July 1946. The group's assignment to drop the ABLE Day test bomb on 1 July provided a wealth of detailed information. Combined with the extensive United States Strategic Bombing Survey reports on the Hiroshima and Nagasaki explosions and the underwater test late in the month, the ABLE Day test gave clearer indications of the vast combat potential of the atomic bomb as well as of its considerable logistical requirements. The JCS Evaluation Board that met to report on the tests provided another opportunity for the AAF to learn more about the weapon that it alone could use. The Air Force hoped that the resulting official CROSSROADS reports would provide the required knowledge of the bomb and thus permit quantitative planning for atomic warfare.[23]

On 5 February 1947, Curt LeMay forwarded to Lieutenant General Lewis Brereton, Chairman of the Military Liaison Committee to the Atomic Energy Commission (AEC), a report prepared by Colonel Turner C. Rogers. The full strategic implications of the atomic bomb on warfare, Rogers stressed, could not be estimated without data on the probable supply of bombs. An unlimited stockpile would entirely change the planning, but in the absence of better information Rogers could only assume a limited supply for the next ten to twenty years. Such uncertainties among top Air Force planners accurately reflected the situation in joint and air war planning.[24]

Although organizationally the Air Force opted to integrate the atomic bomb within its existing unit and staff structure, doctrine was a

different matter altogether. The wartime concept of strategic bombardment, built on the disruption and destruction of the enemy's war-making capacity and will to fight, relied on precision bombing attacks on carefully selected economic-industrial targets. Before the end of the war in Europe, however, tactical requirements such as massed formations for defense and bomb concentration and technological improvements such as all-weather radar bombing had driven the Air Force from precision bombing to a modified area concept.

Against Japan, precision bombardment gave way almost entirely to urban attacks due to the unusual structure of Japan's industrial economy and the vulnerability of its cities to incendiary raids. Twentieth Air Force struck directly at the enemy's urban population and will to fight and indirectly at its war-sustaining industrial structure. The atomic bomb's tremendous destructive power completed the metamorphosis of strategic bombing from a precision instrument to a bludgeon of mass destruction. The Spaatz Board in October 1945 saw that the atomic bomb was, and would remain, primarily an offensive weapon for use against large urban-industrial targets. Technological and tactical imperatives forced Air Force leaders unwillingly but inevitably toward a doctrine of strategic bombing that emphasized attacking the enemy's most vital and populous urban-industrial centers to gain the maximum effect from the few atomic bombs expected to be available.[25]

Early in 1947, Turner C. Rogers accurately summarized the extent of this doctrinal evolution:

> Success in a war of the future will depend more than ever before on the industrial capacity and efficiency of the protagonists, therefore destruction of the enemy's industrial capability will contribute most toward reduction of his ability to wage war. This fact coupled with the character of the atomic explosion leads to the conclusion that the most profitable target for the atomic bomb will be large industrial centers.[26]

He then summed up the Air Force's view of American atomic strategy:

> But more important than defensive measures is the prevention of the initial attack. Fear of retaliation has always been the greatest deterrent to any nation contemplating all-out war. Twice in this century our unpreparedness has led a would be world conqueror to believe he could achieve such success. Japan was well aware of our weakness when she struck at Pearl Harbor. The ability to strike back effectively will be our best guard against attack. . . . The possession of a substantial number of atomic weapons and the means of delivering them to any part of the world provides the most potent threat of retaliation known to man.[27]

The theory of strategic deterrence that formed the heart of subsequent Air Force strategic doctrine coalesced in 1945–1946 and was well devel-

oped by early 1947, far in advance of the war plans, aircraft, or supply of atomic weapons to implement such a concept.

Planning for Strategic Air War, 1945–1948

War planning received little serious attention in the Air Force's initial plans except for vague references to readiness and potential aggressors. Some airmen, however, considered possible future enemies even before the war ended. In a January 1945 report to the Theodore von Karman Committee, Air Plans and Intelligence officers singled out the Soviet Union as the only possible enemy in the future and developed a detailed target list of Soviet industrial facilities.[28] Throughout 1945, special air intelligence teams collected information on Germany's secret weapons and all available German intelligence on the Soviet Union and its air force.[29]

In planning their postwar composition, basing, and deployment, Air Force leaders wanted air units sited to fulfill occupation duties in Germany and Japan and to respond quickly to potential aggression. The Pacific and Far East were well covered at first, but leaders were concerned about the Peripheral Basing Program devised for Europe.[30] In September 1945, diplomatic considerations and demobilization pressures forced General Dwight D. Eisenhower, commanding the U. S. Forces, European Theater (USFET), to request a reduction in bomber groups from five to two. Vandenberg informed Eaker that this was unacceptable because it would unbalance the strategic and tactical air elements. "Further," he wrote, "retention of five (5) VHB groups in the European theater is necessary to combat any possible threat from the East."[31] There could be little doubt that he meant the Soviet Union. Thus, as early as the fall of 1945, the Air Force perceived the stationing of B–29s in Europe as a countermove to Soviet forces and intentions.

The Air Force's plans and perceptions, however, were to remain just that. On 27 October 1945, Arnold warned Marshall that rapid demobilization was incapacitating the Army Air Forces:

> We amazed the world with the great speed with which we built up our Air Force superiority. Today we are tearing it down even more swiftly—possibly to the even greater amazement of the world and undoubtedly to the comfort and gratification of our potential enemies. . . . Both our Occupational Air Forces and our Strategic Reserve are already weakened to a point where I consider them far below our war standards. Further reductions and further losses of highly skilled personnel will accelerate this loss of effectiveness.[32]

By the following spring, hasty demobilization had undercut the Air Force's ability to act in Europe and elsewhere; its combat-ready units evaporated as trained flight crews and maintenance men returned to civilian life. After an extensive examination, the Peripheral Basing Program was scrapped in May 1946 due to the lack of personnel and suitable

VHB bases and to the growing realization that B–29s positioned in occupied Germany would be vulnerable to any Soviet offensive.[33]

Out of necessity and inclination, the Air Force now decided to base strategic units in the United States under SAC's control and rotate them to various theaters for training and orientation. This new policy saved money, guaranteed a strategic air presence in Europe, enhanced readiness while reducing vulnerability, increased morale, promoted training, and acquainted crews and support personnel with all regions, especially Europe and the Arctic, where they might have to operate.[34] Moreover, this change revealed the intimate and delicate interaction of budgets, doctrine, technology, basing, and strategic planning.

This policy was a temporary expedient. The Air Force counted on the development of advanced air weapons not only to facilitate the accomplishment of its missions but also to reduce its overseas commitments. With its range of 10,000 miles, the Consolidated B–36 that was then under development would provide the necessary intercontinental striking capability until long range, jet-powered bombers and guided missiles were ready; it would also remove the need for additional overseas bases. The desire to base all strategic forces in the United States to reduce their vulnerability and to have them constantly ready dominated Air Force strategic thinking and planning in the years to come.

While awaiting the B–36 and the B–52 that would replace it, the Air Force sought other solutions to the problem of range extension of its medium range B–29s, B–50s, and the future all-jet B–47. Although one-way missions were proposed as an emergency measure, aerial refueling was tested and adopted in 1948 as the best practical method of increasing the medium bombers' striking range.[35] The development of some relatively simple technology and flying techniques significantly altered the capabilities and flexibility of the entire strategic force while reducing its vulnerability.[36] Thus, long before Albert Wohlstetter and the RAND Corporation ever thought about the vulnerability of the numerous oversea air bases, the Air Force realized the threat and knew the solution—new technology.[37] It was but a short step from this idea to one of the most basic tenets of strategic deterrence thinking—that the credibility of a deterrent was directly proportional to its invulnerability.

In June-July 1946, Carl Spaatz travelled to England and Europe to discuss possible revised basing arrangements with Air Chief Marshal Lord Tedder, Chief of the Air Staff, Royal Air Force (RAF), and with American theater commanders. As a result of his talks with Tedder, Spaatz received RAF agreement to provide former American bomber bases for B–29s in case of a war emergency in Europe. He also obtained RAF cooperation in the modification of certain bases for the support of atomic

operations.[38] In August 1946, Colonel E. E. Kirkpatrick of the Manhattan District went to England to supervise the construction of the assembly buildings, aprons, and loading pits, and the installation of the required equipment.[39] By early 1947, atomic bomb assembly and loading facilities were in existence in the United Kingdom and the Marianas to support possible atomic bombing operations in Europe or the Far East. These actions set the pattern for future Air Force and Strategic Air Command war planning because the bases in the United Kingdom would remain the core of all strategic air offensive operational plans through the late 1950s. All that was needed now was an emergency war plan to specify the Air Force's exact role in any future conflict, and the first postwar joint and air war plans were already in preparation in mid-1946.

In February and March 1946, the services and the JCS began serious planning for industrial mobilization and strategic warfare. Joint war planning started with the PINCHER series of studies on various strategic problems and geographic areas. Early emergency war plan studies adopted the strategic defensive and relied heavily on a strategic air offensive to destroy the enemy's war-making capacity through atomic and conventional bombing attacks.[40] Air planners, however, thought that these studies reflected typical World War II thinking that subordinated air power to ground and sea power. Colonel Alvin R. Luedecke, one of the key Air Force planners, questioned the evolving PINCHER studies on 6 September 1946, when he wrote to Brigadier General Frank F. Everest, the Air Force member of the Joint War Plans Committee (JWPC): "Now it seems that the same old thinking of World War II is coming up again with the result that Air Power is treated as an adjunct to Ground and Sea Power."[41]

Possibly one of the things that disturbed Everest and other airmen was the early joint planning for the atomic bomb. In June 1946, Admiral Chester Nimitz, Chief of Naval Operations (CNO), questioned the present thinking that called for early atomic strikes to offset Soviet offensives. He thought reference to atomic bombs and planning for their use should be avoided because the bomb might be outlawed or not employed.[42] Spaatz disagreed; he saw the atomic bomb as the decisive weapon. To him, planning to use the greatest American advantage was imperative due to the funds already invested and to Soviet numerical superiority.[43] Nevertheless, studies in December 1946 scratched plans for atomic bombing, assuming the bomb would not be used "for political reasons."[44] These early joint plans still stressed initiation of an early strategic air offensive against Soviet petroleum-oil-lubricants (POL) facilities and urban-industrial targets but without the atomic bomb.[45] Joint planning staggered through the following year without producing an acceptable joint outline emergency war plan or even an agreed concept for one. This

failure was at least partly a result of the festering roles and missions controversy.

In joint strategic planning, the Navy worked tirelessly to keep JCS plans focused on Middle East oil and the Mediterranean lines of communication so it could tie its carriers to missions in these areas. The Air Force argued that American carriers could no more operate in the Middle Sea against Soviet land-based air power than the Royal Navy had in 1940–1942 against the Luftwaffe. In October 1946, Major General George C. McDonald, AC/AS, Intelligence, warned Spaatz of an impending Navy push on the Mediterranean to drum up support for a "Big Navy" to keep the Soviets in check. The only problem was that the Navy, even with carrier aircraft, could not reach any significant portion of the Soviet heartland. McDonald surmised that "the real military worth of the carriers may come in trading carriers sunk for time, measured in weeks, while land based air power can arrive on station." Allocation of the land-based air units necessary to allow the carriers to operate with any chance of survival would only reduce the ability to strike the Soviet Union.[46]

Not content with its Mediterranean ploy, the Navy also frustrated Air Force attempts to plan a strategic air offensive against the Soviet Union. Air Force files on strategic planning and roles and missions leave the distinct impression that at every turn the Navy tried to prevent implementation of Air Force concepts of strategic air warfare. Air leaders had struggled in the 1930s to develop their doctrine of strategic bombing and then had used it with devastating consequences against Germany and Japan. Now, admirals with no such experience tried to dictate the bases, phasing, targets, weapons, and strength of the air offensive. These intrusions deeply disturbed the airmen, particularly because they had the primary service responsibility for strategic air warfare. The roles and missions infighting slopped over into strategic plans because functions assigned in them could be used to justify forces and each service's share of the defense budget.[47] Apparently, the Navy sought to buy time until it developed the large carriers and atomic bomb-carrying aircraft to give it a firm claim to a strategic air-atomic mission. The fear of losing this claim became a reality in the spring of 1949 when Secretary of Defense Louis Johnson cancelled the U. S. S. *United States* (CVA–58), leading to the Navy's attack on the B–36 program. The Air Force-Navy conflict of the late 1940s culminated but did not end in the B–36-Supercarrier controversy and the "Unification and Strategy" hearings of 1949.[48]

Paralleling joint efforts at planning, the Air Force and War Department prepared their own plans for the early months of hostilities. In the spring of 1946, Air Force war planning began in earnest with a rough outline plan that specified exactly how the available air units would be

employed in an emergency. Air Force headquarters soon realized that a basic war plan was required to govern mobilization, deployment, and operations should war break out with the Soviet Union. It is unclear whether these actions resulted from War Department moves to prepare industrial mobilization plans, which had to be based on some realistic estimates of wartime requirements and thus plans, or from the initiation of the PINCHER studies. What is clear is that the AAF decided a detailed, carefully prepared emergency plan showing the commitment of all air units during the first months of hostilities was needed at all times. The Strategy Branch of Plans was to develop this plan, named MAKEFAST.[49]

The real impetus for the formulation of the first detailed post-war strategic air war plan came on 10 September 1946 when Brigadier General George A. Lincoln, Plans and Policy Group, Directorate of Plans and Operations, War Department General Staff, directed the AAF to draw up plans for the immediate initiation of strategic air operations against the Soviet Union. The planning assumptions, based heavily on early PINCHER studies (especially JWPC 432/7), included the early deployment and use of the 58th Bomb Wing, as yet the Air Force's lone atomic unit.[50] Air Force planners, however, still lacked adequate technical information on stockpiles and production rates upon which to base any accurate estimate of atomic operations. Consequently, Plan MAKEFAST, submitted in October 1946, was an entirely conventional bombing campaign concentrating on the Soviet petroleum industry. MAKEFAST was essentially the strategic bomber offensive of World War II with much smaller forces, refined by wartime experiences, and directed against the Soviet Union. When MAKEFAST was presented to Carl Spaatz and other Air Force leaders during the December 1946 commanders' conference, he directed that an atomic (special weapons) annex be developed and the plan revised quarterly using the latest information.[51]

Even if an atomic plan had existed in late 1946, the nascent strategic force would have found its execution difficult, if not impossible. The 509th Bomb Group had ten of twenty-three modified aircraft in commission, twenty trained crews, and few atomic bomb shapes—known as Fat Man "pumpkins"—for loading and bombing practice. Only sixteen of forty-six SILVERPLATE B–29s modified during the war were available to operational units, while another eighteen were stripped of equipment and in storage. Six of sixteen VHB groups were activated with aircraft; three had no aircraft; and the other seven were not activated.[52] The Air Force was far short of its goal of an all-atomic strategic air arm to carry out its doctrines of atomic warfare and would have had serious trouble conducting even conventional operations.

Plan EARSHOT, the initial revision of MAKEFAST, appeared in March 1947. It was the first true atomic air war plan but lacked the

detailed logistical considerations to support its own execution. While more refined than MAKEFAST, EARSHOT was really little different. It still stressed conventional operations against the Soviet urban-industrial and oil target systems from bases in the United Kingdom and Middle East, plus supporting strikes from Japan, the Ryukyus, and Alaska. Because of the uncertainty about the condition or usability of the Middle East airfields in the Cairo-Suez and Palestine areas, the B–29 units and personnel would primarily deploy to the United Kingdom for strategic air operations in conjunction with the RAF Bomber Command. Although more closely attuned to ongoing JCS studies, EARSHOT was still just a War Department and AAF plan that specified the Air Force's requirements rather than detailed its capabilities.[53]

In forwarding this short-range emergency plan to his major commanders, Spaatz emphasized that EARSHOT left much to be desired. He hoped that their detailed comments would permit a more reliable revision. While specific deployments, operations, and deficiencies in personnel and logistical support were not considered, Spaatz pointed out that EARSHOT nonetheless was:

> . . . world wide and of necessity portrays, either directly or by implication, a large portion of the accepted strategic thinking of the Army Air Forces, the War Department and the JCS; however, it is not unlikely that the general scheme of action, and the strategic thought implied in the plan, may be adhered to in whole or in part for many years.[54]

Based on it and its summertime revision, EARSHOT JUNIOR, Headquarters SAC initiated its first detailed planning for the actual conduct of strategic air operations, including the target analyses, mobility plans, combat mission folders, and operations plans and orders that formed the nitty-gritty of the deterrence business. SAC Operation Plan (OPLAN) 14–47 that appeared later that year was SAC's first for a post-war air offensive.[55]

MAKEFAST and EARSHOT covered only the opening months of a war with the Soviet Union, but they showed that planners envisaged a long struggle fought like the recent war. The strategic air offensive was seen as the only weapon with which to strike back at the Soviets, whose offensive powers were considered almost supernatural. Why planners assumed the Soviet Union could launch simultaneous offensive thrusts in Scandanavia, Western Europe, South and Southeastern Europe, the Middle East, India, and the Far East is hard to fathom given the tremendous wartime damage and losses sustained by the Soviets. Whatever the reasoning, the basic war plans were formulated using a mobilization base concept and a classical land strategy similar to that of the 1942–1945 European campaign.[56]

Air power was still seen, as Frank Everest had noted, as an adjunct to land and sea power. As in the last war, air power would weaken the

enemy, prepare the way for invasion and reconquest of lost territory, and support the ground forces in the seizure and occupation of the Soviet Union. Such planning frustrated and disheartened many airmen. The lessons of air power had not been learned and were not being applied even in War Department planning. In its purest form, a properly planned and executed air power strategy sought to neutralize and disarm an enemy and to destroy his ability and will to wage war and thus harm the United States. By striking at the Soviet heartland with atomic and conventional weapons, a true air strategy aimed to cut casualties and costs to the nation and its allies who would be outnumbered in any contest with the Soviet Union. Matched against the traditional land and sea power strategies and their powerful supporters, this concept had few advocates outside a small coterie of air power enthusiasts.

During 1946–1947, the continuing lack of knowledge of the atomic bomb and the grave deficiencies in training, equipment, and priorities both in atomic and conventional bomb groups severely restricted the Air Force's ability not only to plan for strategic air war but also to conduct it if necessary. The inability to get accurate information from the Manhattan Project and then the Atomic Energy Commission made it impossible to plan atomic operations on anything but sheer guesswork. The Atomic Energy Act of 1946 that established the AEC on 1 January 1947 imposed even stricter limits on the dissemination of information on the bomb and its related equipment. Under the new "Restricted Data" category of classification, equipment associated with the handling, loading, and dropping of the bomb was classified, and the crews who were to fly the missions were not yet cleared to see or use the equipment. This situation continued throughout 1947, but by the year's end the Air Force was seeking some relief from the sillier clauses of the Act.[57] Otherwise, training and thus operational capability of the atomic units would continue to be handicapped. For instance, because of the "Restricted Data" equipment in its B–29s, the 509th Bomb Group had not been outside the continental United States for training missions to bases it would have to use if war came.[58] Even without these shortcomings, SAC units would have found it almost impossible to execute current war plans because adequate operational maps and target charts did not exist as of November 1947 to support strategic air operations on a global scale.[59]

During the closing months of 1947, the absence of a viable Air Force atomic program and of an agreed joint war plan still incapacitated Air Force planners. SAC's Eighth Air Force, formerly the 58th Bomb Wing, was maintained in constant readiness as the atomic striking force, but the 509th was still the only operational atomic unit. Faced with numerous problems and obstructions, the Air Force was slow to develop a program equal to the significance of atomic warfare. New priorities in administration, personnel, funding, training, and materiel were urgently needed.

Although sensitive to these requirements, top Air Force leaders were hard pressed now that independence was finally a reality. Awareness of the problems was one thing, the money for the remedies was another.

The situation in joint war planning was little better. In his September briefing to the President's Air Policy Commission, chaired by Thomas K. Finletter, O. P. Weyland, AC/AS, Plans, had stated:

> Any realistic estimate of the peacetime requirements of the Armed Forces must be based on joint war plans which, *in turn* [Weyland's emphasis], must be based on an estimate of the *capabilities* of our potential enemies. Until we know what kind of *wartime* structure is needed to fight a particular enemy, we cannot accurately estimate our peacetime military establishment. . . . Although we have an agreed joint strategic concept of how a future war must be fought, we do *not* have an agreed joint mobilization plan to establish a phased expansion of air, ground and naval forces to the sizes and in the priorities necessary to *win* a war.[60]

After summing up the status of joint war and mobilization planning two months later, Hoyt Vandenberg, Vice Chief of Staff, told Secretary of the Air Force W. Stuart Symington that "it is believed obvious . . . that *we do not have* a joint war plan. . . ."[61] The basic problem remained that roles and missions and budgets were so closely tied to joint war and mobilization plans that no service was willing to agree to anything that might give another additional functions or force requirements and thus budget claims.[62]

On 16 December 1947, Secretary Symington wrote to Secretary of Defense James Forrestal and Director of the Bureau of the Budget James E. Webb protesting the cut in the Air Force's Fiscal Year 1949 (FY 1949) budget request. The JCS had confirmed the Seventy-Group Air Force as necessary for national defense and approved $5.2 billion for FY 1949 for the Air Force. Although the Air Force asked for only $4.421 billion *of this, the Bureau of the Budget slashed the request to $2.9 billion.* Symington protested that, with the Air Force already pared to fifty-five groups, this reduction would permit maintenance of only forty fully operational groups and a mobilization structure while severely restricting development and procurement.[63] He told Forrestal that in view of the increasingly tense situation in Europe,

> . . . and any common sense strategic concept as how to get at Russia, we are more shocked at this decision than at anything that has happened since we came into Government, especially as the Bureau of the Budget further limits the relative small percentage of what is considered necessary through specifying in detail how a great deal of our administration and organization should be handled.[64]

Symington's vigorous objections availed him little against an economy-minded President and Congress.

1948: The Year of Change

Budget cuts were but one example of the problems faced by the Air Force during these years. Unfortunately for the service, national leaders

remained unconvinced of the central importance of strategic air power. Despite his ostensibly tough foreign policy toward the Soviet Union, Truman had not given the Air Force or SAC any special priorities and had done little to resolve the interservice strife that hobbled planning. The Air Force worked hard to develop and maintain the atomic striking force, but lacked the resources and urgency to make it the number one priority. The strategic force barely held its own in 1946–1947 due to demobilization and budgetary limitations. In 1947 further defense cuts reduced the Air Force to an interim fifty-five groups (thirteen VHB and three other very long range groups for reconnaissance, mapping, and weather) for FY 1948, and additional reductions threatened to cut that to forty operational groups.[65] In this situation, the Air Force strove to retain a strong strategic element without upsetting its balance. While the airmen struggled to keep some strategic capability, joint planning was so disjointed that two different emergency war plans, BROILER and FROLIC, were considered for implementation on 1 July 1948.[66]

Several events early in 1948 then helped to change the course of American foreign policy and to break the logjam in joint planning. The Communist coup in Czechoslovakia in February was the first of the multiple crises of that year that hardened American policy and attitudes toward the Soviet Union and its satellites. In this atmosphere, Forrestal met with the Joint Chiefs and Service Secretaries at Key West, Florida, in March to resolve the basic differences over roles and missions.

Although the origins of the interservice squabbling are veiled in the mists of antiquity, the immediate origins of the Key West Conference were in the original Functions paper (Executive Order 9877), hastily signed by President Truman on 26 July 1947, which gave the Air Force the primary mission of prompt and sustained offensive and defensive air operations.[67] The question left unresolved was the nature and the extent of the Navy's secondary responsibilities in this area. The Air Force clearly believed that the Navy's plans for carrier operations, especially as elucidated in Nimitz's January 1948 retirement statement, infringed upon the responsibilities assigned by the President to the Air Force, the only service with battle-proven experience in all phases of strategic air operations.[68] This and other vagaries in EO 9877 resulted in the establishment of an Ad Hoc Committee of Lieutenant Generals Alfred C. Wedemeyer (Army) and Lauris Norstad (Air Force), and Vice Admiral William Styer to iron out the differences. Although it cleared up some problems, the Committee deadlocked over the question of primary and collateral responsibilities in roles and missions, especially between the Air Force and Navy over strategic air war and between the Army and Navy over the role of the Marine Corps. A split paper (SM–9735) was submitted on 4 March, and Forrestal called for the Joint Chiefs to meet with him at Key West on 11–14 March to settle the issues.[69]

Carl Spaatz submitted the Air Force's view of roles and missions on 8 March, stating, as the Air Force and Army always had, that the service charged with primary responsibility for a mission should determine the nature and extent of collateral participation to insure effectiveness and economy. Spaatz vigorously opposed as "unnecessary, wasteful, and confusing the unilateral establishment by any service of requirements for forces and equipment which are designed to accomplish this or any other primary function of another service."[70]

The net result of the Key West Conference was an apparent settlement of these major irritants. The Air Force retained primary responsibility for strategic air warfare, air defense, and other basic air missions, with collateral functions in sea interdiction, anti-submarine warfare (ASW), and aerial minelaying. The Navy received collateral functions in land interdiction, close air support, and direct participation in the overall air effort as directed by the JCS. At Spaatz's urging, Forrestal added the stipulation that the Navy would not use the collateral strategic air war function to justify additional forces and to develop its carriers into a strategic air force. The Navy agreed to this qualification.[71]

On 21 April, Forrestal circulated a proposed new Functions statement outlining the agreements reached at Key West. The very next day, Admiral Louis E. Denfeld, CNO, sent Forrestal a memo seeking to "clarify" the proposed memo and annex of functions. He contended that the Air Force might be responsible for strategic air warfare but that did not include target selection, which should be a joint responsibility. Denfeld acknowledged that strategic air war was an Air Force function, but said "the Navy shall attack any targets, inland or otherwise, necessary to the accomplishment of its mission." The Navy would participate in the overall air effort as directed by the JCS and, Denfeld continued, "intended that the capabilities of naval aviation will be utilized to the maximum in the air offensive against vital strategic targets." He then stated that joint war plans would soon recognize and exploit the ability of carrier aircraft "in the near future" to deliver atomic bombing attacks.[72] Clearly, then, the Navy had little intention of abiding by the Key West Agreements which in reality had provided the wedge it desired.

Denfeld's memo elicited immediate hostile comment from Admiral Leahy, Truman's Chief of Staff, General Omar N. Bradley, Army Chief of Staff, and Spaatz. In separate memos to Forrestal, they contradicted Denfeld's interpretation of Key West and castigated his memo as an attempt to negate the agreements reached there, which Spaatz felt to be his primary purpose. All three agreed that Key West limited the Navy to air units necessary to support its missions—carrier aviation—and that the CNO had accepted the agreement that no separate strategic air force would be developed using requirements for carriers as a basis for its

development. Targets for naval aviation were to be for prosecution of the naval campaign and only as directed by the JCS for the overall air effort.[73] Forrestal approved the majority opinion in a new Functions memo on 1 July, but the situation was clearly not yet resolved.

However tentative they proved to be, the Key West Agreements cleared the way for strategic planning. Neither BROILER nor FROLIC were accepted, but a hybrid, HALFMOON, was approved for planning purposes in May 1948. At long last an agreed concept guided service and JCS theater staffs in their war planning. The Air Force now had to redraft its 1948 air war plan, HARROW, which was keyed to the unapproved Plan FROLIC.[74]

The Berlin Blockade soon overshadowed the continuing dispute among the services and made strategic war planning much more critical. The prospect of war with the Soviet Union brought the sense of urgency needed to strengthen the strategic air force. Fortunately, programs initiated earlier were producing results. Operation SANDSTONE in the spring promised a plentiful supply of atomic weapons.[75] More atomic B–29s were emerging from modification centers; B–50s and air refueling squadrons of KB–29s appeared that summer; and the B–36 was approaching service.[76] The Air Force's move to gain control of the Armed Forces Special Weapons Project (AFSWP) to smooth the transfer of atomic weapons from the AEC to SAC in case of an emergency, and the unceasing interservice feuding, led Forrestal to call another special meeting, this time at Newport, Rhode Island. At Newport, Hoyt Vandenberg, now the Air Force Chief of Staff, compromised on most issues to reach accord with the Navy. The Air Force emerged as a limited JCS executive agent for AFSWP until the Navy developed an atomic capability, while the Navy gained a strategic air-atomic role for its carrier aircraft. In the long run, Newport settled some issues, but soon the fighting over the FY 1950 defense budget reopened old wounds and inflicted new ones.[77]

President Truman limited the FY 1950 budget to $14.4 billion, not enough to support all the forces that the three services required to conduct their strategic responsibilities under the recently approved joint war plan HALFMOON. Forrestal established a special Budget Advisory Committee under General Joseph McNarney, then Commanding General, Air Materiel Command and formerly Deputy Chief of Staff under Marshall (1942–1944) and theater commander in Europe (1945–1947). In a meeting of the Service secretaries and Joint Chiefs with Forrestal, McNarney's committee outlined its findings based on a tentative concept of minimum operations required in case of war, relying heavily on Air Force atomic operations.

From the start of the meeting, the Navy leaders, primarily Admiral Louis Denfeld, CNO, and Vice Admiral Robert Carney, Deputy CNO,

were bitter and hostile. In his opening statement, Denfeld attacked the Air Force and questioned current plans for atomic operations from the United Kingdom and Iceland:

> Even if we dismiss the foregoing considerations as unlikely, the unpleasant fact remains that the Navy has honest and sincere misgivings as to the ability of the Air Force successfully to deliver the weapon by means of unescorted missions flown by present-day bombers, deep into enemy territory in the face of strong Soviet air defenses, and to drop it on targets whose locations are not accurately known. For this reason alone, it appears rash to fail to provide some measure of insurance against the chance that the effort may not be effective.[78]

He then criticized the Army and Air Force plans in McNarney's presentation as lacking comprehension of Navy tasks and abilities: "This is not surprising, since no Service can be expected to be expert in any other's business."[79]

Vandenberg and Symington reacted strongly to Denfeld's statement, which reflected the bad feelings between the services on their respective roles in the strategic air war. The Air Force Chief of Staff said:

> I have one comment, as one Service Chief, that I'd like to make at this time. I regret the lack of confidence on the part of the Navy, but I'd like to call attention to the fact that in your own paper you stated, '. . . no Service can be expected to be an expert in any other's business.'[80]

Symington was just as straightforward but carried his displeasure one step farther. "It seems to me," he said, "and this remark I perhaps should not make, but being very frank, I will—the idea is to substitute a large Navy for the atomic bomb."[81]

The briefings continued throughout the morning, but feelings improved very little. Finally, McNarney objected to Carney's repeated statement that the Budget Advisory Committee's plan was the Army-Air Force plan for the Navy. Then General Omar N. Bradley, Army Chief of Staff, could stand no more:

> Mr. Secretary, I'd like to make the remark that that is the fourth time this morning that there's been side-remarks about the Air Force's and the Army's ideas of what the Navy should be. Of course, they know more about it than we do, but I haven't seen any hesitancy on the part of the Navy to question even how the Air Force is going to carry out their mission. They've been questioning and criticizing. I don't see why we can't express our ideas as well.[82]

From this point on the fight degenerated into the sad spectacle of the B–36—Super Carrier and Unification Hearings of 1949 and the subsequent dismissal of Denfeld and his replacement by Forrest P. Sherman.

Because of the steady deterioration in Soviet-American relations during 1948, Vandenberg, as Chief of Staff, put greater emphasis on the strategic forces. SAC's readiness and operational capabilities were im-

proved, and its mobility and operations plans tested in the deployments of conventional B–29 groups to Germany and the United Kingdom in July and August. What was needed was aggressive and knowledgeable leadership, that General George C. Kenney, the present SAC commander, could not provide. Vandenberg considered many possible replacements before finally deciding on the man he would place in charge of SAC if war broke out—Curt LeMay.[83]

When Curt LeMay assumed command of SAC in October 1948, the haphazard development of SAC ended. With LeMay came his new team—Tommy Power, Walter "Cam" Sweeney, Emmett "Rosie" O'Donnell, August "Auggie" Kissner, and others already with SAC, Roger Ramey, William "Butch" Blanchard, John D. "Jack" Ryan, Jack Catton, and Clarence "Bill" Irvine, rejoined their old boss. With a firm background in atomic energy from his research and development tour, an unrivaled command of strategic air operations, and his proven staff, LeMay quickly shook the bugs out of SAC and began its transformation into a honed weapon of strategic warfare. SAC's primary mission was the strategic air offensive, and LeMay fought any and all deviations from that assignment. His objective was to train SAC crews and ground personnel into a team that was always ready to execute its primary mission so that it would never have to. This has remained SAC's basic philosophy since 1948. Although SAC and the strategic mission were granted the Air Force's first priority at the 1948 commanders' conference, not until the Korean War expansion provided the men, money, and materiel for all Air Force missions was the claim honored.[84]

The Korean War was the real turning point for SAC. In December 1949, SAC had 72,000 men, 14 bomb groups and 610 strategic aircraft, 2 strategic fighter groups, and 6 air refueling squadrons. Four years later, LeMay had 171,000 men, 37 bomb wings and over 1,000 strategic aircraft (mostly B–36s and all-jet B–47s), 6 fighter wings, and 28 air refueling squadrons.[85] This remarkable growth in size, composition, and capabilities was just the beginning. In the 1950s, LeMay built SAC into an air force within the Air Force. He fought to get the best for his command and usually did, but not without making a good many enemies along the way. When he left SAC in Tommy Power's hands in 1957, Curt LeMay had created for the United States a strategic air force vastly superior to any in the world— a deterrent to nuclear war and a guarantor of the nation's security.

The End of an Era

Many authors have concluded that American strategic air power offset the vast Soviet ground superiority in Europe in this period. However, few of them realize the enormous chasm that separated the apparent

atomic monopoly of the United States from the actual situation through at least 1949. Truman's foreign policy and his primary strategic trump cards, the atomic bomb and strategic air power, were not in harmony before 1949–1950. Many writers, for instance, mention Truman's unspoken message to Stalin in the summer of 1948 when he sent atomic B–29s to England, posed to strike should the Soviet leader make a misstep during the Berlin Blockade.[86] In fact, not a single aircraft capable of carrying the atomic bomb was deployed to the United Kingdom during the Berlin crisis.[87] The possession of strategic bombers, bases, and a stockpile of weapons did not mean that those planes could place those bombs on assigned targets, or for that matter, even carry them. Many people apparently believed it did, but they were not in the Air Force.

The question I must ask, but cannot answer, is how much Truman knew of the actual condition of the strategic force that supposedly backed his policy toward the Soviet Union. If he knew and did nothing, he played a dangerous game of bluff, even for the most audacious poker player. If he did not know, it was not because the Air Force did not tell him or his Secretaries of Defense. In the early 1950s, this disparity disappeared forever. The Soviet atomic explosion of August 1949, the Communist seizure of power in China in October, NSC–68 in April 1950, and then the invasion of South Korea the following June made national leaders acutely aware of the danger of conflict with the Communist powers. This led to the development of military forces and capabilities commensurate with American defense responsibilities.[88]

Between 1952 and 1954, a number of factors combined to signal the end of the "Air-Atomic Era": Dwight D. Eisenhower's election, his supposedly "New Look" defense policy, the end of the Korean War, and others. Primarily, the strategic situation was altered by the MIKE Shot of Operation IVY on 31 October 1952 that proved the feasibility of thermonuclear weapons (hydrogen bombs).[89] The Soviet hydrogen bomb test the next August merely confirmed this momentous change. For an idea of the revolutionary impact of this new weapon on strategic planning, just compare these yields in equivalent tons of TNT: Hiroshima and Nagasaki, under 20,000 (20 kilotons, 20 KT); the YOKE Test in Operation SANDSTONE, 49,000 (49 KT); and the MIKE Shot, 10,400,000 (10,400 KT or 10.4 megatons, 10.4 MT).[90] The increase in destructiveness was absolutely staggering, and its implications were easily understood. This "thermonuclear breakthrough" promised production line weapons with yields of one-to-two million tons that weighed under 3,000 pounds, small enough for tactical aircraft and ballistic missile warheads.

This breakthrough supplied the critical technological advance that allowed the Air Force in March 1954 to step up the intercontinental ballistic missile (ICBM) development program for Atlas and later to add

Titan and Minuteman and the intermediate range ballistic missile (IRBM), Thor. Once operational, ICBMs could hit Soviet or Chinese targets with excellent accuracy within thirty minutes of launching from hardened U.S. bases.[91] The development of similar Soviet capabilities completed the awesome cycle. The instantaneous retaliation of ICBMs, when teamed with the intercontinental reach and operational flexibility of the B–52/KC–135 force, completely recast the strategic air force and the nature of strategic planning and warfare. The "Era of the Unthinkable" replaced the tentative, oftentimes chaotic, and much less deadly "Air-Atomic Era."

If we speak of maturity as the achievement of full or natural development, then the period from 1945 through 1953 was indeed a search for maturity, more accurately described as adolescence. For the whole Air Force and its strategic force, this trying adolescence produced the great strength and maturity attained during the later 1950s and maintained ever since.

Notes

1. Ltr, Gen H. H. Arnold, CG/AAF, to Gen C. A. Spaatz, CG/USASTAF, 19 Aug 45, in Library of Congress, Manuscript Division, Carl A. Spaatz Collection (hereafter cited as LC/Spaatz), Diary Personal August 1945, Box 21.

2. Memo for Chief of Staff, Gen H. H. Arnold, CG/AAF, "Potentialities of New Developments in Warfare," 28 May 45, in National Archives, Record Group 18, Records of Headquarters U. S. Army Air Forces, 1945 Air Adjutant General Central Decimal File (hereafter cited as NA RG 18, 1945 AAG), 385 Manners and Methods of Conducting Warfare, Box 191.

3. U. S. Congress, Senate, Committee of Military Affairs, *Hearings on Department of Armed Forces, Department of Military Security*, 79th Congress, 1st Sess. See especially testimony of Generals Arnold and Jimmy Doolittle.

4. Perry McCoy Smith, *The Air Force Plans for Peace, 1943–1945* (Baltimore, MD: The Johns Hopkins Press, 1970); Michael Sherry, *Preparing for the Next War: American Plans for Postwar Defense, 1941–45* (New Haven, CN: Yale University Press, 1977).

5. Memo for Gen George, Maj Gen L. Norstad, AC/AS, Plans, "Arguments for Justification of 70 Group Post-War Air Force," 10 Sep 45, in NA RG 341, Records of Headquarters U. S. Air Force, Deputy Chief of Staff, Operations, Top Secret Plans and Operations File (hereafter cited as NA RG 341, DCS/O, TS P&O), OPD 320.2 (4 Apr 44) Top Secret Supplement, Box 129A.

6. JCS 1478/4, CG/AAF, "Interim Plan for the Permanent Military Establishment of the Army of the United States," 2 Oct 45, in NA RG 218, Records of the Joint Chiefs of Staff, JCS Central Decimal File, CCS 370 (8-19-45), Sec 1.

7. Ltr, Maj Gen F. L. Anderson, AC/AS, Personnel, to Gen C. A. Spaatz, CG/USASTAF, 17 Aug 45, in LC/Spaatz, Diary Personal August 1945, Box 21.

8. Smith, *Air Force Plans*, Chap 5, "The Evolution of Force Structures," 54–74, especially 71–74; Sherry, *Preparing*, Chap 7, "Preventing World War III," 191–232; R. Frank Futrell, "Preplanning the USAF, Dogmatic or Pragmatic?" *Air University Review*, XXII, No 2 (Jan-Feb 1971), 63–68; R. Frank Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964* (Maxwell AFB, AL: Air University, 1974), Chap 5, "The Air Force in National Defense: Organization and Strategy, 1944–1949," 95–134, Chap 6, "Responses to Soviet Nuclear Weapons and Limited War: 1949–1953," 135–81.

9. Smith, *Air Force Plans*, 54–74; Memo for Gen H. S. Vandenberg, AC/AS, OC&R, Col J. J. Ladd, "Period II Troop Basis," 27 Aug 45, in NA RG 18, 1945 AAG 320.3 Troop Basis, Vol 3, Box 96; Memo for Air Staff, Brig Gen W. E. Todd, Ch, Opnl Plans Div, AC/AS, Plans, "Deployment of Strategic Air Force," 18 Aug 45, w/incl, Memo for Gen Arnold, Maj Gen L. Norstad, AC/AS, Plans, "Deployment of Strategic Air Force," 17 Aug 45, in NA RG 341, DCS/O, Top Secret Air Adjutant General Files (hereafter cited as TS AAG), File 21, Box 7; see especially JCS 1478 and 1530 series documents, CCS 370 (8-19-45), "Postwar Requirements for Military Forces," in NA RG 218.

10. Memo for Vandenberg, Ladd, 27 Aug 45; Memo for Gen George, Norstad, 10 Sep 45.

11. Futrell, *Ideas, Concepts, Doctrine*, Chap 4, "Air Force Thinking and World War II," 63–94; LC/Spaatz, "Trans-Arctic Air Offensive," October 1945, in Subject File, Misc Folder No 8: A. R. Maxwell, Box 329.

12. Memo for Chief of Staff, Arnold, 28 May 45.

13. Rpt to Gen Arnold, Gen C. A. Spaatz, Lt Gen H. S. Vandenberg, Maj Gen L. Norstad, 23 Oct 45, 1st ind to Memo, Lt Gen I. C. Eaker, Dep CG/AAF, to Spaatz, Vandenberg, and Norstad, "Orders," 14 Sep 45, in NA RG 341, DCS/O, TS P&O, OPD 384.3 Atomic (17 Aug 45), Sec 1, Box 448.

14. *Ibid.*

15. Gen H. H. Arnold, CG/AAF, *Third Report of the Commanding General of the Army Air Forces to Secretary of War* (Washington: 12 Nov 45), 67, 68.

16. Routing & Record Sheet (R&RS), Col W. P. Fisher, AC/AS, OC&R, to Ch, Air Staff, "The Establishment of Atomic Bomb Striking Force," 30 Oct 45, w/incls, in Alfred F. Simpson Historical Research Center (AFSHRC), Maxwell AFB, AL, Microfilm Roll K1167, in Off of Air Force History, Washington; Memo for AC/AS-5(Plans), Lt Gen H. S. Vandenberg, AC/AS-3 (OC&R), "Revisions of the Seventy (70) Group Program," 6 Nov 45; Memo for AC/AS-5, Lt Gen H. S. Vandenberg, AC/AS-3, "Atomic Bomb Striking

Force," 16 Nov 45; and Memo for Ch of Air Staff, Maj Gen L. Norstad, AC/AS, Plans, "Atomic Bomb Striking Force," in NA RG 18, 1945 AAG 370.22 Campaigns and Expeditions, Box 178.

17. R&RS Cmt 1, Lt Gen I. C. Eaker, Dep CG/AAF, to Air Staff, "Atomic Bomb Striking Force," 3 Dec 45, in NA RG 18, 1945 AAG 370.22 Campaigns and Expeditions, Box 178.

18. R&RS Cmt 2, Lt Gen H. S. Vandenberg, AC/AS, OC&R, to Dep CG/AAF, "Atomic Bomb Striking Force," 17 Dec 45, in NA RG 341, DCS/O, Files of Assistant for Atomic Energy (hereafter cited as A/AE), 1945 Top Secret 322 Atomic Bomb Striking Force, Box 1; R&RS Cmt 4, AC/AS, OC&R, to Maj Gen C. E. LeMay, DCAS/R&D, "Atomic Bomb Striking Force," 4 Jan 45, and Memo for Gen Vandenberg, Brig Gen A. R. Maxwell, Ch, Rqmts Div, AC/AS, OC&R, "The Establishment of an Atomic Bomb Striking Force," 5 Dec 45, in NA RG 18, 1945 AAG 370.22 Campaign and Expeditions, Box 178; Memo for Gen Eaker, Lt Gen H. S. Vandenberg, AC/AS, OC&R, "The Establishment of a Strategic Striking Force," 2 Jan 46, approved by Maj Gen C. C. Chauncey, 7 Jan 46, AFSHRC, Maxwell AFB, AL, Document No 179.061–34A, Off of Air Force History, Washington.

19. Memo for Ch of Air Staff, Maj Gen E. E. Partridge, AC/AS, Opns, "Conference on Reorganization of the 58th Bomb Wing," 26 Apr 46, w/incl, "Organization and Deployment of the 58th Bombardment Wing," in NA RG 341, DCS/O, A/AE, 1946 Secret 008 Policy, Box 2.

20. R&RS, Eaker to Maj Gen F. L. Anderson, AC/AS–1, "Personnel for Manhattan Project," 14 Mar 46, in NA RG 341, DCS/O, TS AAG, File 22, Box 7; 1st ind to ltr, Hq Air Materiel Command to CG/AAF, "Air Forces Relationship to Manhattan District," Brig Gen A. R. Crawford, Ch, Res & Engr Div, AC/AS–4, to CG/Manhattan District (Maj Gen L. R. Groves), 8 Nov 46, w/incl, ltr, Maj Gen L. C. Craigie, Ch, Engr Div, AMC, to CG/AAF, "Air Forces Relationship to Manhattan District," n. d., in NA RG 18, 1946–47 AAG 321 AAF, Vol 1, Box 603; Memo for AC/AS–3, Maj Gen C. E. LeMay, DCAS/R&D, "Inter-Branch Responsibility for Atomic Bomb Program," w/incl, 14 Jun 46, in NA RG 341, DCS/O, A/AE, 1946 Secret 312.1 Manhattan District, Box 2; Ltr, Col W. H. Blanchard, CO, Roswell AAF & 509BG, to Maj Gen C. E. LeMay, DCAS/R&D, 24 Sep 46, w/incl, Blanchard to Ryan, et al, 23 Sep 46, and ltr, Blanchard to LeMay, 27 Sep 46, in NA RG 341, DCS/O, A/AE, 1946 Secret 353 Bomb Commanders and Weaponeers Training, Box 3.

21. Ltr, Blanchard to LeMay, 24 Sep 46, and Blanchard to Ryan, et al, 23 Sep 46.

22. Ltr, Blanchard to LeMay, 27 Sep 46.

23. Memo for Ch of Air Staff, Partridge, 26 Apr 46; Ltr, Brig Gen R. M. Ramey, CO, TG 1.5 (Prov), 58BW, to Maj Gen C. E. LeMay, DCAS/R&D, 29 Mar 46, and Ltr, Le May to Ramey, 4 Apr 46, in NA RG 341, DCS/O, A/AE, 1946 Secret 471.6 Atomic Bombs; Ltrs, Blanchard to LeMay, 24 and 27 Sep 46; Memo for AC/AS–3, LeMay, 14 Jun 46.

24. Memo for Lt Gen Lewis Brereton, Chairman, MLC to AEC, Maj Gen C. E. LeMay, DCAS/R&D, AAF, 8 Feb 47, w/incl, Rpt, Col T. C. Rogers, "Strategic Implications of the Atomic Bomb on Warfare," 3 Feb 47, in NA RG 341, DCS/O, A/AE, 1947 Top Secret 360.2 Outline of Planning Factors for Atomic Bomb, Box 4.

25. *Ibid.*; Rpt to Gen Arnold, Spaatz, Vandenberg, and Norstad, 23 Oct 45; Memo for Gen Eaker, Brig Gen T. S. Power, Dep AC/AS–3, "Army Air Forces Presentation for Joint CROSSROADS Scientific Symposium," 1 Feb 47, w/incl, "Presentation of Gen Power: Effect of the Atomic Bomb on AAF Tactical and Strategic Doctrine," n. d., in NA RG 341, DCS/O, TS AAG, File 26, Box 9; Memo for AC/AS–3, Brig Gen A. R. Maxwell, Ch, Rqmts Div, "Army Air Forces' Concept of Strategic Bombing," 1 May 46, and R&RS, Maj Gen E. E. Partridge, AC/AS–3, to DCAS/R&D, "Army Air Forces' Concept of Strategic Bombing," 7 Jun 46 in NA RG 18, 1946–47 AAG 353.41 Bombing, Box 629; R&RS, Brig Gen A. R. Maxwell, Ch, Rqmts Div, AC/AS–3, to Air Def and Guided Missile Div and Opns Div, AC/AS–3, and AC/AS–2, "Strategic Warfare at Extended Radii of Action," 15 Apr 47, w/incls, in NA RG 18, 1946–47 AAG 385 Warfare Misc, Box 644; Ltr, Brig Gen T. S. Power, Dep AC/AS–3 to CG/AU, "Preparation of AAF Concept and Outline Strategy for War," 11 Apr 47, in NA RG 18, 1946–47 AAG 381 War Plans Misc National Defense, Vol 3, Box 642; Wesley F. Craven and James L. Cate (eds), "Strategic Bombardment from Pacific Bases," in *The Army Air Forces in World War II*, Vol 5, *The Pacific: Matterhorn to Nagasaki, June 1944 to August 1945* (Chicago: University of Chicago Press, 1953), 507–756.

26. Rpt, Rogers, "Strategic Implications," 3 Feb 47, attached to Memo for Brereton, LeMay, 5 Feb 47.

27. *Ibid.*

28. Memo for Brig Gen J. L. Loutzenheiser, Maj Gen L. S. Kuter, AC/AS, Plans, 13 Dec 44; R&RS Cmt 1, Loutzenheiser, Ch, Opnl Plans Div, AC/AS, Plans, for Kuter, "Character of Possible War in 1965," 28 Dec 44; R&RS Cmt 2, Col W. M. Burgess, Dep AC/AS–2, to AC/AS–5, "Character of Possible War in 1965," 20 Jan 45; R&RS Cmt 1, Col L. M. Guyser to Maj Gen L. S. Kuter, AC/AS–5 "Character of Possible War in 1965," n. d., w/tabs, in NA RG 18, Records of Operational Plans Division, Strategic Planning Records.

29. Ltr, Spaatz, CG/USSTAF, to Arnold, CG/AAF, 19 Mar 45; Ltr, Lt Gen B. M. Giles, Dep CG/AAF, to Spaatz, n. d.; Ltr, Spaatz to CG/AAF, "Exploitation of Air Technical Intelligence Objectives," 8 Apr 45; Ltr, Maj Gen L. S. Kuter, AC/AS–5, to CG/USSTAF, "Exploitation of Air Intelligence Objectives," 23 Apr 45, in NA RG 341, DCS/O, TS AAG, File 51 Europe, Sec 6, Box 13; Ltr, Brig Gen G. C. McDonald, ACS–2, Intell, USSTAF, to Maj Gen J. P. Hodges, AC/AS–2, 4 Jun 45; Ltr, Maj Gen E. R. Quesada, AC/AS–2, to McDonald, 15 Jun 45; Ltr, McDonald to Quesada, 26 Jun 45; Ltr, Quesada to McDonald, 2 Jul 45, in NA RG 18, 1945 AAG 386.3 Captured Property, Box 191.

30. Memo for Gen Arnold, Norstad, 17 Aug 45, attached to Memo for Air Staff, Todd, 18 Aug 45; Memo for Ch of Air Staff, Maj Gen L. Norstad, "Proposed Organization and Deployment of Post-War Air Force (70 Gp Program)," 31 Aug 45, w/incl, Memo for Col Hinton, "Post-War Air Force Organization and Deployment in Areas other than where major Ground Force Units are Located," 31 Aug 45, in NA RG 18, 1945 AAG Interim, Postwar and Peacetime Air Forces, Vol 2, Box 99.

31. Memo for Dep CG/AAF, Lt Gen H. S. Vandenberg, AC/AS–3, "Occupational Air Force Troop Basis," n. d. (approximately 10–13 Sep 45), in NA RG 341, DCS/O, TS AAG, File 21, Box 7.

32. Memo for the Chief of Staff, Gen H. H. Arnold, CG/AAF, "Determination of Permanent Army and Army Air Forces Establishment," 27 Oct 45, in LC, General Henry H. Arnold Collection, Folder 114: Letters to General Marshall, Box 44.

33. Rpt, USAFE, "Location of VHB Units in ETO," n. d., and Brief, "USAFE Study on Location of VHB Units in ETO," n. d., in LC/Spaatz, Chief of Staff Papers, "Briefing Materials for European Trip," 21 Jun 46, Box 264; Memo for CG/AAF, Maj Gen L. Norstad, AC/AS, Plans "Plans for Overseas Deployment of A. A. F. Units," 10 Apr 46, in NA RG 18, 1946–47 AAG 370 Deployment, etc, Misc, Vol 1, Box 632.

34. See note above; Memo for Spaatz, Brig Gen F. F. Everest, Actg AC/AS, Plans, "VHB Air Base Construction in the United Kingdom," n. d., in LC/Spaatz, Chief of Staff Papers, "Briefing Materials for European Trip," 21 Jun 46, Box 264; Ltr, Maj Gen St. Clair Streett, Dep CG/SAC, to CG/AAF, "Operational Training and Strategic Employment of Units of Strategic Air Command," 25 Jul 46, w/incl, "Operational Training and Strategic Employment of Units of Strategic Air Command, 18 Jul 46, w/tabs, attached to 1st ind, Brig Gen T. S. Power, Dep AC/AS–3, to CG/SAC, 9 Oct 45; R&RS, Col A. Q. Mustoe, Actg Dep AC/AS–3, to AC/AS–3 and Air Staff, "Operational Training and Strategic Employment of Units of Strategic Air Command," 29 Aug 45, w/cmts attached, in NA RG 18, 1946–67 AAG 322 Organization and Training of Units, Vol 1, Box 605; Memo for CG/AAF, Maj Gen O. P. Weyland, AC/AS, Plans, "Rotation of VHB Groups to ETO," 6 Aug 46, and R&RS Cmt 4, Brig Gen W. A. Matheny, Asst Dep AC/AS–3, to AC/AS–4 and DCAS, 20 Aug 46, in NA RG 341, DCS/O, TS AAG, File 23, Box 7.

35. R&RS, Maxwell to Air Def & Guided Missile Div and Opns Div, AC/AS–3, and AC/AS–2, "Strategic Warfare at Extended Radii of Action," 15 Apr 47.

36. *The Development of the Strategic Air Command, 1946–1976* (Offutt AFB, NE: Off of the Command Historian, Hq SAC, 21 Mar 76).

37. Albert Wohlstetter, F. S. Hoffman, R. J. Lutz, and H. S. Rowen, *Selection and Use of Strategic Air Bases* (RAND Report R–266) (Santa Monica, CA: The RAND Corporation, 1954); for a fuller, RAND-ish account, see Bruce L. R. Smith, *The RAND Corporation* (Cambridge, MA: Harvard University Press, 1966), 195–240.

38. R&RS, Lt Gen I. C. Eaker, Dep CG/AAF, to Air Staff, "Decisions Reached in London Between Gen Spaatz and Air Ministry—June 1946," w/incls, Memoes, Maj Gen Clayton Bissell, Mil Attache, London, 28 Jun and 6 Jul 46, in NA RG 341, DCS/O, TS AAG, File 23, Box 7; LC/Spaatz, Chief of Staff Papers, "Briefing Materials for European Trip," 21 Jun 46, Box 264.

39. Ltr, Gen C. A. Spaatz, CG/AAF, to Maj Gen C. L. Bissell, Mil Att, London, 8 Aug 46, in NA RG 341, DCS/O, TS AAG, File 23, Box 7.

40. JCS 1630 series in CCS 381 (2-19-46), RG 218; JPS 789, JSP, "Concepts of Operations for 'PINCHER'," 2 Mar 46; JPS 789/1, PC 432/6, 10 June 46, in NA RG 341, DCS/O, TS P&O, PD 381 Russia (PINCHER) (2 Mar 46), Box 949, and CCS 381 (3-2-46), Sec 1-3, in NA RG 218, JCS Geographic File, 1948-50, Box 37; Dr. Kenneth Condit, *History of the Joint Chiefs of Staff, The Joint Chiefs of Staff and National Policy*, Vol 2: 1947-49, in NA RG 218.

41. Memo for Brig Gen F. F. Everest, Col J. J. Caldara, n. d.; Memo for Everest, 6 Sep 46; and Memo for Col A. R. Luedecke, Brig Gen F. F. Everest, 6 Sep 46, in NA RG 341, DCS/O, TS P&O, PD 381 Russia (PINCHER) (2 Mar 46), Box 949.

42. JCS 1630/3, Adm C. Nimitz, CNO, 13 Jun 46, in NA RG 341, DCS/O, TS P&O, OPD 381 Strategic Guidance (19 Feb 46), Sec 1, Box 382; Memo, Adm C. Nimitz, CNO, to Gen D. D. Eisenhower, CSA, 13 Jun 46, in NA RG 165, Records of War Department General and Special Staffs, OPD Files, ABC 471.6 Atom (17 Aug 45), Sec 7.

43. JCS 1630/4, Gen C. A. Spaatz, CG/AAF, to JCS, 1 Jul 46, in NA RG 341, DCS/O, TS P&O, OPD 381 Strategic Guidance (19 Feb 46), Sec 1, Box 382.

44. JWPC 4861/1, JSPG, "Strategic Guidance for Mobilization Planning," 18 Dec 46, in NA RG 341, DCS/O, TS P&O, OPD 381 Strategic Guidance (19 Feb 46), Sec 1, Box 382; JCS 1630 series, in CCS 381 (2-19-46), RG 218.

45. See note above.

46. Memoes, Maj Gen G. C. McDonald, AC/AS, Intell, to Gen C. A. Spaatz, 17 and 18 Oct 46, in LC/Spaatz, Chief of Staff Papers, Folder: Navy 1, Box 262.

47. Condit, *History of JCS*, RG 218.

48. Futrell, *Ideas, Concepts, Doctrine*, 121-34; Paul Y. Hammond, "Super-Carriers and B-36 Bombers: Appropriations, Strategy, and Politics," in Harold Stein (ed), *American Civil-Military Decisions* (Tuscaloosa: University of Alabama Press, 1963), 465-567; U. S. Congress, House of Representatives, Committee on Armed Services, 81st Congress, 1st Sess, *Investigation of the B-36 Program* (Washington: GPO, 1949) and *The National Defense Program—Unification and Strategy* (Washington: GPO, 1950).

49. Memo for Secretary of the Air Force, Gen H. S. Vandenberg, Vice Chief of Staff, USAF, "Status of Current Joint War and Mobilization Planning," 5 Nov 47, in NA RG 341, DCS/O, TS P&O, PO 381 (5 Nov 47), Box 355; R&RS, Maj Gen O. P. Weyland, AC/AS, Plans, to Brig Gen Rueben C. Hood, Jr., Ch, Air Staff, "Formation of Air War Plans Committee," 1 Jul 46, in NA RG 341, DCS/O, TS AAG, File 25, Box 8.

50. Memo for CG/AAF (Attn: F. F. Everest), Brig Gen G. A. Lincoln, Ch, Plans & Policy Gp, Plans and Opns Div, WDGS, "Plan for the Immediate Initiation of Strategic Air Operations," 10 Sep 46, attached to Air Plan for "MAKEFAST," in NA RG 341, DCS/O, TS P&O, PO 381 (10 Sep 46), Box 380.

51. Memo for SECAF, Vandenberg, 5 Nov 47; Air Plan MAKEFAST, Oct 46, in NA RG 341, DCS/O, TS P&O, PO 381 (10 Sep 46), Box 380.

52. Status Rpt (As of 31/2359Z Dec 46), Off of Comptroller, Statistical Control Div, 8 Jan 47, in NA RG 18, 1946-47 AAG 322 Organization and Training of Units, Vol 2, Box 605; Ltr, Blanchard to LeMay, 24 Sep 46; Ltr, Brig Gen T. S. Power, Dep AC/AS-3, to CG/SAC, "Range Bombing Program, Bomb Practice M-107," 15 Oct 46, w/incl, in NA RG 18, 1946-47 AAG 353.41 Bombing, Box 629; *Development of SAC*.

53. Short Range Emergency War Plan (SREP), Strategy Br, War Plans Div, AC/AS, Plans, "Outline Air Plan 'EARSHOT'," 15 Mar 47, in NA RG 341, DCS/O, TS P&O, PO 381 (10 Sep 46), Box 380; Memo for SECAF, Vandenberg, 5 Nov 47; Memo for Spaatz, Brig Gen W. L. Ritchie, Actg AC/AS-5, "Cable from General Bissell, London, Dated 27 April 1947," in LC/Spaatz, Diary Jan-Sep 1947, Box 28.

54. Ltr, Gen C. A. Spaatz, CG/AAF, to Gen G.C. Kenney, CG/SAC, n. d., w/incl, SREP EARSHOT, 15 Mar 47, in NA RG 341, DCS/O, TS P&O, PO 381 (10 Sep 46), Box 380.

55. File, PO 381 (10 Sep 46), Box 380.

56. Air Plans MAKEFAST and EARSHOT, in NA RG 341, DCS/O, TS P&O, PO 381 (10 Sep 46), Box 380.

57. Ltr, Gen C. A. Spaatz, CSAF, to Lt Gen E. C. Whitehead, CG/FEAF, 6 Oct 47, in NA RG 18, 1946-47 AAG 312.1 Operations Letters, Vol 2, Box 58; Richard G. Hewlett and Francis Duncan, *Atomic Shield* (Washington: AEC, 1972), *passim*.

58. Ltr, Maj Gen C. E. LeMay, DCAS/R&D, to CG/SAC, 22 Sep 47, in NA RG 341, DCS/O, A/AE, 1947 Secret, Box 8.

59. R&RS, Maj Gen G. C. McDonald, Dir/Intell, USAF, to DCS/O, "Plan for the Production of Air Objective Folders for Global Air Operations," 25 Nov 47, in NA RG 18, 1946–47 AAG 381 War Plans Misc National Defense, Vol 1, Box 642.

60. Maj Gen O. P. Weyland, Dir/Plans, DCS/O, "Presentation by General Weyland to the President's Air Policy Commission, 16 September 1947," in NA RG 341, DCS/O, TS AAG, File 31, Box 10.

61. Memo for Symington, Gen H. S. Vandenberg, VCSAF, "Status of Current Joint War and Mobilization Planning," 6 Nov 47, in NA RG 340, Records of Office of Secretary of the Air Force, Off of Admin Asst, Subj File, 1946–50, 1j (2), Box 3.

62. Condit, *History of JCS*.

63. Memo for Secretary of Defense Forrestal, W. Stuart Symington, SECAF, 16 Dec 47, w/incl, Ltr, Symington to J. E. Webb, Dir/Bureau of Budget, 16 Dec 47, in LC/Spaatz, Chief of Staff Papers, Folder: Secretary of Air Force 1, Box 263.

64. *Ibid.*

65. *Ibid.*; Memo for Record, Col D. O. Darrow, Strat Br, AC/AS, Plans, "Deployment of a 55 Group Air Force," 15 Sep 47, in LC/Spaatz, Chief of Staff Papers, Folder: Organization 1, Box 262; Futrell, *Ideas, Concepts, Doctrine*, 113.

66. Condit, *History of JCS*, 284.

67. EO 9877, 29 Jul 47.

68. Condit, *History of JCS*, 168.

69. *Ibid.*, 173–79; SM-9735, Rpt of Ad Hoc Cmte on Roles and Missions, 4 Mar 48, in NA RG 341, TS P&O, PD 660.2 (18 Jul 45), Sec 6, Box 650.

71. Condit, *History of JCS*, 179.

72. Condit, *History of JCS*; Memo for SECDEF, Adm L. E. Denfeld, CNO, 22 Apr 48, in NA RG 341, TS P&O, PD 660.2 (18 Jul 45), Sec 8, Box 651.

73. Memo for Forrestal, Gen C. A. Spaatz, CSAF, n. d.; Memoes, Leahy, Bradley, and Spaatz, 29 Apr 48, in NA RG 341, TS P&O, PD 660.2 (18 Jul 45), Sec 8, Box 651; Condit, *History of JCS*.

74. Condit, *History of JCS*, 283–88; for complete details, see CCS 381 USSR (3-2-46), JCS Geographic File 1948–50, Boxes 37, 37A, 37B, 37C, 38; R&RS, Brig Gen W. L. Ritchie, Ch, Plans Div, to Air Staff, "First Draft, Plan HARROW," 12 May 48, in NA RG 341, TS P&O, PO 385 HARROW, Box 472C.

75. Hewlett and Duncan, *Atomic Shield*, 163–64, 175–76.

76. *Development of SAC*.

77. Agreed Final Version of Newport Meetings, 20–22 Aug 48, in NA RG 341, TS P&O, PD 660.2 (18 Jul 45), Sec 8, Box 651; cited in Hewlett and Duncan, *Atomic Shield*, 170–171.

78. For a detailed account of the FY 1950 budget battle, see Warner R. Schilling, "The Politics of National Defense: Fiscal 1950," in Warner R. Schilling, et al, *Strategy, Politics, and Defense Budgets* (New York: Columbia University Press, 1960), 29–266; Condit, *History of JCS*; Minutes, Secretary of Defense Budget Meeting with the Three Secretaries and the Joint Chiefs of Staff, 4 Oct 48, Vol 1, in RG 218, CCS 370 (8-19-45), Bulky Package, Part II, Box 129.

79. Minutes, 4 Oct 48 Meeting.

80. *Ibid.*

81. *Ibid.*

82. *Ibid.*

83. Interview, Dr. Murray Green with Gen John B. Montgomery, USAF (Ret), Los Angeles, CA, 7 Aug 71.

84. Interview, John T. Bohn, Command Historian, SAC, with Gen C. E. LeMay, USAF (Ret), 9 Mar 71, in Off of Air Force History, Washington; C. E. LeMay with MacKinlay Kantor, *Mission with LeMay* (Garden City, New York: Doubleday & Company, 1965), 429–500; Futrell, *Ideas, Concepts, Doctrine*, 145–71; NA RG 341, TS P&O, OPD 337 (6 Aug 45); Lt Gen C. E. LeMay, "Notes for Discussion with General Vandenberg," 4 Nov 48, in LC/General Curtis E. LeMay Papers, Gen LeMay's Diary, Folder 1, Box B64.

85. *Development of SAC*, 15, 38.

86. For example, Louis J. Halle, *The Cold War As History* (New York: Harper and Row, Harper Torchbooks, 1975), 166; Joyce and Gabriel Kolko, *The Limits of Power: The World and United States Foreign Policy, 1945–1954* (New York: Harper and Row, 1972), 493.

87. Robert J. Donovan, *Conflict and Crisis: The Presidency of Harry S. Truman, 1945–1948* (New York: W. W. Norton and Company, 1977), 368.

88. Futrell, *Ideas, Concepts, Doctrine*, 135–81; Paul Y. Hammond, "NSC-68: Prologue to Rearmament," in Warner Schilling, *Strategy, Politics, and Defense Budgets*, 271–378; Samuel P. Huntington, *The Common Defense: Strategic Programs in National Politics* (New York: Columbia University Press, 1961), 25–64.

89. Hewlett and Duncan, *Atomic Shield*, 590–93.

90. Hewlett and Duncan, *Atomic Shield*, Appendix 4: Announced Nuclear Tests, 672–73.

91. John T. Greenwood, "The Air Force Ballistic Missile and Space Program, 1954–74," *Aerospace Historian*, XXII, No 4 (December 1974), 191–93.

AMERICAN POSTWAR AIR DOCTRINE AND ORGANIZATION: THE NAVY EXPERIENCE

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The title of this session is "The Search for Maturity in American Postwar Air Doctrine and Organization." This title intriguingly suggests that it may be possible for a large military establishment such as the United States Air Force or Navy to find "maturity" through a careful, systematic search of available options. Maturity, however, is generally not discovered as the result of a concerted effort, but is grown into so gradually that it is difficult to identify the precise moment at which it is achieved. A military organization may be said to have reached maturity when its high command has thoroughly analyzed the challenges posed by existing conditions—including the threat of potential enemies, the nature of the domestic political situation, and the state of military technology—and has determined how to manipulate technology and organization so as to operate effectively in pursuit of its chosen objectives.

With respect to naval air doctrine—by which is meant, in this paper, basic tenets of strategic rather than tactical doctrine—the Navy had reached maturity by the end of World War II. The service had achieved its wartime goals by skillfully adapting tactics and weaponry, including the most advanced air technology available, to meet the challenges posed by global war. Changing circumstances, however, require continued growth. The development of the atomic bomb, the emergence of the Soviet Union as a major military power, and the postwar struggles at home over budgets and reorganization of the armed services posed a new set of challenges which demanded major adjustments in naval air doctrine.

Between 1945 and 1949, confidence and pride in wartime accomplishments were overshadowed by conflict and confusion as the Navy struggled to redefine its role to meet the needs of a vastly changed national security environment. By 1949, the broad outlines of postwar naval air doctrine were evident, but further refinement and adjustments were required in response to continuing changes in technology, domestic politics, and definitions of national policy goals. By the mid-1950s, the Navy had developed most of the technological and organizational tools necessary to implement the doctrine it had evolved. In this sense, it had once again achieved maturity, at a new level, appropriate for the postwar world.

The process by which this level of maturity was reached is the subject of this paper.[1]

The Interwar and Early Postwar Years

A study of the emergence of postwar naval air doctrine must begin with a review of the interwar era. During the 1920s and 1930s, the Navy developed a flexible and generally effective procedure for adapting to strategic and technological innovation. Specialized training was introduced, but special branches were not created. Every officer entering a specialty like aviation or submarines was reminded that his first duty was to the Navy as a whole and that eventually he would be required to assume the traditional responsibilities of command at sea. As a result, new technology and tactics were tested not within the protective walls of a separate branch but within the body as a whole during annual fleet problems in which virtually the entire Navy participated. Innovations introduced in this way initially faced greater resistance, but, if successful, could be more fully accepted.[2]

Sea-based aviation was developed partly in response to the naval limitation treaties of the 1920s and 1930s, which forced the Navy to seek alternatives to the large battle fleets in planning for the defense of U.S. Pacific possessions. The aircraft carrier was from its inception an integral, although initially minor, part of naval operations and strategic planning. A generation of naval officers trained during this period witnessed the testing of sea-based aviation, observed its implementation in World War II, and came to accept—sometimes begrudgingly—its proven effectiveness. It was this generation, experienced in the application of naval aviation even if they were not aviators, which assumed control of Navy strategic planning after the war.[3]

The Navy's approach to innovation in the interwar era may thus be described as both conservative and highly flexible. Its approach to doctrine shared the same characteristics. The Navy relied very little on written doctrine as a training tool, preferring that naval officers absorb the fundamentals of naval theory through the practice of their craft. The result was that the Navy's officer corps shared a cohesive, almost mystical, understanding of the principles of sea power based on common experiences and carefully preserved traditions. Although this type of unwritten dogma served the Navy very well before and during the war, it was difficult to define and even more difficult to communicate.[4]

In addition, it tended to hinder rapid adjustment to fundamental change. As Bernard Brodie noted in January 1946, the Navy's "indubitably superb accomplishment in the greatest of all naval wars . . . [will] not faciliate it taking the lead in reevaluating its own place in the national security."[5] The early postwar studies of naval air power focused almost

exclusively on past accomplishments. These included an abortive and controversial study for the United States Strategic Bombing Survey called "The Carrier Air Effort Against Japan" and a similar study called "U.S. Naval Aviation in the Pacific, A Critical Review."[6]

The Navy's orientation in the immediate postwar era is probably best reflected by Fleet Admiral Ernest J. King's triumphant third report to the Secretary of the Navy summarizing the Navy's contribution in World War II. In this report, King extolled the virtues of the "balanced fleet" and pointed out how the aircraft carrier had become an "integral and primary component of the fleet," capable of carrying out a multiplicity of missions, including destruction of hostile air and naval forces, support of amphibious operations, reconnaissance over the sea, and the defeat of "hostile land-based planes over positions held in force by the enemy."[7] Although the theme of flexibility and the emphasis on tactical missions were to constantly reemerge in postwar naval planning, King's presentation gave little indication of how naval air doctrine would be adapted to postwar challenges.

In a pattern that would become all too familiar, at least in the early postwar years, the Navy appears to have first turned its attention to the question of postwar naval doctrine not as a result of its own initiative but in response to outside stimuli. In February 1946 a Joint Strategic Survey Committee report outlined the future missions of the United States' land, sea, and air forces. For the next four months the Joint Chiefs of Staff (JCS) debated the fundamental differences in service philosophy raised in this report. The Army and Army Air Forces, led by General Dwight Eisenhower, Army Chief of Staff, and Army Air Forces Commanding General Carl Spaatz, argued that service missions should be defined in terms of the medium in which each service operated, i.e., land, sea, and air, and that duplication in weapons systems should be eliminated. The immediate question at issue was not the combat role of the aircraft carrier—this would come later—but whether the Navy should be allowed to maintain and operate land-based aircraft for such purposes as reconnaissance, anti-submarine warfare, and air transport in support of amphibious landings.[8]

The Navy responded that function, not weapon systems, should determine the role and composition of each service, and that each service should have forces large, varied, and flexible enough to accomplish its mission in the face of any contingency. With inter-service tension over anti-submarine operations in the Atlantic still fresh in the Navy's memory, Chief of Naval Operations Fleet Admiral Chester Nimitz and Deputy CNO for Air Vice Admiral Arthur Radford angrily resisted the suggestion that they turn over control of vital support operations to the Army Air Forces. Not only would this impair the efficiency and effectiveness of

naval operations, but, they feared, it might seriously hamper naval air research and development activity, as had happened to the British Royal Navy when its fleet air arm was controlled by the Royal Air Force during the interwar period.

Radford was careful to point out that in demanding the right to control its own land-based air operations, the Navy had no intention of encroaching on the legitimate functions of the Army Air Forces. "The Navy does not contemplate," he stated,

> the creation of a land-based strategic bombing command; developing a land-based fighter force for the defense of the United States or of major outlying bases; building a tactical air force for land campaigns, or maintaining a competitive transport service. These are not nor have they ever been the intentions of the Navy. As is well-known, however, a most important part of the Navy is its air arm, complete and adequate, to fulfill naval missions. It includes aircraft based on ships, tenders, seadromes, or fields, with any type of landing gear—floats, wheels, or skis; powered by any type of engine—reciprocating, turbine, or jet; carrying any type of useful weapon—gun, rocket, torpedo, bomb, mine, or atomic explosive. We intend to take full advantage of scientific research and development applicable to air warfare including guided missiles and pilotless aircraft. We will continue to coordinate our enterprises with those of the Army in anticipation that each service will benefit by the progress of the other; unwarranted duplication will be avoided but no promising field of aeronautical science or tactics will remain unexplored. Our aircraft will continue to be manned by pilots, aircrewmen and technicians who will be unexcelled by any others in the world.[9]

This and similar statements provided the first general definition of what the Navy believed its future to be in the field of aviation. Such a definition, however, was by no means complete. Although Radford described Air Force missions with some care, he failed to describe in a comparable manner precisely what the Navy's missions might be. This led the Air Force to charge that the Navy, despite its protestations, actually hoped to compete for control of strategic air operations.

The dispute was apparently settled in the Navy's favor by the National Security Act of 1947, which created a Department of the Air Force, but also guaranteed to the Department of the Navy control over naval aviation, including any land-based aviation "organic thereto."[10]

This provision, however, proved to be a much more temporary safeguard than the naval officers who had aggressively lobbied for it on Capitol Hill had hoped it would be. The question of the Navy's role in aviation, particularly with regard to the strategic air offensive, was to be a repeated source of conflict over the next several years.

The Atomic Bomb and Naval Aviation

Central to this controversy was the question of the atomic bomb. In the immediate aftermath of Hiroshima and Nagasaki, atomic technology was a matter of critical importance to the Navy because of the threat it

appeared to pose to surface fleet operations. If an entire carrier task force could be destroyed by a single atomic bomb, the Navy's future would be in serious jeopardy. In response to public charges that this was indeed the case, the Navy prepared a test fleet to be sacrificed on the nuclear altar at Bikini Atoll in July 1946. The tests carried out during Operation CROSSROADS on 1 and 25 July 1946, however, largely relieved the Navy's fears. The results demonstrated, at least to the Navy, that a surface task force could survive an atomic attack if minor modifications in fleet routine were instituted—in particular, a more widely dispersed steaming formation and washdown techniques for radiological defense.[11]

The question of how the Navy might make use of the atomic weapon received much less immediate attention than the question of whether the Navy could survive any such use by an enemy power. Although Secretary of the Navy James Forrestal and Assistant Secretary Artemus Gates both stated in 1945 that U.S. aircraft carriers would someday be capable of launching an atomic attack, there is no evidence that the Navy was organizing to achieve a carrier-based strategic bombing capability in the immediate postwar years.[12] The position and office of Deputy CNO for Special Weapons (OP–06) had been created in November 1945 when the Office of the Chief of Naval Operations was formally established. The chief function of this position was to organize and implement Operation CROSSROADS. Once this assignment was nearly completed, however, officers within that organization apparently turned their attention to the question of how the Navy could employ atomic weapons. On 24 July 1946, for example, a letter originated by Commander Doyen Klein of OP–06 was sent to President Truman under the signature of Acting Secretary of the Navy John L. Sullivan proposing the modification of a number of aircraft carriers so that they could handle atomic bombs.[13]

In November 1946, however, OP–06 was disestablished, and its functions were reassigned. The DCNO (Operations), who had control of strategic plans, was now charged with overseeing atomic energy development; the DCNO (Logistics) was placed in charge of modification of carriers to handle atomic weapons; and the DCNO (Air), who administered the development of aircraft, aviation ships, and tactical concepts of aerial warfare, was also given responsibility over guided missile development.[14] As a result, dedicated younger officers, such as John Hayward, Frederick Ashworth, and Joseph Murphy, were forced to attempt to develop a nuclear strike capability for the Navy outside its formal structure. They received aid from Vice Admiral Forrest Sherman, the DCNO (Operations), and Vice Admiral Arthur Radford, the DCNO (Air), but no central office directed their efforts.[15]

One explanation for this lack of attention to the possibilities of atomic technology lies in the fact that in 1946 the Navy was focusing on an

apparently more urgent problem. The German development of advanced conventional type XXI and XXVI U-boats toward the end of World War II, and the fact that the Soviet Union had captured a number of these submarines, had led to fears that the Russians could have as many as twenty of these fast submarines by 1948 and several hundred by 1951, thus seriously jeopardizing allied control of the seas in war.[16] In June 1946, Chief of Naval Operations Chester Nimitz initiated Project GIRDER, a major research and development initiative in anti-submarine warfare. From this time until at least the spring of 1950, submarine technology and anti-submarine warfare development were the Navy's top research and development priorities.[17] This is reflected in the Fiscal Year 1948 shipbuilding program developed between May and July of 1946. Although the need for a new aircraft carrier capable of handling heavier airplanes was recognized, the majority of ships proposed were submarines and anti-submarine types.[18]

The Navy was further discouraged from attempting to develop an atomic weapons capability by the confusion that then existed in planning circles as to whether atomic weapons would be available for use in war. During the spring of 1946, initial war plans for conflict with the Soviet Union, codenamed PINCHER, were prepared by the Joint War Plans Committee and the Joint Staff Planners of the JCS. These plans called for taking maximum advantage of the atomic bomb.[19] Concurrently, however, President Truman was preparing and presenting a national policy calling for international control of atomic energy and the banning of all nuclear weapons. In response to this policy, Admiral Nimitz urged the Joint Chiefs "to avoid any specific affirmation at this time of any intention to use the atomic bomb."[20] In addition, it was unclear through the summer of 1947 what the limits and capabilities of the atomic bomb might be and how many might be available for use even if international control were not achieved. In the face of such practical and philosophical uncertainties, the Navy was inclined to confine its attention to the kind of analysis that had been carried out in Operation CROSSROADS. Instead of planning for offensive operations, assessments were made of what damage might result if American ports and the Panama Canal were subjected to atomic attack.[21]

Strategic Air and the Navy

No general statement of postwar naval doctrine was promulgated until early 1947, when U.S. Fleet Publication Number One, *Principles and Applications of Naval Warfare*, was released. In that paper, the Navy identified the "destruction of the opposing will to resist" as "the fundamental objective of the armed forces in war." It noted that this objective could be achieved by attacking the enemy's means of resistance—including industrial potential, naval and air forces, and transportation

networks—until the enemy was forced to consider further prosecution of the war to be "unprofitable." It pointed out that air attacks would not achieve an early, easy victory, and that "the outcome of the war is dependent finally on ability to isolate, to occupy, or otherwise to control the territory of the enemy."[22]

Because of its mention of industrial targets, this statement suggested to the Air Force and subsequent analysts that the Navy was interested in competing for a role in the strategic air offensive. This interpretation, however, does not do justice to the complexity of the Navy's position. In May 1947, Bernard Brodie prepared a statement for the Library of Congress Legislative Reference Service describing the naval high command's view on atomic warfare that, although unofficial, was described as having been approved by Admiral Nimitz. That statement argued that bombing raids could be performed more effectively by carrier-based jet aircraft and guided missiles than by heavy long range bombers. Not only were the Navy's planes faster and more maneuverable, but they would be operating from mobile bases over relatively short range.

Although the Navy's leadership did not specify the type of targets which would be destroyed in such attacks, it is clear that they were intended to be relatively limited. They believed that the kind of blanket strategic bombing that had been carried out over Germany and Japan by subsonic propeller-driven bombers would no longer be possible in the postwar world. The technology of aerial defense had so outstripped offensive developments that unacceptably large numbers of aircraft would have to be sacrificed to achieve the kind of massive impact which had been sought by the Army Air Forces during World War II.[23] This view was reinforced by the Navy's belief that relatively few atomic weapons would be available to the United States over the coming decade. If only a small number of bombs could be deployed, it would be necessary to ensure that a high percentage of them would reach their intended targets and that destruction of those targets would have maximum impact.

The Army Air Forces disagreed with this analysis at two critical points. They argued that adequate atomic weapons would soon be available to carry out the type of strategic bombing used during World War II, and, that, despite improvements in aerial defense the long range heavy bomber was a proven weapon fully capable of carrying out the missions for which it had been designed.[24]

Bernard Brodie's report is interesting because it provides the first statement of a general Navy position on atomic air strategy in the postwar period. It did not, however, accurately reflect official Navy planning. In January 1947, Vice Admiral Forrest Sherman, the flag officer charged with directing naval strategic planning, gave a presentation to President Truman in which he did not mention naval use of atomic weapons, but

stressed instead the conventional tactical role of carrier forces. This apparent internal conflict reflects a persistent split between long-term technologically oriented projection and near-term war planning which plagued the Navy as well as the other services after World War II.[25] Whereas actual war planning necessarily focused on currently available weaponry, the kind of forecasting which Brodie was describing was freed from such constraints.

It was not until after the final report of the JCS Bikini Evaluation Committee in July 1947 that the Navy initiated any serious consideration of how it could most effectively make use of the atomic bomb. The Bikini Evaluation Report, presented in detail to the assembled leadership of the nation's armed services on 29 July 1947, argued for a significantly upgraded evaluation of the weapon's potential power. It stressed the need for an effective atomic bomb striking force in being at all times as a deterrent to attack. It also stressed the scarcity of fissionable material and concluded that the bomb would have to be used primarily against urban targets rather than against troops or naval vessels.[26] Concerned about the nation's low level of conventional readiness, and impressed by the results of the Bikini tests, many naval officers—especially naval aviators—concluded that the Navy should attempt in earnest to develop a nuclear weapons capability.

The Navy's shift in attitude toward the atomic bomb in 1947 was indicated by a change in its justification of the construction of its new aircraft carrier, the CVA–58. Design work on this ship had begun in April 1945 in response to recommendations for future carriers developed from World War II combat experience. The new ship was the logical extension of existing carrier technology: it was bigger, had more powerful catapults and arresting gear, and, because it had no "island" superstructure, had a significantly greater flight deck area for parking and operating the heavy jet fighters and multi-engine attack planes which represented the next generation of naval aircraft. The CVA–58 was designed as a multi-purpose ship that could handle a wide variety of weapons, conventional and atomic. By the fall of 1947, however, when the new ship was included in the Fiscal Year 1949 shipbuilding program, the Navy was referring to it as an "atomic carrier" both to the public and to Congress. This emphasis reflected not only the Navy's desire to develop its nuclear capability in the wake of the Bikini tests, but also its apparent belief that the carrier would stand a better chance of getting funded if it were defined in terms of the new technology.[27]

Further indications of a growing interest in atomic weapons is to be found in the force projections the Navy developed in November 1947 in support of the first Joint Outline of the Long Range War Plan, CHARIOTEER, being prepared by the Joint Strategic Plans Group. CHARI-

OTEER was intended to define what forces, particularly air forces, the United States would need in the event of war with the Soviet Union in 1955. These projections were not solely for JCS use, but were also intended for submission to the President's Air Policy Commission, which was then preparing its public report on the nation's future aviation requirements.[28] The Navy report on its needs projected that it would require four four-carrier task groups by 1955. Each task group would contain one CVA–58 class carrier; all the carriers in each group were to be equipped with long-range multi-engine bombers.[29] The Aviation Plans Division of the Office of the DCNO (Air) provided its own forecasts of the types and capabilities of naval aircraft and guided missiles which would presumably be developed by 1955. At the top of the list were the North American AJ–1 multi-engine prop-jet attack plane, which was to be the Navy's first nuclear capable aircraft, and a multi-engine jet design, the ADR–42, which, it was believed, could only operate from one of the CVA–58 type ships.[30]

These studies were complemented by a series of additional papers which went beyond technology and force levels to discuss the Navy's philosophy of its future role in warfare. The two most significant public papers were Admiral Chester Nimitz's valedictory statement upon retiring as Chief of Naval Operations, "The Future Employment of Naval Forces," issued on 6 January 1948, and Rear Admiral Daniel V. Gallery's famous memo of 17 December 1947, which was leaked to the public by Drew Pearson in March 1948. Nimitz argued that the Navy had developed carrier technology and tactics to such a point that it could create offshore bases of superior capability and relatively low vulnerability virtually anywhere in the world. He pointed out that since a feasible intercontinental bombing force was not likely to be achieved for several years to come, the Navy was the service best prepared to project power against the enemy in the initial phases of a war. The Navy, therefore, should be assigned continuing responsibility for supplementing Air Force bombing operations.[31]

Gallery, the Assistant CNO for Guided Missiles, went even further. His memo suggested that the Navy would be quite capable of handling most offensive air operations. In fact, he proposed, the entire Navy should be restructured to pursue this objective. "For the past two years," he argued,

> our defense of the Navy has been based mainly on old familiar arguments about exercising control of the seas. Much has been said about anti-submarine warfare, naval reconnaissance, protection of shipping and amphibious operations. It has been assumed, at least implicitly, that the next war will not be much different from the last one. This assumption is basically wrong, and if we stick to it, the Navy will soon be obsolete. The next war will be a lot different from any previous one. It seems obvious that the next time our Sunday Punch will be an Atom Bomb aimed at the enemy capitols and industrial centers and that the outcome of the war will be determined by strategic bombing. The war will be won by whichever

side is able to deliver the Atom Bomb to the enemy, and at the same time protect its own territory against similar delivery. I think the time is right now for the Navy to start an aggressive campaign aimed at proving that the Navy can deliver the Atom Bomb more effectively than the Air Force can.[32]

If this campaign proved successful, he went on, the Navy's primary mission could be the delivery of atomic attacks, while the Air Force would have the air defense of the United States as its prime responsibility. Gallery recommended as an interim measure the immediate development of a special carrier bomber based on the P2V Neptune until the development of a so-called "atomic" carrier capable of quickly launching a jet-propelled multiple plane strike force. This extreme position met with general skepticism on the part of senior officers of DCNO (Air) and the outright disapproval of the new Chief of Naval Operations, Admiral Louis Denfeld, and the Secretary of the Navy, John L. Sullivan.[33]

A more moderate position which received wider acceptance was circulated by a veteran naval aviator, Rear Admiral Ralph Ofstie, a Navy member of the joint Military Liaison Committee to the Atomic Energy Commission and a former member of the JCS Bikini Evaluation Board. In a paper entitled "The Composition of the U.S. Military Establishment," Ofstie followed the line taken by Admiral Nimitz, noting that the carrier striking force was peculiarly well suited for offensive air operations against the USSR. Ofstie, however, went beyond previous Navy statements in tentatively identifying the targets for this striking force. In his view, the first wave of attacks should focus on political control centers and urban and industrial concentrations in order to disrupt national organization and command structures. Other tactical targets could then be attacked, using conventional as well as atomic weapons. Ofstie believed "that the day of the great strategic bombing force suited only to aerial bombing is finished." He proposed that emphasis should be placed on developing high performance, high mobility aircraft with improved accuracy, rather than on trying to produce large numbers of "super bombers."[34]

The Nimitz, Gallery, and Ofstie memoranda demonstrate the lack of consensus that existed within the Navy with regard to the basic functions and missions of naval air power. Nimitz had raised the possibility that the Navy might participate in the air offensive; Gallery had taken the extreme position that strategic bombing should be the primary mission of the Navy. Ofstie, probably best representing the views of a majority of naval aviators, proposed a kind of middle course: the Navy should undertake atomic missions, but it should reject strategic bombing as practiced by the Air Force and develop an alternative model based on flexibility and selectivity.

Central to Ofstie's statement, and to the Navy's way of thinking at this time, was the desire to keep as many options open as possible. A

series of operations analysis studies, completed in February and March 1948, indicated, as Nimitz had predicted, that sea-based aviation would be equally or even more effective than land-based aviation in delivering long range air attacks against the Soviet Union.[35] The Navy remained unconvinced, however, that strategic bombing would win a war, despite Gallery's arguments, and certainly was not committed to trying to gain control of the air offensive. Unfortunately, the Navy's insistence on keeping its nuclear options open was interpreted by the general public, and more importantly by the Air Force, as indicating just such a desire. The CVA-58, which was included in the Navy's Fiscal Year 1949 budget, became the public symbol of a presumed Navy campaign to undermine Air Force prerogatives.[36]

The Roles and Missions Debate

Concerned for its new existence as an independent organization, the Air Force was undoubtedly inclined to exaggerate the threat posed by the Navy. In the winter of 1948, the Air Force, with about thirty-five nuclear-capable B-29 bombers, was the only service capable of delivering an atomic attack of any kind. The Navy had modified its three *Midway*-class carriers to handle atomic weapons, but the first dedicated nuclear-capable naval aircraft, the AJ-1 Savage, was at least twenty-one months from delivery, and an interim aircraft, the P2V-3C Neptune, had not yet been carrier-tested prior to being modified to carry atomic bombs.[37] In addition, it became increasingly clear that the full resources of both the Air Force and the Navy would have to be used to counter the threat posed by Soviet conventional forces in the event of war. The war plans drawn up in 1948 projected that the situation in Western Europe in case of a Soviet invasion would be so desperate that maximum use of all available forces would be required to meet the emergency.[38] Nevertheless, projections did little to ease growing interservice tension over allocation of responsibility for atomic weapons and bombing operations.

It was against the backdrop of the Nimitz and Gallery statements and the proposed construction of the CVA-58 that the roles and missions disputes of 1948 were carried out. For the most part, these arguments appeared to deal with relatively minor points, such as the question of which service would set schedules for the development of nuclear capable aircraft,[39] and who would serve as the executive agent for the JCS to the Armed Forces Special Weapons Project.[40] However, the issue of whether the Navy would be allowed to determine what air operations were necessary to accomplish its wartime missions would receive a great deal of attention and provoke extensive controversy. The JCS position paper on Armed Forces functions was reviewed and revised at the Key West Conference in March 1948 in hopes of resolving the Navy-Air Force split over this issue. The statement issued as a result of that conference, how-

ever, as well as a subsequent clarification by Secretary of Defense James Forrestal and a second conference held at Newport in August 1948 failed to satisfy either service. Misunderstanding and conflict between the services was worse by the fall of 1948 than it had been before passage of the National Security Act a year before.[41]

The General Board Sets the Navy's Course

During the winter of 1948, in the absence of any consensus within the national military establishment regarding service roles and missions, and without clear guidance on national security policy from the President or the National Security Council, the Navy initiated a broad survey of its role in postwar national defense. The need for such a study was abundantly clear by this time. The uses and limitations of nuclear weapons were better understood, and the possibility of conflict with the Soviet Union seemed increasingly imminent. The General Board was the logical office within the Navy Department to undertake such a study. The Board had been established in March 1900 for the purpose of advising the Secretary of the Navy on questions of high policy. It did not represent any special interest group within the Navy; rather, it was composed of some of the brightest senior line officers in the Navy and Marine Corps. Because of this broad representation, the Board was in a better position than the naval aviation community to evaluate the role of air power within the context of the Navy's overall contribution to national defense.

The driving force behind the General Board study of "National Security and Navy Contributions Thereto for the Next Ten Years" was Captain Arleigh Burke, a surface officer with special training in ordnance explosives who had served as Chief of Staff to Vice Admiral Marc Mitscher, Commander of Fast Carrier Task Force 58 in World War II. It was Burke who recommended that an overall review of national security requirements should be undertaken before attempting to identify the Navy's place in national defense.[42] His 200-page final report, which was released on 25 June 1948, was based on written statements collected from several hundred senior naval officers and distinguished civilians.

The report's conclusions regarding strategic air warfare were in distinct contrast with the views developed in the naval aviation community during the previous two years. The General Board did not offer carrier-based aviation as a major alternative to land-based forces in carrying out the strategic air offensive, and it expressed reservations about the offensive itself as currently envisioned. The report conceded that the air offensive would be vital to the United States in the event of a war with the Soviet Union and that atomic weapons would have to be used to achieve the desired results within a reasonable time. It argued, however, that control of the seas, selective initiation of ground offensives, and other

conventional operations must also be considered necessary elements in U.S. strategy and that "sole reliance on the complete success of violent and irretrievable departures from established concepts and techniques of war"—apparently meaning strategic nuclear bombing—would be highly inadvisable.[43] The General Board further expressed the view that the most vulnerable targets in the Soviet Union were not its industrial cities, as attacks on most of these would require too great an expenditure of scarce resources, but the large southern oil fields and the principle naval and submarine bases.

Taking a page from the concerns of Project GIRDER, the report identified anti-submarine warfare as the first mission of the carrier task forces. In an effort that was expected to absorb the greater part of their energy, those forces would destroy and blockade "enemy submarine bases by atomic, radiological, conventional bombing or mining attacks." Additional carrier missions, in order of importance, were support for amphibious assaults to seize advanced bases, air cover for surface forces and convoys in sea lines of communications, and, finally, contributing to the air offensive by attacking targets which could not easily be reached by any other means. In an accurate appraisal of the Navy's current capabilities, which had unfortunately been lacking in earlier studies, the General Board concluded rather pessimistically that

> the Navy's initial tasks of control of the seas, occupation or seizure of advanced bases, attacks on Russian bases and denial of advanced bases to Russia, combined with the enormous logistic supporting effort for the other services and our allies, will place so many demands upon the Navy for immediate operations in widely separated parts of the world that fulfillment of all demands may well be beyond the capacity of the Navy in being.[44]

The General Board study, which was circulated as widely within the Navy as its top secret classification would allow, was a turning point in the Navy's efforts to chart its course in the postwar environment. It provided for the first time a realistic assessment of the demands which would be placed on the Navy in war and the Navy's ability (or inability) to meet those demands. Unlike the Gallery memorandum, it did not endorse the concept that strategic bombing could win the war, and it emphasized the continuing importance of traditional naval tasks. Using the best estimates of the enemy threat then available, the General Board pointed out how impossible it would be for the Navy to attempt to assume a major role in the strategic air offensive while carrying out its own vital missions.

More on the Roles and Missions Debate

From the fall of 1947 on, American joint war plans had called for both an atomic air offensive against the Soviet Union and conventional operations, including naval operations in the Eastern Mediterranean and

the maintenance of a substantial foothold in Western Europe. A major reassessment of such war plans became necessary, however, as a result of the $14.4 billion ceiling which President Truman imposed on the Fiscal Year 1950 defense budget and refused to negotiate. A series of heated debates within the JCS in October 1948 produced a plan in line with this austerity budget which called for abandonment of Western Europe and a reduction of the Navy's missions to defense of the sea lines of communication. An atomic air offensive launched from Great Britain, the Suez area, and Okinawa would be the primary U.S. war effort.[45]

This proposed reduction in conventional operations and increased reliance on strategic bombing produced a two-fold reaction within Navy planning circles. First, it led to a concerted Navy campaign to defend the aircraft carrier as a multi-purpose weapon which could provide much needed operational flexibility. In presenting this argument, the Navy was not only fighting for its own organizational survival, but was concerned that the strategy being proposed was rigid, one-dimensional, and inherently unsound. Second, the Navy began to voice serious doubts about the proposed strategic air offensive. This concern had been slowly developing during the previous year and a half, beginning with the argument that strategic bombing as it had been practiced during World War II would no longer be possible in an era of sophisticated air defense. By the fall of 1948, as we shall see, the Navy was questioning not only whether such attacks were feasible, but whether they would promote U.S. war aims even if they could be successfully delivered.

The effort to defend the Navy's existing carrier forces in the face of the budget ceiling was only successful in the sense that it averted complete disaster. In the October 1948 JCS debates over the Fiscal Year 1950 budget, the Navy argued that a nine-carrier force level, a cut of two from Fiscal Year 1949, was the absolute minimum that it could accept. The Chief of Staff of the Air Force, General Hoyt S. Vandenberg, recommended that the Navy should have only four carriers, while the Chief of Staff of the Army, General Omar Bradley, recommended six. Secretary of Defense Forrestal on 9 November approved an eight-carrier force level, provided that it could be maintained out of the $4.6 billion allocated to the Navy.[46]

Six months later, on 23 April 1949 after consultation with President Truman, Louis Johnson, who had replaced Forrestal as Secretary of Defense, cancelled the construction of CVA-58, only recently named USS *United States*. Johnson's decision was primarily an economy move, but he justified it on the grounds that the carrier would be an unwarranted duplication of effort since its primary mission was apparently atomic warfare.[47] The eighteen months of Navy propaganda focusing on the nuclear capability of the ship thus proved to be its undoing. While the

cancellation of the CVA-58 did not affect the eight carrier force level established for Fiscal Year 1950, it was an ominous indication of what was to come. On 5 July 1949, Secretary Johnson set a tentative carrier force level for Fiscal Year 1951 of only four ships. Although this was raised two months later to six, the continuing decline of carrier air power appeared inevitable.[48]

The Navy's opposition to continued reliance on the strategic air offensive fared little better than its effort to retain an adequate conventional carrier force. A number of naval officers prepared statements questioning the efficacy and appropriateness of the planned atomic attack on industrial concentrations in the enemy's cities during the winter and spring of 1949. Those developed by the Strategic Plans Division for Admiral Denfeld's use in the JCS defined the Navy's position in interservice debates. Others, including papers by Ralph Ofstie, Arleigh Burke, and, surprisingly, Dan Gallery, were circulated only within the Navy Department. Gallery argued eloquently that the planned atomic air offensive would be unlikely to win a war:

> . . . this kind of war is not as simple as the prophets of the ten day atomic blitz seem to think. Some authorities estimate that the damage done by strategic bombing of Germany was equivalent to 500 Atomic Bombs. But Germany did not surrender until her armies were defeated. This damage is costing the U.S. huge sums of money now. In addition, levelling large cities has a tendency to alienate the affections of the inhabitants and does not create an atmosphere of international good will after the war.

In a total reversal of the position he had developed a year before, he proposed that "we should abandon the idea of destroying enemy cities one after another until he gives up and find some better way of gaining our objective."[49]

In May 1949, a joint ad-hoc committee headed by Air Force Lieutenant General Hubert R. Harmon completed a study requested by Secretary of Defense Forrestal in October 1948. The purpose of the study was to analyze the probable impact of the planned air offensive under the most favorable conditions. It concluded that, even if all the bombs reached their assigned targets, the air offensive alone would not destroy the Soviet Union's will or capability to make war or prevent a Soviet takeover of Western Europe. Although Air Force Chief of Staff Vandenberg objected to these conclusions and attempted to have them deleted from the final report, an impassioned defense of the study by Admiral Denfeld was effective in preventing major modifications. Since the report was never circulated, however, its impact on strategic planning was limited.[50]

The fear that the Navy would be reduced to little more than a convoy and escort force while the atomic air offensive continued to dominate U.S. strategy finally brought forth within the Navy a clear statement

regarding its philosophy of naval aviation. In a postmortem on the cancellation of the USS *United States*, Ralph Ofstie concluded that the Navy itself was to blame for the defeat, because it had "simply remained on the defensive and failed to make its position clear."[51] Ofstie attempted to remedy this failing. On 29 April 1949 he presented what was to be the simplest and yet the most comprehensive statement to date of naval air doctrine:

> . . . Strategic air warfare (SAW) may be defined as the sustained mass attack (when using conventional bombs) or attack with weapons of mass destruction (atomic bombs) against the war making capacity of an enemy. It is essentially based on the wholesale destruction of urban and industrial areas and the civil populace of the enemy rather than direct attack on his active military machine.
>
> . . . The Navy does not concur in any view that readiness to conduct SAW should be a major factor in the peacetime air power of the United States. However, the Navy would naturally be ready, within its capabilities to assist in SAW, as a purely secondary function, if directed by appropriate authority.
>
> . . . Naval air, representing the mobile air power of the United States, is primarily directed to the delivery of the maximum air strength wherever that mobile air force can be employed against targets of direct and immediate military importance. It considers these targets to be military forces (land, sea, and air), military installations (land, sea, and air bases), and lines of communication (ocean and inland shipping, rail and road transport, and the fuel, therefore—oil).[52]

This statement succinctly spelled out the basic elements of an emerging consensus within the Navy regarding the place of naval air power in national strategy; as such, it provided a basis for future refinements of air doctrine.

These principles also provided a framework for the Navy's continuing efforts to defend its prerogatives within the national military establishment. A renewed movement for additional unification of the armed services in the fall of 1948 had produced a series of proposals for further reducing naval autonomy, including the proposal that the Secretary of the Navy be demoted from cabinet status. The ensuing debate over revision of the National Security Act, which continued until the approved amendments became law in June 1949, served to keep alive the Navy's fear that it would be forced to accept an increasingly subordinate place in national defense. This round of interservice competition came to a head in the fall of 1949 in the Congressional hearings over the B–36, unification, and national strategy.

The Navy's reaction to attack on its position was to strike back publicly through the press and appeals to Congress. The situation appeared desperate, and desperation tactics were employed, including the use of innuendo and falsehoods, which only weakened the Navy's position. The House Armed Services Committee's B–36 Investigation of August 1949 proved especially embarrassing to the Navy because of the use of such tactics by certain zealous individuals.[53] The shadow cast by these proceedings, in turn, made it difficult for the Navy to present its

position convincingly during the much more substantive Unification and Strategy Hearings before the same Committee in October. During those hearings, a pantheon of high ranking naval officers, led by Admiral Radford, but including Admirals King, Nimitz, Denfeld, Blandy, Ofstie, and Captain Burke, made a massive, technically oriented presentation that attempted simultaneously to prove the need for a Navy, extol the virtues of the aircraft carrier, criticize the weakening of the Navy's place in the defense organization, attack the technical capabilities of the B–36 bomber, and question the effectiveness of the atomic air offensive in achieving the goals of American air strategy.[54] The emphasis placed by the Navy on the virtues of aircraft carriers while attacking the B–36, the general inarticulateness of most Navy spokesmen, and their inability to document their critique of the air offensive because of the sensitive nature of supporting documents, all combined to leave the cumulative impression on the public that the Navy was condemning the direction of current U.S. strategy primarily because it had not been allowed to dominate the air offensive with carrier-based aircraft.[55]

The new consensus regarding naval air power, which had provided the basis for the Navy's presentation during the Unification and Strategy Hearings, in some ways marked a return to prewar and postwar concepts. Ralph Ofstie's April 1949 memo is oddly reminiscent of Admiral King's 1945 expression of his views on the World War II role of naval aviation. Aircraft carriers were to serve as the United States' mobile striking force, capable of performing a spectrum of missions, from providing naval presence in time of peace (as carriers had been doing in the Mediterranean since 1946) to delivering the atomic bomb in war. The central concept was flexibility, and the focus was on allowing the Navy to define its own strategy in pursuit of its stated missions.

The OP–55 Study

In August 1949, the Air Warfare Division of the Office of the DCNO (Air), OP–55, which was charged with formulating "long range and short range programs for the most effective employment of naval aviation in air warfare," spelled out the specific applications of this new strategy in a study on "The Future Development of Carrier Aviation." This study used as its starting point the JCS 1948 Key West Conference statement on the functions of the armed forces, which identified the Navy's prime mission to be "control of vital sea areas and protection of vital sea lines of communication." The Navy's willingness to accept this definition did not indicate that it had capitulated to external pressures, but rather that the identification of naval air missions suitable to the postwar environment had given the service the confidence to pursue its own path without fear of restriction and encroachment.[56]

The OP–55 study was the most significant single statement of naval air doctrine yet produced. Its most significant immediate conclusion was that enemy air power, rather than enemy submarines, was the most serious threat confronting the Navy. The paper argued that the Soviet submarine fleet was neither as large nor as sophisticated as had been projected since 1946 and that it could be "effectively throttled early in the war and kept under control by a timely and aggressive anti-submarine campaign employing carrier air strikes, aerial minelaying, and antisubmarine subs as the spearheads, backed by the more conventional measures such as barrier patrols, convoy escorts, and ASW hunter-killer carrier groups."[57]

Soviet tactical air forces, which were judged to be experienced, technologically advanced, and potentially extremely dangerous, posed a much more serious threat over the next ten years to U.S. control of the sea lanes in the Eastern Atlantic and the Mediterranean. The problem of Soviet air power had earlier been identified in a January 1949 report by the staff of Admiral Richard Conolly, Commander in Chief, U.S. Naval Forces, Eastern Atlantic and Mediterranean. The report had proposed using aircraft carriers as mobile air bases for fighters engaged in intercepting enemy air attacks on sea lines of communications and advanced bases in the Eastern Mediterranean.[58] OP–55 rejected this strategy, arguing that the Navy should take aggressive, offensive action to destroy the air threat by attacks on enemy air installations:

> Carrier aviation must retain the bulk of its strength in *offensive power* if it is to support a truly offensive Navy rather than a defensive one. Our Navy must carry out numerous functions other than defensive antisubmarine warfare and must possess the self-contained ability to move at will and wage offensive war against the enemy in the air, on the surface and below the surface.

The report pointed out that the Navy would expect to make use of long-range heavy attack aircraft and atomic bombs, but that these planes and weapons would be used for tactical missions rather than in strategic air attacks. "It is not military practice to limit the employment of any one weapon to the fulfillment of any one function," the report concluded, arguing that the Navy should be allowed to use all available weapons in pursuit of its assigned objectives.

The OP–55 report made clear that heavy attack aircraft and nuclear weapons would play only a minor role in naval aviation. It recommended that heavy attack planes be kept to a minimum in designing carrier air groups and that emphasis be placed instead on general purpose fighter aircraft with both offensive and defensive capabilities and on day attack and close air support attack airplanes. It emphatically recommended construction of a flush deck aircraft carrier along the lines of the cancelled USS *United States* as a "*necessary* and logical development" in naval technology, but stated that a somewhat smaller new carrier, the size of

the *Midway* class, might be substituted if necessary. Failing both of these, it urged modification of one of the existing *Midway* or even *Essex* class carriers to the configuration of the CVA–58 in order to meet the urgent need for a carrier able to accommodate the increasing size and capability of carrier-based aircraft.

The Air Warfare Division's study initiated a process of refinement and implementation of naval air doctrine that proceeded through the mid 1950s along the lines established in the summer of 1949. Its recommendations regarding ship and aircraft construction and deployment were largely implemented, and its analysis of the threats confronting the U.S. Navy and its basic missions underwent only minor adjustment during this time.

Decisive Developments

The problem of gaining support and adequate funding for its projected building programs had been a major stumbling block for the Navy in trying to define its future in the postwar period. Without the constant distraction of interservice competition for limited budget funds, naval air doctrine might have evolved more smoothly and rapidly. In the year after the release of the OP–55 study, however, three developments occurred which were largely to alleviate this source of frustration: a new Chief of Naval Operations with outstanding leadership abilities took office; the fall of China and the Soviet nuclear explosion triggered a movement aimed at upgrading the U.S. military posture; and the Navy's performance during the early months of the Korean conflict proved its particular value in national defense. Each of these developments deserves at least a brief discussion.

Admiral Louis Denfeld was fired as CNO shortly after the Unification and Strategy Hearings. His replacement was Admiral Forrest Sherman, a brilliant, controversial officer who had been one of the architects of unification. Sherman was the first career naval aviator to serve as CNO. He brought to the JCS considerable experience in strategic planning, a clear grasp of naval strategy, and unusual skill at interservice infighting and bargaining. His impact was felt almost immediately. During his first six months as CNO he successfully blocked reduction of the active carrier force below seven despite the tightness of operating funds and helped to heal the interservice rifts that had developed during the previous three years. Until his untimely death in July 1951, Sherman was a leading advocate of conventional preparedness against emergencies short of global war and of keeping as many options open as possible for facing a world-wide conflict.[59]

The willingness of national decision makers to fund the kind of military establishment that could implement such a strategy increased

rapidly following the fall of China in September 1949 and the discovery of the Soviet atomic explosion that same month. NSC–68 of April 1950 crystallized and symbolized the decision makers' mood. It recognized that a one-dimensional nuclear-oriented defense posture would be inadequate to handle the demands of national security and recommended—after rejection of such other options as isolation, preventive war, and continuation of current policies—that the United States build up its overall military, economic, and political power to avoid defeat in the Cold War and to defend against a possible Soviet attack in 1954.[60]

The North Korean invasion of South Korea on 25 June 1950 was the final impetus to rapid expansion of the U.S. military and of the Navy in particular. Seventh Fleet aircraft carriers were among the first U.S. combat units to respond in a sustained manner to the emergency, vindicating the Navy's claims about the value of mobile, flexible carrier striking forces. On 11 July, the JCS agreed to postpone a scheduled reduction in carrier force levels, and one day later Defense Secretary Louis Johnson, who had cancelled the USS *United States* only fifteen months before, told Forrest Sherman, "I will give you another carrier when you want it."[61]

By 8 August, Johnson was discussing a defense budget of $50 billion, as compared to the $13 billion budget for Fiscal Year 1951. In December 1950, the National Security Council (NSC) decided that the force levels the JCS had recently set as goals for 1954 should be treated as interim levels to be achieved no later than 30 June 1952. Revised final estimates were prepared by the JCS later that month. These called for a ninety-five group Air Force, an eighteen division Army, and a Navy of twelve large aircraft carriers, fourteen carrier air groups, fifteen light and escort carriers, plus large numbers of additional ships. The buildup and renovation of U.S. nuclear and conventional forces continued through the remainder of the Truman administration and for several years beyond. During this period, a new "super-carrier" was included in each fiscal year defense budget, beginning with USS *Forrestal* in Fiscal Year 1952.[62]

The expansion of naval forces was complemented by the achievement in February 1951 of a rudimentary nuclear attack capability for American aircraft carriers. Since the spring of 1949, the Navy had been training for atomic missions using modified P2V–3C Neptune patrol planes, which could be launched from a carrier but could not land on one. That fall the first deliveries of carrier-based AJ–1 Savages were made to the Navy's sole nuclear attack squadron, VC–5. Until late 1950, however, VC–5 had no bombs available nor any assigned missions in which they would be used.[63]

On 14 June 1950, President Truman, in response to a JCS request via the Atomic Energy Commission, permanently released ninety non-nuclear mechanical assemblies from the Atomic Energy Commission to

the military. By September, both the JCS and the NSC had apparently approved storage of some of those components on *Midway* class aircraft carriers.[64] Although nuclear capsules for those components were not released by the President to the military until April 1951, nor put on aircraft carriers until at least 1953, a clumsy but workable system of flying those capsules from the United States to carriers at sea, codenamed "Daisy Chain," was developed during 1951–1952.[65]

The Navy's ability to make use of the weapons once they were received was still strictly limited. In February 1951, six AJ-1s and three P2V-3Cs flew to Port Lyautey, Morocco, in the first operational deployment of Navy nuclear capable aircraft. Malfunctions in the planes forced their grounding for four months, however, and through October the AJ-1s operated at sea for only nineteen days. Dan Gallery, who commanded the Sixth Fleet's carrier division at that time, was asked years later whether he had ever considered using the planes in the event of war. "We just didn't even think about it," he said.[66]

The mission developed in October and November 1950 for the Navy's nuclear capable aircraft was specifically a naval one: to destroy the capabilities of the Soviet surface and submarine fleets in areas within a 600-mile radius of the Mediterranean, Norwegian, and Bering Seas.[67] By September 1951 that mission had been expanded somewhat, as indicated by a statement on carrier forces prepared for the JCS in connection with continuing NSC studies of mobilization:

> These forces represent the major striking power of the Navy and are primarily responsible for neutralizing at the source the enemy's offensive capabilities to threaten control of the seas. These forces will destroy enemy naval forces and shipping, attack naval bases, attack airfields threatening control of the seas, support amphibious forces and support the mining offensive. As additional tasks, the carrier striking forces will defend bases and vital areas against attack through the seas, as required. In addition to the above, these forces will provide naval support essential to the conduct of operations by Supreme Allied Commander, Europe (SACEUR), Commander in Chief, Far East (CINCFE) and other area commanders. For example, the 6th Fleet, now in the Mediterranean, will provide naval support to SACEUR in the accomplishment of his missions.[68]

The assignment of carrier forces to support SACEUR's missions was the result of events that had transpired since January 1951. In that month General of the Army Dwight Eisenhower, the newly appointed Supreme Allied Commander, Europe, had briefed President Truman and the cabinet on his vision of NATO's future. Eisenhower's strategic concept for the defense of Europe was to use a "great combination of sea and air strength" in the Mediterranean and the North Sea in addition to building up ground forces on the central front. Then, he noted, "if the Russians tried to move ahead in the center, I'd hit them awfully hard from both flanks."[69]

Tactical support for ground forces has been a mission of the Sixth Fleet since 1948, and the Navy had argued persistently that atomic weapons as well as conventional ordnance should be used for this purpose. In 1949, after the Harmon Report had demonstrated that strikes on industrial concentrations alone would not prevent the Soviet Union from taking Western Europe, and the NATO treaty had been signed committing the United States to the defense of Western Europe, the Strategic Air Command was tasked with holding back a Soviet advance with nuclear weapons.[70] Because of the difficulty of hitting troop concentrations and the scarcity of nuclear weapons, however, plans for carrying out this mission were three years in the making. Before 1952, the JCS did not feel they could allocate atomic weapons or units specifically for tactical use.

Not only was the actual number of bombs small, but the so-called "doctrine of scarcity" held that "there is a definite, positive, and known limit to the number of atomic bombs which can be produced."[71] In early 1950, however, the prospects offered by the experimental breeder reactor and the discovery of new deposits of low grade uranium ore put an end to such thinking. Significant increases in nuclear weapons production were approved in 1950 and 1952.[72] In addition, advances in bomb technology had led to the development of relatively small atomic bombs which could be delivered by general purpose fighters and day attack planes like the Navy's F2H–2B Banshee and AD–4B Skyraider. In February 1952, the JCS informed Eisenhower that, for planning purposes, a number of atomic weapons had tentatively been allocated for tactical use in the defense of Western Eurasia and that Navy as well as Air Force aircraft could be considered as prospective delivery vehicles.[73]

The increased availability of nuclear weapons led to new clashes between the services over control and coordination of offensive atomic operations, particularly the retardation mission. In early 1952, channels for coordination of nuclear strikes and review of unified commanders' nuclear target annexes were established through a jointly staffed war room in the Pentagon.[74] The Navy, however, continued to insist on its right to maintain flexibility in planning for the use of nuclear weapons. Naval leadership repeatedly argued that they could not predict "exactly what targets the Navy will attack on any particular day. It will depend entirely on the situation existing and the requirement for the delivery of the attack."[75] In addition, the Navy and the Air Force strongly disagreed over whether carrier task forces would be able to survive in high threat areas and launch atomic strikes against their targets. A Weapons Systems Evaluation Group (WSEG) study completed in February 1952 indicated to the Navy that atomic missions against tactical targets in Europe as well as targets of naval interest in the Soviet Union would be well within its capability once it received the new *Forrestal* class carriers. The Air Force, however, questioned the premises, execution, and objectivity of the

WSEG study and argued that it had not adequately demonstrated that carriers could operate effectively in any capacity in a war.[76] The Navy and the Air Force also disagreed over what kind of nuclear weapons should be stockpiled for naval missions. The Navy preferred to have available some quantity of gun-type weapons which used more fissionable material than the standard implosion bombs, but had greater penetration capability for striking submarine pens. The Air Force held that scarce fissionable material resources should be used to produce a larger number of implosion bombs for less specialized missions.[77] These three areas of conflict continued for the remainder of the decade to limit Navy-Air Force cooperation with regard to atomic operations.

Despite changes in organization, force levels, and technology, naval air doctrine underwent no major revision between 1949 and 1953. The basic concept that the Navy's carriers would serve as flexible mobile striking forces fulfilling tactical missions remained constant. Although some minor adjustments were necessary, they are difficult to pinpoint since no statement of doctrine for this period comparable to the OP-55 study has been uncovered in classified or unclassified sources.[78] In the fall of 1953, however, a subtle shift in the direction of national defense policy reopened old debates and posed a serious challenge to established naval air strategy.

The New Look

President Dwight D. Eisenhower, who for a number of years had been growing increasingly concerned over rapidly rising government spending, decided in the spring of 1953 to take a "new look" at defense policy and defense spending. A series of studies were undertaken which climaxed on 30 October 1953 with the approval of NSC 162/2 as the administration's statement of Basic National Security Policy. That statement concluded that "the risk of Soviet aggression will be minimized by maintaining a strong security posture, with emphasis on adequate offensive retaliatory strength and defensive strength" based on "massive atomic capability" as well as conventional readiness. It argues, however, that such a military posture would have to be achieved and maintained "at the lowest feasible cost," so as not to "seriously impair the basic soundness of the U.S. economy by undermining incentives or by inflation."[79]

This doctrine of "massive retaliation," as it became known following Secretary of State John Foster Dulles' address on the subject in January 1954, was hotly debated in the JCS. To the Navy, it seemed to threaten the kind of over-reliance on the atomic air offensive which had characterized defense planning under the Truman budget ceilings. For reasons of economy, conventional forces were to be frozen or even cut back,

while emphasis was placed on the terrible deterrent and striking power of strategic nuclear attacks.[80] This posed a dilemma for the Navy not unlike the one it had faced in 1948. Although naval planners objected to the strategy itself, they were determined to be in the forefront of the nation's defense in line with whatever policy was adopted. On 7 December 1953, CNO Admiral Robert B. Carney presented to the JCS the Navy's analysis of massive retaliation. Development of such a capability, he argued, was valuable as a deterrent for the time being, but could result in an atomic stalemate once the Soviet Union had acquired a substantial stockpile of its own. Thus, the United States could not afford to be without highly mobile, combat-ready strategic reserves, "if we are to continue over the long term to be able to cope with limited aggression and at the same time be prepared for general war."

In a passage that laid out the future of naval aviation, Carney stated:

> There is no question but what we must maintain a strong U.S. air capability, including a capability for inflicting massive damage, but not neglecting our capabilities for tactical air support, control of sea communications and vital sea areas, and defense against air attack. U.S. military air power comprises Air Force, Navy, and Marine Corps air power; all three play vital roles in our military posture and none must be neglected if that posture is to be truly effective. Naval air forces, including carrier aircraft, and Marine aviation, all trained to a high state of combat readiness, have repeatedly proved their effectiveness and value. Our entire politico-military philosophy today is based on the concept of collective security, which comprises overseas alliances, overseas bases, and U.S. military forces deployed overseas. The keystone of this entire structure is the confidence felt by our Allies that we can and will maintain control of sea communications in the face of any threat. U.S. Naval air forces as now constituted are essential to maintain this vital sea control in the face of the well-recognized Soviet surface, submarine, air and mining threat to our world-wide sea communications. From both the military and economic viewpoint then, it is unsound drastically to cut back these forces, already bought and paid for, for the sole purpose of making funds available to enlarge other types of U.S. air power.[81]

After the doctrine of massive retaliation was approved, however, the Navy turned from criticizing it to seeking ways of taking advantage of it. In January 1954, Admiral Carney prepared another memo which argued that the offensive striking power emphasized in the stated policy should be interpreted to include aircraft carriers as well as other weapons in the national arsenal. This interpretation was endorsed by the JCS on 5 February 1954.[82]

The dual position taken by the U.S. Navy with respect to national strategy and the atomic bomb in the winter of 1954 marked a culmination of the maturation process which naval air doctrine had been undergoing since 1945. By 1949, the Navy had developed a clear vision of what the wartime and peacetime missions of naval aviation should be. In 1954, it demonstrated an ability to adapt to a changing environment without losing sight of its own goals and identity. Its response to the doctrinal challenge posed by NSC 162/2 was to present a mature statement of its

own doctrine, and, when its position was overridden, to attempt to move ahead toward achieving its goals within the context of the policy it had opposed.

For the next several years, the Navy made every effort to conform to the national security policy adopted in October 1953. Nuclear delivery capabilities for all attack aircraft carriers were upgraded as new planes such as the Douglas A3D Skyraider and A4D Skyhawk entered fleet service. In addition, the Navy publicly advertised its aircraft carriers as being thermonuclear capable weapons systems that were contributing to the national strategic deterrence mission.[83] At the same time, however, the Navy's basic strategic concepts governing the use of all this hardware were much the same as they had been in 1949. The main planned mission of naval aviation at the start of any war was still to be "offensive action (including atomic), against enemy resources that threaten control of the seas, and in support of the land battle."[84]

A Changing Role for the Carrier

Under the leadership of Admiral Arleigh Burke, the author of the seminal General Board study of 1948, and, as director of the Navy's Strategic Plans Division, the original author of Admiral Carney's memo of 7 December 1953, the Navy continued to move away from emphasis on massive atomic retaliatory striking power and toward emphasis on the greater flexibility required to face limited aggression in remote areas of the globe.[85] By January 1958, when the Navy issued a statement of its general long-range objectives for the era of the 1970s, it was proposing that carrier forces be specifically tailored "for limited war, to be the nation's primary cutting tool for that purpose." Although carriers would be equipped with long-range aircraft and nuclear missiles and could serve an auxiliary function in more global conflicts, the Navy's major contribution to nuclear deterrence and nuclear exchange would be in the form of ballistic missile submarines, not naval air power.[86] Despite some modifications, the basic task of attack carriers into the 1970s closely followed the course laid out in this 1958 statement.

Summary

It is very difficult to draw precise conclusions from the records thus far available on the development of naval air doctrine from 1945 through 1958. When one has sorted out the protagonists, identified and analyzed their positions, and traced the course of their arguments, the most striking finding is a negative one: the Navy produced little in the way of doctrinal innovation with regard to air power in this period. Despite the technological revolutions which transformed air warfare during and immediately following World War II, the Navy's vision of the role of the aircraft carrier remained strikingly static. Naval aviators did flirt in 1947 and 1948

with the idea that the Navy might play a leading, or at least significant, role in the kind of nuclear strategic air offensive which seemed to be the doctrine of the future. But the Navy never formally endorsed the concept that strategic bombing could win a war and never seriously sought a role in the air offensive, except to keep its options for the use of air power open.

The doctrine the Navy adopted and maintained grew out of a careful analysis of its technological capabilities and its own combat experience and reflected the service's general philosophy and orientation. Just as naval aviators had been trained in the interwar period to see themselves as naval officers first and aviators second, so naval aviation was viewed in the postwar era as an integral part of the Navy as a whole, to be used in support of the Navy's primary mission—control of the seas. Furthermore, the Navy's conservative approach to acceptance of technological innovation caused it to respond more slowly and cautiously than the Air Force to the challenge of nuclear technology. Whereas the Air Force seized on the new technology and attempted to channel and control it, naval officers, perhaps manifesting a basic fatalism born of long experience at the mercy of the sea, merely attempted to learn to live with it.[87] Although they considered the nuclear weapon to be more than "just another bomb," they did not believe it was an "absolute weapon" which could be used to decide the course of conflicts through its unlimited destructive power. Throughout this period the Navy's leadership continued to focus on traditional objectives, while insisting that they have access to any weapons or technology that might be of use to them.

Naval determination to keep all options open and to maintain the flexibility and mobility of sea-based aviation in the postwar period led to constant conflict with the other services as well as the Department of Defense. At a time when greater precision was being sought in statements of national strategy, and when increasing coordination was necessary in operational matters, naval air doctrine remained fluid and imprecise; and the Navy stubbornly resisted efforts to integrate its carrier forces into rigid and comprehensive war plans.

Independent, intransigent, and inarticulate, the Navy's major contribution to the development of postwar defense was its resistance to change—its insistence that traditional approaches to strategy should not be lightly abandoned, that strategic bombing could never replace actual control of territory or the seas, and that conventional and tactical alternatives to the strategic air offensive must be maintained. Its one truly innovative contribution to the development of postwar defense policy occurred on the level of technology rather than theory: the Polaris missile was to have a profound impact on the national strategy of deterrence. On the conceptual level, it was the Navy's refusal to abandon its priorities

under pressure which had the most lasting influence. Its conceptutal conservatism and attachment to its own traditions brought the Navy to focus by degrees on a problem much in the nation's future: that of limited war.

Notes

1. The principal sources for this study are recently declassified papers from the following repositories: Record Group 218, Papers of the United States Joint Chiefs of Staff (hereafter cited as JCS); Record Group 341, Papers of the Chief of Staff of the Air Force (hereafter cited as CSAF); Record Group 319, Records of the Plans and Operations Division, Papers of the Army Staff (hereafter cited as OPD); and Record Group 428, Papers of the Secretaries of the Navy (hereafter cited as SECNAV), all in the U.S. National Archives; the papers of Op-30, Strategic Plans Division; OP-23, Organizational Research and Policy Division; the post-1946 Command File; and the personal papers of the following U.S. naval officers: Arleigh A. Burke, Ralph A. Ofstie, and Forrest P. Sherman, all in the Operational Archives, Naval Historical Center, Washington, D.C. (hereafter cited as NHA). Additional valuable official and semiofficial sources were Kenneth W. Condit, *The History of the Joint Chiefs of Staff: The Joint Chiefs of Staff and National Policy*, Vol. II, 1947–1949 (Washington, D.C.: Historical Division, JCS, 1976, declassified 1978) (hereafter cited as *JCS History*): George F. Lemmer, *The Air Force and the Concept of Deterrence, 1945–1950* (Washington, D.C.: USAF Historical Division Liaison Office, 1963; Sanitized and declassified 1975); and Robert D. Little, *Organizing for Strategic Planning, 1945–1950: The National System and the Air Force* (Washington, D.C.: USAF Historical Division Liaison Office, 1964; Sanitized and Declassified 1975). For an earlier interpretation of much of the material covered in this paper, see David A. Rosenberg and Floyd D. Kennedy, *History of the Strategic Arms Competition, 1945–1972 Supporting Study: U.S. Aircraft Carriers in the Strategic Role, Part I—Naval Strategy in a Period of Change: Interservice Rivalry, Strategic Interaction, and the Development of a Nuclear Attack Capability, 1945–1951* (Falls Church, Virginia: Lulejian and Associates, Inc., Contract N00014-75-C-0237 for Deputy Chief of Naval Operations (Plans and Policy), 1975.

2. For a fuller discussion of this process, see David A. Rosenberg, "Officer Development in the Interwar Navy: Arleigh Burke—The Making of a Naval Professional," *Pacific Historical Review*, XLIV (November 1975), pp. 503–526.

3. The best published studies of the aircraft carrier in naval strategy are Charles M. Melhorn, *Two-Block Fox, The Rise of the Aircraft Carrier, 1911–1929* (Annapolis, Md.; Naval Institute Press, 1974); Archibald D. Turnbull and Clifford L. Lord, *History of United States Naval Aviation* (New Haven, Connecticut: Yale University Press, 1947); Vice Admiral Sir Arthur Hezlet, *Aircraft and Sea Power* (New York: Stein and Day, 1970); Norman Polmar, *Aircraft Carriers, A Graphic History of Carrier Aviation and Its Influence on World Events* (Garden City, N.Y.: Doubleday and Co., 1969); and Clark G. Reynolds, *The Fast Carriers, The Forging of an Air Navy* (New York: McGraw-Hill, 1968).

4. Statements of naval doctrine, other than tactical doctrine, are rare. Classical studies such as those of Alfred Thayer Mahan, Sir Julian Corbett, and Bradley Fiske exist; none are the equivalent of such writings as those of Giulio Douhet or General William Mitchell however as basic influences on doctrine. The best examples of basic naval doctrine for the interwar and World War II periods are the U.S. Naval War College pamphlet, *The Estimate of the Situation and the Order Form* published from 1911 through the 1930s in various editions, and *Sound Military Decision* (Newport, R.I.: U.S. Naval War College, 1943). All of these papers may be found in the Naval Historical Collection, U.S. Naval War College.

5. Bernard Brodie, "New Tactics in Naval Warfare," *Foreign Affairs*, XXIV, (January 1946), pp. 210–233.

6. David MacIsaac, *Strategic Bombing in World War II, The Story of the United States Strategic Bombing Survey* (New York: Garland Publishing, Inc., 1976) 127–129 describes the controversy over the "Carrier Air Effort Against Japan." The final disposition of this manuscript is unclear; it may have finally been published, possibly in much abbreviated form, as *U.S. Naval Aviation in the Pacific, A Critical Review* (Washington, D.C.: Office of the Chief of Naval Operations, 1947).

7. Fleet Admiral Ernest J. King, Third Official Report to the Secretary of the Navy, in *The War Reports of General of the Army George C. Marshall, General of the Army Henry H. Arnold, and Fleet Admiral Ernest J. King* (Philadelphia: J.B. Lippincott, 1947), p. 656.

8. JCS 1478/8, 20 February 1946, through JCS 1478/18, 17 May 1946, CCS 370 (8–19–45), Sec. 3., JCS.

9. JCS 1478/12, 29 March 1946, *ibid.*

10. U.S. Congress, 80th Congress, 1st Session, Public Law 253, Chapter 343, Section 206 (b).: See also Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, pp. 64–69.

11. For a complete discussion of the impact of the atomic bomb on naval design and construction, see JCS 1691/10, 29 December 1947, CCS 471.6 (10-16-45) sec. 9, Part 2, JCS, the text of the Bikini Evaluation Report of "The Atomic Bomb as a Military Weapon", especially Section Three, "Effects on Ships"; See also Vice Admiral W.H.P. Blandy, "Bikini: Guidepost to the Future", *Sea Power*, VI, (December 1946), pp. 7-9.

12. U.S. Congress, House of Representatives, Committee on Naval Affairs, *Hearing on House Concurrent Resolution 80, Composition of the Postwar Navy* (Washington, D.C.: Government Printing Office, 1945), p. 1165.

13. John L. Sullivan to the President, Serial 0014P602, 24 July 1946, Folder 98C, Arleigh Burke Papers, NHA; See also copy in "Secretary of the Navy" Folder, Subject File, President's Secretary's File, Harry S. Truman Library (hereafter cited as PSF-HSTL).

14. A full discussion of these changes may be found in Appendix 1, OPNAV General Organization for Strategic Warfare, 1945-1972, in Rosenberg and Kennedy, *Naval Strategy in a Period of Change*.

15. See Vincent Davis, *The Politics of Innovation: Patterns in Navy Cases* (Denver, Colorado: University of Denver Monograph Series in World Affairs, 1966), pp. 7-22.

16. Fleet Admiral C.W. Nimitz to President Truman, 4 June 1946, Memos to and from the President Folder, 1946, William D. Leahy Papers, JCS; See also Nimitz to the Secretary of the Navy, Serial 0008P03, 23 July 1946, in A8, Intelligence, Folder I, 1946, Op-30 Papers, NHA.

17. "Presentation of Undersea Warfare for the Secretary of the Navy" by Rear Admiral C.B. Momsen, appended to Memo, Captain Richard W. Ruble to the Secretary of the Navy, A8 Intelligence Folder, John L. Sullivan Papers, SECNAV Papers.

18. See the memoranda regarding the Recommended Building Program, Fiscal 1948 Budget in personal folders on the General Board, Arleigh Burke Papers, NHA.

19. On the development of the PINCHER plans, see the material in the CCS 381, USSR (3-2-46), Secs. 1 through 7, JCS; and in the ABC 381 USSR, 2 March 1946, Secs. 1A through 1G, OPD. See also Rear Admiral C.D. Glover to Chief of Naval Operations, Serial 0005P30, 21 January 1947, A16-3(5) War Plans, 1947, Folder, Op-30 Files, NHA; and David A. Rosenberg, "Planning for a PINCHER War: Policy Objectives and Military Strategy in American Planning for War with the Soviet Union, 1945-1948," unpublished paper presented at the Fourth National Meeting of the Society for Historians of American Foreign Relations, August 4, 1978.

20. Admiral Nimitz to General Dwight Eisenhower, 13 June 1946, ABC 471.6 Atom, 17 August 1945, Sec. 7, OPD.

21. See for example, Rear Admiral William S. Parsons, Director of Atomic Defense (Op-36) to the Chief of Naval Operations, Serial 0050P36, 14 July 1947, A16-1 Folder, Op-30 Papers, NHA.

22. U.S. Navy, Office of the Chief of Naval Operations, *Principles and Applications of Naval Warfare*, United States Fleet Publication No. 1, 1947, quoted in Desmond P. Wilson, Jr., "Evolution of the Attack Aircraft Carrier: A Case Study in Technology and Strategy," published in U.S. Congress, 91st Congress, 2nd Session, Joint Senate-House Armed Services Subcommittee of the Senate and House Armed Services Committees, *CVAN-70 Aircraft Carrier* (Washington, Government Printing Office, 1970).

23. "U.S. Navy Thinking on the Atomic Bomb," in Bernard Brodie and Eilene Galloway, *The Atomic Bomb and the Armed Services* (Washington, D.C.: Library of Congress Legislative Reference Service Public Affairs Bulletin No. 55, May 1947), pp. 24-41.

24. "The Effects of the Atomic Bomb on National Security (An Expression of War Department Thinking)" in *Ibid.*, pp. 62-85; see also Robert Hotz, "Army-Navy Split on Role of Air Power in Atomic Warefare," *Aviation News*, VII, April 21, 1947, pp. 7-8.

25. Sherman, Presentation to the President, 14 January 1947, CNO Chronological File, Post 1946 Command File, NHA; As an example of this split, compare PINCHER plans cited in fn. 19 and JCS 1630, 19 February 1946, CCS 381 (2-18-46), Sec. 1, JCS on early postwar planning guidance for joint agencies about a possible future war.

26. JCS 1961/10, 29 December 1947; Commander H. Rivero to Captain W.G. Lalor, 28 July 1947, CCS 471.6, Sec. 15, JCS describes the 29 July 1947 presentation. For a concise discussion of the evolution of U.S. atomic strategy as it related to the Bikini report, see David A. Rosenberg, "American Atomic Strategy and the Hydrogen Bomb Decision," *Journal of American History* (forthcoming, 1979).

27. For an example of the way the CVA-58 (or rather Project 6A) was discussed prior to the Bikini report, see the Memoranda regarding Recommended Shipbuilding and Con-

version Program—Fiscal 1949, in personal folders on the General Board, Arleigh Burke papers, NHA. For the way that discussion changed, see Rear Admiral Thomas Combs, Acting Chief of the Bureau of Aeronautics to the Secretary of the Navy, 7 November, 1947, A1, Plans, Projects, Policies, 1948–49 Folder, John L. Sullivan Papers, SECNAV; a full history of the ship is in Captain Arleigh Burke to the Judge Advocate General, Serial 067P23, 11 May 1949, A21/1–1/1 Carrier Folder, Section II, Op-23 Papers, NHA.

28. JSPG 499, 20 November 1947, and JSPG 499/2, 3 December 1947, are the various versions of CHARIOTEER, both in CCS 452, U.S., (8–1—47) Secs. 1 and 2, JCS. See also JCS History, 284.

29. Rear Admiral W.F. Boone to Captain R.J. English, 27 January 1948, with four enclosures, A16–12, War Plans, 1952, Op-39 Papers, NHA; See also Admiral John H. Towers, Chairman, General Board to the Chief of Naval Operations, 21 November 1947 (General Board No. 420) in personal folders on the General Board, Arleigh Burke papers, NHA.

30. Vice Admiral D.B. Duncan, Deputy CNO (Air) to Op-30, Serial 0004P504, 10 December 1947, A16–3, Warfare Operations, 1947, Op-30 Papers, NHA.

31. "The Future Employment of Naval Forces," Navy Department Pamphlet P–514, p.7.

32. There were in fact *three* Gallery memos. The most important one, from which this quote is taken, is Gallery to DCNO (Air), Serial 00124P57, 17 December 1947. The only copy of this paper in official form is in a special folder in the miscellaneous papers of Arleigh Burke, NHA. The full memo is readily available in The *Army-Navy-Air Force Register*, December 11, 1954. The two earlier memos that were later combined to form the 17 December paper are Gallery to Rear Admiral J.J. Clark, Assistant Deputy CNO (Air), 14 and 17 November 1947, both in A16–11 Folder, Section 3, Op-23 files.

33. Interview with Rear Admiral Gallery, Oakton, Virginia, 9 April 1975.

34. Rear Admiral Ofstie to DCNO (Air), 7 January 1948, with paper, "Composition of the National Military Establishment," appended. Box 8, Ralph Ofstie Papers, NHA. Attached to this paper is a memo by Dan Gallery to the DCNO (Air), Serial 0013P57, 14 January 1948, that notes that "this is an excellent summary of the situation during the interval when we have the A bomb and the Russians do not," but that when both sides have the bomb his 17 December 1947 memo should apply. Notes on the Ofstie 7 January memo indicate that Rear Admirals J.F. Bolger, E.W. Litch, and W. Tomlinson had seen and concurred with the views expressed in it.

35. Operations Evaluation Group Study No. 327, Serial LO, 467–48, 26 February 1948, A2.1–1/1 File, Section II, Op-23 Papers, NHA; Interview with Mr. John P. Coyle (author of O.E.G. 327), Washington, D.C., 27 January 1975; Rear Admiral Jerauld Wright to Distribution List, with studies attached, Serial LO, 317–48, 12 March 1948, Files of the Aviation History Unit, Deputy Chief of Naval Operations (Air Warfare) (Op-05d5) (hereafter cited as AHU Files).

36. The Air Force engaged in a number of studies that were designed to attack the military value of the CVA–58. See "Aircraft Carrier Operations in the Pacific, World War II," Folder 168–7017–15, 1947–1948, Aerospace Studies Institute, Archives Branch, Alfred F. Simpson Historical Research Center, Alabama (hereafter cited as AFSHRC). This document is labelled "basic study which was the foundation of Air Force position on the CVA–58, 1947–1948." See foundation of Air Force position on the CVA–58, 1947–1948." See also Air War College, "Employment of Carrier Forces for Strategic Atomic Attacks" prepared for the Air Staff, March 1948, RB4–72306, Folder 168–7017–16, AFSHRC; another copy of this paper may be found in Box 10, Deputy Chief of Staff, Operations, Executive Office, House Investigation, August-October 1949, CSAF.

37. Information on the U.S. nuclear capability in the winter of 1948 is taken largely from JCS 1745/5, 8 December 1947, CCS 471.6 (8–15–45), Sec. 8, JCS, and Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, pp. 159–162.

38. *JCS History*, pp. 283–293. See also JSPG 496/1, 8 November 1947 to JSPG 496/4, 11 February 1948, and JCS 1844/4 to 1844/13, 9 March 1948 to 21 July 1948, all in CCS 381 USSR (3–2–46) Secs. 8 to 18, JCS.

19. JCS 1745/5, 8 December 1947 to JCS 1745/12, 19 January 1948, CCS 471.6 (8–15–45) Sec. 8, JCS. See also Secretary of the Navy John L. Sullivan to the Secretary of the Air Force, 9 August 1948, A16, War, Preparation for, Conduct of, 1948–1949 Folder, John L. Sullivan Papers, SECNAV.

40. JCS 1854, 23 March 1948, to JCS 1854/8, 24 August 1948, CCS 471.6, (8–15–45) Secs. 9 to 12, JCS, and Sullivan to the Secretary of the Air Force, 9 August 1948.

41. Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, pp. 79–89.

42. Captain Arleigh Burke, Memorandum for Members of the General Board, "Very Rough, Very Tentative Outline for Serial 315," 4 March 1948, General Board Folders, Arleigh Burke Papers, NHA.

43. General Board, "National Security and Navy Contributions Thereto, A Study by the General Board," 25 June 1948, G.B. 425, Serial 315, Enclosure (D), 28. Arleigh Burke Papers, NHA.

44. *Ibid.* Enclosure (D), pp. 6–7; Covering Letter, p. 4.

45. *JCS History*, Chapter VII, pp. 213–255. See also Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, Chapter V, 1.

46. Memo for Files by Op-003, Subject: Increase in Naval Forces, July 13, 1951, "Naval and Marine Forces" Folder, Box 1, Forrest Sherman Papers, NHA.

47. Louis Johnson to President Truman, 23 April 1949, "Defense, Secretary of, Miscellaneous" Folder 1, Subject File, PSF–HSTL; Memorandum by the Chief of Staff, U.S. Air Force to the Secretary of Defense on the CVA–58 Project, n.d., but about 22 April 1949, in Folder "U", General File PSF–HSTL. Johnson's memo notes that the underscoring in pencil on the JCS memos on the CVA–58 are his. The underscoring on the Air Force Chief of Staff's memo stressed such phrases as "this carrier is designed for bombardment purposes."

48. Memo by Op-003, July 13, 1951; See also Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, pp. 122–125.

49. Gallery to DCNO (Air), 17 January 1949, MLC–AEC Folder, Box 8, Ralph Ofstie Papers, NHA.

50. The only declassified version of the Harmon Report is "Report by the Ad-Hoc Committee to the Joint Chiefs of Staff on Evaluation of Effect on Soviet War Effort Resulting from Strategic Air Offensive", 11 May 1949, in A1/EM–3/7, JCS Folder, Sec. III, Op-23 Papers, NHA. See also JCS 1953/4, 8 July 1949, JSC 1953/5, 19 July 1949, and Memo, General Vandenburg to the JCS, 23 July 1949, all in CCS 373 (10–23–48) Secs. 2, 3, and Bulky Package, JCS, respectively; For the subsequent fascinating fate of the Harmon Report, see Rosenberg, "American Atomic Strategy and the Hydrogen Bomb Decision."

51. Ofstie to Op-05 (DCNO (Air)), 26 April 1949, A21/1–1/1 Carrier, Section II, Op-23 Papers, NHA.

52. Ofstie to Op-05, 29 April 1949, MLC–AEC Folder, Box 8, Ofstie Papers, NHA.

53. U.S. Congress, House of Representatives, Committee on Armed Services, *Investigation of the B–36 Bomber Program*, 81st Congress, 1st Session, (Washington: Government Printing Office, 1949), contains the full story.

54. U.S. Congress, House of Representatives, Committee on Armed Services, 81st Congress, 1st Session, *The National Defense Program—Unification and Strategy* (Washington: Government Printing Office, 1950); The full raw data behind the Navy presentation may be found in B–9, Agenda Manual, Section III, Op-23 Papers, NHA.

55. Although his analysis tends to qualify this assessment somewhat, this is the primary impression one gets from reading Paul Y. Hammond's otherwise excellent study, "Super-Carriers and B–36 Bombers: Appropriations, Strategy, and Politics," in Harold Stein (ed.), *American Civil-Military Decisions* (Tuscaloosa: University of Alabama Press for the Twentieth Century Fund, 1963), pp. 465–567.

56. Air Warfare Division (Op-55) "Study on Future Development of Carrier Aviation with Respect to Both Aircraft and Aircraft Carriers," 22 August 1949, AHU Files. OP-55's mission is described in *Organization Manual for the Office of the Chief of Naval Operations*, OPNAV P 02–100 (Rev. 8–48) August 1948, NHA.

57. *Ibid.*, p. 4; This conclusion was subsequently confirmed in a special Study of Undersea Warfare, Serial 001P003, 22 April 1950, by Vice Admiral F.S. Low. This study was requested by Admiral Forrest Sherman in November 1949, possibly to serve as a check on the conclusions of the Op-55 study. The Low paper may be found in completely declassified form under call number N–210–0651 at the Naval War College Classified Library.

58. "Carrier Task Group Operations in the Mediterranean, a CINCNELM Staff Study," Part I, Conclusions and Recommendations, Tab A, appended to Admiral R.L. Conolly to the Chief of Naval Operations, Serial 0001, 3 January 1949, Folder 79, Miscellaneous, 1949, Op-30 Papers, NHA. Much of the rest of this study remained classified in 1975, but the conclusions were declassified.

59. On Sherman's leadership, see JCS 1800/68, 14 February 1950, CCS 370 (8–19–45), Sec. 21; JCS 1844/49, 7 December 1949, CCS 381, U.S.S.R., (3–2–46), Sec. 42; JCS 1888/

3, 11 April 1950, CCS 370 (5–25–48), Sec. 2, all JCS, which discuss the proposed reduction in carrier forces, the status of U.S. war plans, and overall U.S. military posture, respectively. See also Ernest K. Lindley, "The New Navy Line," *Newsweek*, XXXIV, December 12, 1949, p. 27; Undated Memorandum for the Record, prepared ca. April or May 1951, with no author but obviously by Forrest Sherman, in first unlabelled folder, Box 1, Forrest Sherman papers, NHA, and Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, Chap. VII, especially pp. 166–169, and the sources cited in fn. 3, 7, and 8, on pp. 178–179.

60. NSC–68 is most readily available in U.S. Department of State, *Foreign Relations of the United States, 1950, Vol. I: National Security Policy: Foreign Economic Policy* (Washington: Government Printing Office, 1977) 234–292. The events leading up to that paper are documented in p. 1 ff.

61. Undated Memorandum for the Record, Box 1, Forrest Sherman Papers.

62. *Ibid.*: JCS 1800/115, 13 September 1950 and Decision on, 18 September 1950; JSC 1800/116, 18 September 1950; JCS 1800/133, 7 December 1950; and JSPC 851/37, 11 December 1950, all in CCS 370 (8–19—45) Secs. 27 to 29, JCS. See also NSC 68/3 and NSC 684 of December 1950, with supporting documents, in *Foreign Relations 1950, Vol. I*, 425–477.Information on authorization dates for *Forrestal* class carriers is in Polmar, *Aircraft Carriers*, 587–588. One carrier was authorized each year from Fiscal 1952 through Fiscal 1958.

63. Composite Squadron Five (VC–5) Historical Reports, 31 December 1948, 1 April 1949, 30 January 1950, NHA. Note that on 6 January 1950 a second nuclear capable squadron VC–6 was commissioned. See VC–6 historical report, 22 February 1951, NHA, for details. See also Rosenberg and Kennedy, *Naval Strategy in a Period of Change*, pp. 159–162.

64. JCS 2019/4, 29 March 1950 and Decision, 6 April 1950, CCS 471.6 (8–15–45), Sec. 18A; Memorandum, James S. Lay, Executive Secretary, National Security Council to Acting Chairman, Atomic Energy Commission, 14 June 1950, NSC Atomic File-PSF–HSTL; Captain William G. Lalor to JCS, SM–1632–50, 22 July 1950, citing title of JCS 2019/8 as "Storage of Non-nuclear components of atomic bombs on CVB Class Aircraft Carriers" by Admiral Sherman, CCS 471.6 (8–15–45) Sec. 18A; and Rear Admiral F.S. Withington to CNO, September 1950, in A16–3, Warfare Operations, War Games, 1950, Op-30 Papers, NHA.

65. The "Daisy Chain" system is described, with codename, in Richard K. Smith, *Cold War Navy* (Falls Church, Virginia: The Churchill Press and Lulejian and Associates, 1975), Chapter VI; On nuclear production, see Richard G. Hewlett and Francis Duncan, *A History of the United States Atomic Emergy Commission, Vol. II, 1947–1953, Atomic Shield* (University Park, Pennsylvania: Pennsylvania State University Press, 1972), pp. 525–529, 547–554, 556–568, 576–578; on release of nuclear weapons to the armed forces see *ibid.*, pp. 538–539; SM–684–53, 31 March 1953, Memo, W.G. Lalor to the JCS, notes that JCS 2019/58 discusses storage of nuclear components of atomic weapons on aircraft carriers, CCS 471.6 (8–18–45), Sec. 37.

66. Interview with Rear Admiral Daniel V. Gallery, USN (ret.), Oakton, Virginia, 9 April 1975; VC–5 Historical Reports, 26 July 1951 and 14 February 1952, NHA.

67. Director, Strategic Plans Division to Director of Naval Intelligence, two memoranda, Serials 000966P30 of 8 November 1950, and 0001000P30, 24 November 1950, about "Target Data", both in A16–3, Warfare Operations, War Games, 1950, Op-30 Papers, NHA.

68. JCS 1800/166, 7 September 1951, CCS 370 (8–19–45), Sec. 34, JCS.

69. "Meeting of General Eisenhower with the President and the Cabinet, January 31 1951," in George Elsey Papers, HSTL.

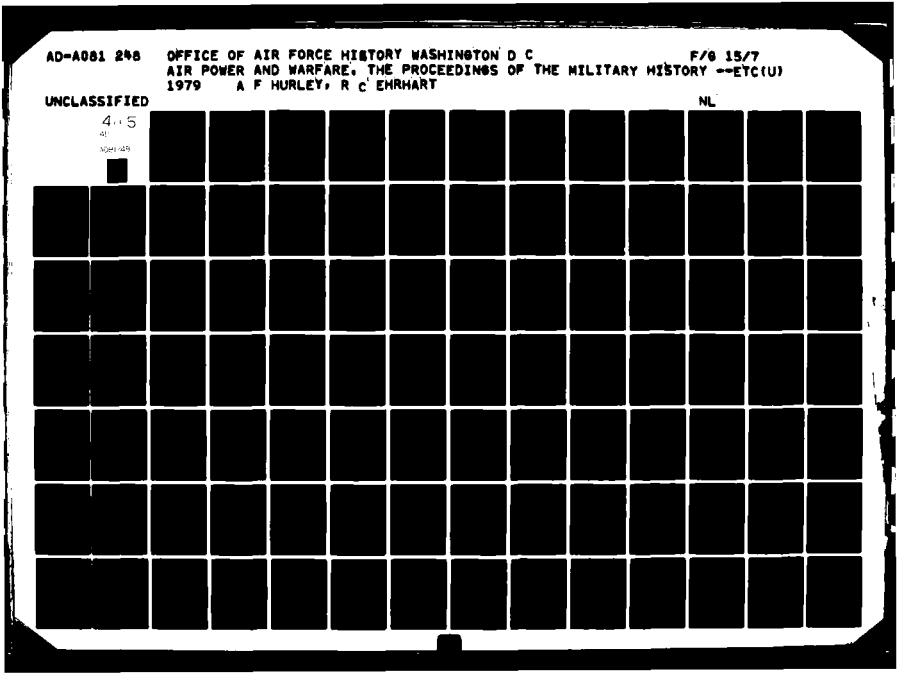
70. JCS 1844/46, 8 November 1949 (War Plan OFFTACKLE), CCS 381, U.S.S.R., (3–2–46) Sec. 41; See also JCS 2056/7, 12 August 1950, CCS 373.11 (12–14–48) Sec. 2, JCS.

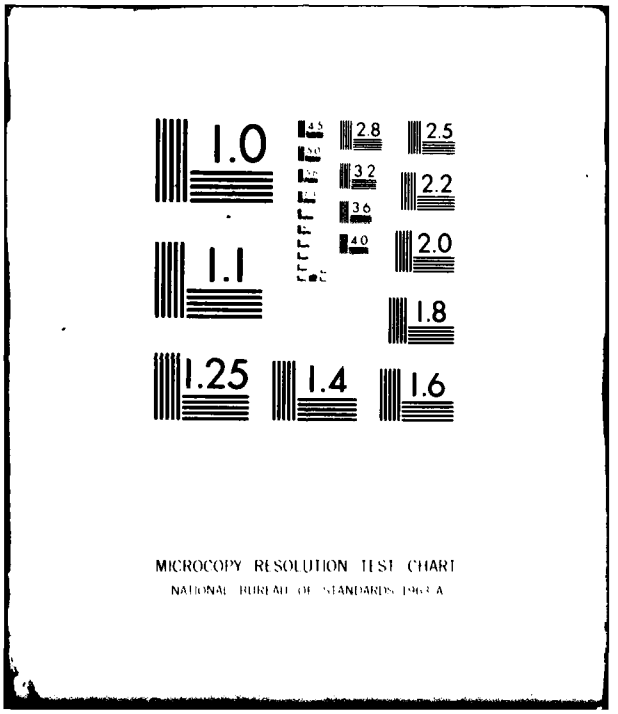
71. The "Doctrine of Scarcity" and the anticipated changes in it are described in Memorandum, Colonel Thomas to Major General David Schlatter, 13 January 1950 on Air Force Capability for Atomic Warfare, 13 January 1950, Tab 3, in OPD A/AE 381 (Atomic Warfare), B, CSAF: The Navy view of this doctrine was described in an interview with Vice Admiral John T. Hayward USN (Ret.), Tyson's Corner, Virginia, 15 July, 1975.

72. Hewlett and Duncan, *Atomic Shield*, pp. 525–578: Memo, Thomas to Schlatter, 13 January 1950.

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73. JCS 2220/4 31 January 1952, CCS 471.6 (4–18–49) Sec. 7, JCS; For a later statement of the same thing, with upwardly revised forces and weapons figures, see JCS 2220/19, 6 May 1953, in Sec. 10 of the same file.

74. JCS 2056/24, 29 February 1952, as promulgated in SM–597–52, 3 March 1952, CCS 373.11 (12–14–48) Sec. 7; See also the various debates that appear in the following JCS papers: JCS 2056/27, 5 May 1952; JCS 2056/31, 20 June 1952; JCS 2056/34, 13 August 1952; JCS 2056/35, 9 September 1952; JCS 2056/38, 10 February 1953; and JCS 2056/42, 25 February 1953, all in the same file. Secs. 7 through 10, JCS.

75. JCS 1854.16, 7 September 1951, CCS 471.6 (8–15–45), Sec. 23, JCS. Later statements of the same nature appear in the papers just cited above.

76. JCS 2131/1, 28 February 1952, contains the Weapons Systems Evaluation Group Study of the Evaluation of the Offensive and Defensive Capabilities of Fast Carrier Task Forces in 1951, including Appendices B and C which contain Air Force criticisms and the Navy's rejoinders. See also the decision on JCS 2131/1, 2 July 1952, in which the JCS agreed to only "note" the conclusions of the study, rather than approve them: all in CCS 045.92 (2-28-50) Sec. 2, and Bulky Package, JCS.

77. Memorandum for the Joint Chiefs of Staff by the Chief of Staff of the Air Force on Military Requirements for Atomic Weapons, CCS 471.6 (11–3–51) Sec. 1, JCS; Interview with Vice Admiral John T. Hayward, USN (Ret.), Newport, Rhode Island, June 4, 1976.

78. The only comprehensive statement of naval air doctrine uncovered between 1949 and 1954 is the now declassified presentation by Rear Admiral James S. Russell on "The Carrier Task Force" to the National War College, 29 January 1954, AHU Files. That presentation must be seen as the logical fulfillment of the 1949 Op-55 study; its discussion of carrier mobility, flexibility, and self-sufficiency; its description of air group composition (3 fighter squadrons, 1 light attack squadron, with a detachment of heavy attack aircraft) and its list of possible carrier air targets (352 Russian or Satellite air fields, 54 shipyards, 44 naval bases, 66 areas suitable for mining) are all in keeping with the broad outlines laid out in 1949.

79. The best published discussions of the "New Look" may be found in Glenn H. Snyder, "The New Look of 1953" in Warner R. Schilling *et. al. Strategy, Politics, and Defense Budgets* (New York: Columbia University Press, 1962), pp. 379–524; Samuel P. Huntington, *The Common Defense; Strategic Programs and National Politics* (New York: Columbia University Press, 1961) pp.64-88; and Douglas Kinnard, *President Eisenhower and Strategy Management: A Study in Defense Politics* (Lexington, Kentucky: University of Kentucky Press, 1977), pp. 1–36. For the background of Eisenhower's concerns on defense spending, see the recently released Eisenhower Diaries from 1948–1952, especially his comments on defense spending following President Truman's release of the Fiscal 1953 budget in January 1952, at the Dwight D. Eisenhower Library. NSC 162/2, October 30, 1953, from which the quotes were taken, is most readily available in *The Pentagon Papers*, (The Senator Gravel Edition; Boston: The Beacon Press, 1971) Vol. I, pp. 412–429.

80. On the continuing battles over the place of strategic air power in war and defense planning, see SM–298–53, 26 March 1953, Memorandum for the Joint Strategic Plans Committee by name, with enclosed revision of "Format B" to the Joint Strategic Capabilities Plan, CCS 381 (11–29–49) Sec. 5; JCS 1844/152, 19 October 1953 discussing splits in the same plan, in Sec. 10 of the same file; and JCS 2101/107, 23 October 1953, and Decision, 27 October 1953, which discuss NSC 162/1, in CCS 381 U.S. (1–31–50) Sec. 30, JCS.

81. JCS 2101/112, 7 December 1953, CCS 381 U.S. (1–31–50) Sec. 32, JCS.

82. Memo, Carney to JCS, Serial 0005P35, 18 January 1954, and JCS Info Memo 922, 10 February 1954, in CCS 381 U.S. (1–31–50) Secs. 32 and 35, respectively.

83. For examples of such conformance, see JSPC 851/134, 18 January 1955, in CCS 370 (8–19–45) Sec. 49; See also Polmar, *Aircraft Carriers*, pp. 587 ff; and Philip A. Dur, "The Sixth Fleet: A Case Study of Institutionalized Naval Presence," (Unpublished Ph.D. dissertation, Harvard University, December 1975), pp. 66–68.

84. JSPC 851/134, 18 January 1955; see also such unofficial but highly representative statements of approved doctrine as Commander Malcolm W. Cagle USN, "A Philosophy for Naval Atomic Warfare," *U.S. Naval Institute Proceedings* LXXXIII (March 1957), pp. 249–258.

85. On Burke's leadership and views on carrier air power, see United States Senate, Committee on Armed Services. Eighty-Fourth Congress, Second Session, Subcommittee on the Air Force, *Study of Airpower* (Washington, D.C.: Government Printing Office, 1956) Part XVIII, June 18, 1956, pp. 1339–1386; Memorandum, Chief of Naval Operations

to the Secretary of Defense, Serial 012P00, 6 November 1956, in Originator's File, 1 October thru 30 November 1956, and Letter, Burke to Rear Admiral Walter Schindler, 14 May 1958, Personal File, 1 April-30 June 1958, both Burke Papers, NHA; See also David A. Rosenberg, "Admiral Arleigh A. Burke" in Robert William Love, Jr., (ed.) *The U.S. Chiefs of Naval Operations* (Annapolis, Md.: Naval Institute Press, forthcoming, 1979).

86. Chief of Naval Operations to Distribution List, Serial 04P93, 13 January 1958, with enclosure of "Statement of U.S. Navy Long Range Objectives, 1967–72 (LRO–57)" (also known as the "Navy of the 1970 Era"), in Naval War College Classified Library, Call No. NA 50.062.

87. For an early example of such Air Force attempts, see U.S. Air Force Field Office for Atomic Energy, Draft "Doctrine of Atomic Air Warfare," 30 December 1948, OPD A/AE 381 (Doctrine of Atomic Warfare) CSAF.

ADDITIONAL OBSERVATIONS

JOHN GREENWOOD AND DAVID ROSENBERG

Doctor Greenwood: I have a tendency to disagree with David in many respects, especially on the carrier in strategic air warfare. He frequently mentions the Navy's thinking about the carrier and carrier-based air in the strategic role. The Air Force was particularly disturbed about this, and I don't think it has changed in many respects. They did not believe that the Navy could and would be able to launch strategic air operations against key targets in the Soviet Union.

General Spaatz asked General McDonald, whom I mentioned, in 1946 to study carrier operations against Japan to derive some information on how many times the Navy requested 20th Air Force, one of his two bomber commands, to suppress Japanese land-based air power so that tactical naval air power could operate off the Japanese coast. The number of incidents was staggering. In one particular case, which Frank Futrell brings out, Halsey asked 20th Air Force to destroy air fields in the Tokyo area so that tactical naval air could deliver 500 tons of weapons on target; the Navy requested 6,400 tons of B-29 bombs to suppress Japanese land-based aviation so that the carrier task force could operate within range of the coast. Now this is the kind of thing that disturbed the Air Force about Navy planning to use carriers in strategic war against the Soviet Union.

Moreover, if you start looking at the range of carrier aircraft in 1946 and 1947, they not only could not carry the weapon, they couldn't reach the target. So the Air Force view was very solid, I think. The Air Force was concerned because funds were being diverted from their B–29s, of which they had very few. They felt it was a distortion of the strategic air war mission to have the carriers involved to the extent that it drained off funds. The only thing that could carry out strategic air operations was the B–29 with the atomic bomb. Airmen believed, correctly, that the strategic air mission was the primary point of confrontation with the Navy.

The issue of the Navy's supposedly corollary role in strategic air war and the Air Force's supposedly primary responsibility for this type of war remained the primary point of confrontation. It started in 1944, if you want to go back to the 20th Air Force, developed in 1945, and continued in the postwar period. In the immediate postwar years, during the fight

between the strategic airmen and the carrier admirals, the latter at one point suggested to the airmen that they do the same thing to the Army that the Navy airmen had done to the Navy—take it over. The airmen did not want to do that; they had already opted for independence. But the fight between the airmen and the naval aviators continued. One sees it developed totally in 1948 at both Key West and Newport.

It was a very bad situation, and it crippled planning in 1949 when the services had to devise the first true atomic plans so that Strategic Air Command could make up its operations plans and combat mission folders. From the documents I have read, especially Air Force planning documents, it was a case of total obstruction of the Air Force's attempts to plan a realistic strategic air war against the Soviet Union. Unfortunately, it got worse rather than better in the early 1950s because additional roles became involved. The whole problem is not solved until 1959–1960, with the establishment of the Joint Strategic Target Planning Staff which used computers to lay out all targets and to determine the force.

As I read the documentation, I was absolutely astonished at the actions of both services in their fight on this matter. That's why I pointed out in my paper at one point that this rivalry marred Truman's Presidency. Worse, it jeopardized national security on more than one occasion because operation plans could not be made by SAC because there were no war plans for guidance. If it had come to the crunch in 1948, I doubt whether we could have done much of anything. It was just that simple. That is what disturbed LeMay when he took over.

The point I was trying to make is this: the strategic air mission controversy merits a great deal of investigation. We need the combined efforts of persons like myself and David to look at both sides of the picture to find where the points of confrontation were. Why did the Navy perceive the Air Force as a threat? Clearly, the Air Force perceived as a threat the Navy's attempt to push the Air Force out of its strategic air war mission. The Air Force had planes; it had the weapons; it had the crews; and here the Navy comes along and says, we can do it much better than they can do it.

To a great extent, the study of this issue is a matter of perceptions. One becomes tainted by the sources one works with. One loses a little bit of objectivity, becomes an advocate of one's "own" planners. I have seen so many frustrated buck slips, so many frustrated papers for the chief of staff, for the air war planners, that it is inevitable I would begin to wonder if these are perceptions, if they are firmly held beliefs, or if they are facts. I do believe, for example, that this is the way the air leaders in the late 1940s felt, and they must have had reasons for feeling that way. The solution to this problem of perception is not simply that you shouldn't believe the planners' documents. It is not that way; the

problem is more pervasive. And this is why we need to approach these interservice rivalries from several perspectives—to get a balance.

Mr. Rosenberg: John and I have talked about this issue, and I don't feel we are that far apart. There are a couple of things I want to emphasize, though.

First of all, during the first two years after World War II the United States Navy and the position of United States Naval Aviation was terribly confused. The United States Navy did not know where it was going with aircraft carriers. A number of people expressed viewpoints on a number of ideas, but there was no approved doctrine. The only man who may have had a clear vision and who was the greatest naval leader of this time in the development of naval aviation was Arthur W. Radford. Yet, although he has a large number of papers, his autobiography has not been opened, and his opinions and views remain a mystery. I don't think, however, that the release of Radford's papers or his autobiography will change the view that during the first few years after World War II the Navy was not quite certain what it was going to do with naval air power. What the Navy was most concerned about was that in the unification process it would first lose-land based air and then carrier-based air. Then all the prerogatives, all the strategic views, that the Navy held would be reduced to nothing. Naval officers were well-aware that many people agreed with General Spaatz's position, which he stated in 1946: "What do we need a Navy for? The Russians haven't got a Navy!" That concern—that the Navy would lose its *raison d'etre*—was a driving motive in the Navy's obstruction. Although I won't deny there was an attempt at obstruction, I would prefer to call it an attempt to preserve, to prevent the limiting of naval options until the Navy knew where it was going and what it was going to face.

In addition to the strategic air mission controversy, there was during this period a great philosophical debate underlying the development of war planning and of strategic argument. It had to do with strategic bombing, but it went beyond that. Essentially, it revolved around the question, are we going to have a long war with the Soviet Union, or is it going to be a short war? The Navy was convinced it was not going to be a short war. "The Need for Maintaining Control of the Middle Eastern Oil," about which I wrote a couple of years ago for the *Naval War College Reivew*, was a major concern of the United States Navy, because they figured it was going to be a long war. I might add, this is something we still haven't figured out. Is it going to be a long war? Is it going to be a short war? What do we spend our money on? And that is what it comes down to in the end—to the budget. It *does*, for the period under consideration, come down to Harry Truman. Had there been an adequate budget, the Navy probably would not have gone off the deep end, with

things like the Gallery memorandum, to maintain that the Navy should take over strategic bombing.

Thanks to the work of people like Forrest Sherman in 1949 and 1950, the Navy figured out where it was going. It got back on course and through the mid 1950s and afterwards developed doctrine for naval air power. Naval air power was developed, and has remained, primarily as an instrument for limited conflicts, not limited war precisely—although it was developed in that direction.

COMMENTARY

LT. COLONEL DAVID MACISAAC, USAF

My comments have been somewhat hastily derived and tend to reflect more of my own thoughts on this topic than those expressed in our two papers. They shall also reflect some new modes of questioning—new to me at any rate—that derive from discussing our topic with several of my colleagues this year at the Wilson Center. So perhaps I should also say, with General Eaker, that "my thoughts are those of a private person and have not received the prior approval of any officer or other official presently serving in an official capacity here or elsewhere!"

Like Gaul, my remarks are divided into three parts. First, one or two general observations on our topic for this session; second a few brief comments on the papers we have just heard; and, finally, some concluding observations on both the significance of our topic and the difficulties that must be overcome by its would-be Thucydides.

The search after maturity in air power doctrine and organization in the years following World War II is surely not, as I once naively thought, a topic that has a closing date anywhere in the 1950s, 1960s, or 1970s; rather, it is an on-going topic or problem that bids fair to remain with us throughout the present century. As will undoubtedly be seen in the presentations this afternoon, nothing that *I* would label maturity was achieved either prior to or during our late experiences in Indochina, where the air experience turned out to be an improvised air war to an even greater extent than during World War II. For *that* war, there *was* a plan, brilliantly conceived in the early fall of 1941. The plan underwent some changes over time—some necessary, some not, perhaps—but in its basic outline it was followed in Europe and served the Army Air Forces and the cause of victory well. But once enter the postwar era and examine actual air operations from Korea through Vietnam—even on to the rescue of the *Mayaguez,* if you will—and improvization (sometimes we like to call that "flexibility") in the face of unforeseen difficulties is far more obvious to the eye than any working out of an all encompassing concept of operations.

The reasons for this being true are not hard to find, and several of them are touched upon in the papers we have just heard. The principal one, of course, is that air leaders and air planners didn't see either Korea

or Vietnam coming. Their attentions throughout the postwar period have been directed elsewhere—to put it bluntly, at Russia and at Western Europe—and that has not changed in the slightest in the years since we left Indochina. Although I am not yet prepared to say just what it is, there's something very definitely wrong with this tunnel vision; and its continued existence I would offer as the first point of proof that air power doctrine and organization have a way to go before we can speak of 'maturity.'

During the Truman years, on which both of our speakers have concentrated, the principal stumbling blocks preventing the elucidation of a rational air policy—by which I mean to imply one capable of reacting to the full spectrum of warfare possibilities—were what we might look on as the three Bs—the bomb, the budget, and the bastards in the other departments (whether Air Force, Navy, State, NSC, AEC, or the Bureau of the Budget). Actually there were more than three stumbling blocks, but both of our papers this morning tend to emphasize these three.

As John Greenwood points out, the first major conceptual problem was how to assimilate atomic weapons within existing doctrine and organization *without disrupting existing structures.* I emphasize that last part if for no other reason than to throw out the question of whether it might not appear in retrospect to have been a false and unnecessary premise, however human or understandable. In any event, the basic problem was exacerbated by the continuing refusal of the people in the Manhattan Project and later the Atomic Energy Commission (*and* its successor organizations!) to tell the planners *or* the historians what they needed to know. In any event, assimilating the Bomb, though difficult, was a fairly straightforward task for the new Air Force. The Navy, however, as David Rosenberg demonstrates so well, had the very devil of a time trying to figure out what its own mind was on this subject; his recounting of the history of the Nimitz, Gallery, and Ofstie memoranda—and later the General Board study ramrodded by Arleigh Burke—is a genuine contribution to our understanding of a service to whose nuances outsiders are rarely privy.

The budget was a more immediate stumbling block. Without being doctrinaire about it, Harry Truman had an old-fashioned predilection for a balanced budget and the practice of accumulating a surplus in prosperous years to reduce the national debt. Making matters worse, he had had enough experience with the military to be severely sceptical about the amounts of money they requested; and he refused to be taken in by their scare stories. When James Webb, his budget director, warned him in October 1946 that the Army and Navy would be coming over to the White House next day to point out what dire actions would have to be taken in view of Truman's forced reductions in their Fiscal Year 1948

allocations, he remained unmoved. Webb said they were serious—that the Navy would insist they would have to withdraw the fleet from the Mediterranean. "Baloney," the President responded. "They don't have to bring the damn fleet home—all they have to do is close down a few Navy Yards!" (Presumably easier then than now!) Truman's continuing budget concerns—fully as hardnosed if less well known than his successor's—powerfully affected all early planning in the postwar years. Indeed, as David Rosenberg illustrates in an article soon to appear in the *Journal of American History*, the President's rigid budget ceiling for FY 50 had at least as much to do with the go-ahead decision for the hydrogen bomb as did the Soviet A-bomb explosion or the kind of thinking that led to NSC-68. Rosenberg may be guilty of slighting the roles of certain powerful members of Congress, but certainly for the service planners the FY 50 budget ceiling had the effect of putting adequate conventional warfare alternatives out of reach.

I'll say little about my third 'B'—the bad guys in the other departments or services. The controversies surrounding what we erroneously call 'unification' are too well known and far too dreary in the telling. The bickering and squabbling exasperated Truman, demoralized George Marshall, and became a consistent theme in Eisenhower's diaries from 1946 through the early fifties. Although it is little known out here in these quarters, his initial reaction to the idea of another academy for the new Air Force was wholly negative. Indeed, by December of 1948 he was writing to James Forrestal suggesting that a study be undertaken to find some way of marrying West Point and Annapolis into some form of United Services Academy, perhaps keeping the same two locations but rotating the various classes from one to another.

I said earlier that there were more stumbling blocks than my three "Bs." Two in particular I'll mention briefly. The first and perhaps most difficult for the planners, and operative until at least the presentation of the Gaither Report in 1957, was that no two persons considered an actual war with the Soviet Union less likely than did our first two postwar presidents. That we should have forces adequate to an emergency, yes. That we should take care not to be outdistanced in technology, yes. But that there was any serious likelihood of an attack on the United States—or even Western Europe—by the Soviet Union in the foreseeable future, no. And as I suspect Forrest Pogue's fourth volume will show, this view was shared as well by George Marshall. The world of the Dulles brothers, the Achesons, Rusks, Cliffords, McCloys, and Nitzes was not the world of Harry Truman or Dwight Eisenhower. I cannot yet *prove* this point to the degree that would satisfy a dissertation director, but I offer it anyway as a further reminder of the difficulties facing the planners.

My final stumbling block is referred to by David Rosenberg when he writes of the persistent tug of war between long term technologically

oriented projection and near term war planning. This is as much a problem today as it ever was; and a man formally detailed to a special study group—as, for example, the one presently underway on the unenviable task of figuring out the likely strategic environment in the year 2000—is liable at any moment to be hastily recalled to his regular job in the command post in the bowels of the Pentagon to help plan or coordinate the evacuation of American citizens from the latest hot spot. I hear there are 30,000 people assigned to the Pentagon these days; among them, the number who have any significant time to devote to thinking, as opposed to doing, can probably be counted on the fingers of both hands. So much for stumbling blocks faced by the postwar planners, men who sometimes appear to have fared less well than some academics might seem to have preferred.

John Greenwood opened by reminding us that the development of the postwar Air Force was of such vast scope and complexity that no historian has yet dealt with it in a meaningful manner. I'd like to close with some comments on the prospects for advance in this respect and with a few questions that beg for attention.

Before I do so, let me remind those innocent Christians present—to borrow a term from our Harmon lecturer—of a point or two raised by General Parrish on Wednesday evening. The human element in all this business is absolutely of its essence. . .and is surely the weakest link in all our published work for the period in question. Biographies are few and memoirs fewer. The restrictions imposed on our leading military thinkers after the canning of General MacArthur in 1951 have been nothing less than tragic—both for historians and for presidents. The general was rightly fired, to be sure, as was General Orvil Anderson only a few months earlier, but the over-reaction that set in thereafter robbed this nation and its leaders of an entire level of expertise that can barely any longer wedge its foot in the door of so-called higher strategy, a topic now, as General Parrish put it, so well "democratized" as to allow virtually anyone except a serving officer to be taken seriously. Thus cut off in so many ways from the spark of human feeling that is the essence of history, scholars run the risk of getting trapped in documents that, since they usually represent consensus rather than viewpoint, are far more apparent than real. In short, the story of postwar planning is far less the story of PINCHER, FROLIC, EARSHOT, HALFMOON, etc., etc., than it is the story of Harry Truman, Jim Forrestal, "Hap" Arnold, Carl Spaatz, Chester Nimitz, "Stu" Symington, "Larry" Norstad, Hoyt Vandenberg, and Dwight Eisenhower—or any number of less renowned people. Air power, as Colonel Ron Fogleman used to tell classes full of cadets perplexed at this very idea, air power in the last analysis is People power. Machines can be made to do work, but they never have nor ever

can build an air force that will work. And I thank our Harmon lecturer for reminding us—and we do need to be reminded—of this crucial fact.

So much for special pleading. I promised to close with some comments on the prospects for advance in getting the postwar story told and with a few questions that beg our attention. First, some good spadework is underway, and certainly our two speakers this morning are in the forefront of the effort. In Dr. Greenwood's case, we can only hope that his new responsibilities with the Corps of Engineers do not prevent him from continuing what he so well began. In Professor Rosenberg's case we already have a considerable corpus, starting with his "Naval Strategy in a Period of Change," done in support of the Strategic Arms Competition study. We also have his paper for the recent SHAFR meeting, his paper today, and the forthcoming article in the *Journal of American History*. While most of this work has a naval slant to it, it nonetheless is not produced below decks and is gratifyingly free of the contentiousness that marks the work of many of his predecessors in this field. Larry O'Brien, a student of Allan Millett's, is hard at work now on yet another study of postwar planning. I would be less than generous if I failed to point out that the work of these three gentlemen in breaking down the barriers blocking access to classified materials has been a godsend to Johnnies-come-lately like myself. Then, there's even the hope that our chairman's long-awaited *History of the U.S.-Soviet Strategic Arms Competition, 1945–1972* will before long see the light of day. But I touch only the surface. In addition, we already have Harry Borowski's history of the Strategic Air Command in its early years and Donald Baucom's work on Air Force R&D in the years immediately following the war, and we may look forward to Elliot Converse's forthcoming treatise on the Air Force and overseas basing—to mention, in the last three examples, important new work emanating right here from Colonel Hurley's department. In addition, the work of Tom Etzold and John Lewis Gaddis is at long last making available to a wide audience the basic JCS and NSC papers so long locked away in cold and forbidding storage. Taken together, the wealth of newly available materials, while not yet complete, to be sure, is such that significant interpretation and analysis based on the relevant documents is at length becoming possible.

Perhaps the story of the search after maturity in postwar air doctrine and organization will not find its Thucydides for many years yet to come. And we can probably get by without some new Polybius hell-bent to instruct us on the didactic values inherent in the tale—or even a new Tacitus hung up on moral preoccupations with the corruptions of power. But after all these years and innumerable lost opportunities, our service has at last found, in General Momyer's *Air Power in Three Wars*, its equivalent to Caesar's *Commentaries on the War in Gaul*. This may give

us reason to hope that Titus Livius—dear old Livy—may be out there somewhere banging away on *Ab Air Force Condita.*

If he is, let me conclude with a few questions he might ask and a few cautionary warnings culled from my conversations on this topic with my colleagues at the Wilson Center. These are presented in no particular order and are passed on as no more than food for thought, or perhaps discussion.

1. Be wary of taking the documents *too* seriously. Recall Arnold Toynbee's warning that "the information that is to be found in an official document will have been put there—if we may assume that the document has been drafted competently—in order to serve some official purpose which, whatever it may have been, will certainly not have been the irrelevant purpose of informing a future historian." (Vol. 10, 1954, p. 227). Also, in this same respect, be especially wary of staff planning documents, lest you come to take their content as seriously as staff planners tend to take themselves and their work, ninety plus percent of which is invariably in vain or ignored by the real decision makers.

2. *Find* those *real* decision makers. Lunch time at the Army-Navy Club in Washington is as good a place as any to start.

3. Bear always in mind that "most civilians fail to appreciate the glories of nuclear deterrence and massive retaliation." When they see outside the gates of SAC bases a signboard reading "Peace is our Profession," they tend to think that the local college pranksters erected it overnight and the troops haven't had time yet to dismantle it.

4. Re the planners: Why did they never seem to realize that SAC would not deter limited, salami-slicing wars? Also, why did they apparently spend so little of their time, prior to 1950, anticipating what Russian development of nuclear weapons would mean for U.S. strategy?

5. "Why do you Air Force people inevitably confuse destruction with control?"

6. Finally, dear Livy, don't get caught up in sideshows like the squabbling over so-called unification or over roles and missions. These were present and not without *some* importance—they were insidious perhaps, but not really dangerous: rather like smog in Denver,. . .hardly likely to cause a revolution!

Those questions, some of them bearing the marks of presumably friendly needles, I pass on for what they might be worth. In closing, I would like to quote from a paragraph that Major Fred Shiner forced out of me way back in February of 1977 as he first began planning for this

symposium.

The story of the postwar Air Force must be approached analytically and with reference to recognizable time frames such as: 1945–48 (through Key West & Newport): 1949–53 (from NSC–68 through Korea); 1953–60 (The Age of SAC); 1961–72 (The Age of Turmoil: From Cuba to the Bridge at Thanh Hoa): 1973–78 (Years of as-yet-undefined Transition). Central themes would have to include: the unending turbulence in both doctrine and organization that characterizes the period taken as a whole; the tendency to look to the past, especially World War II, for organizational justification while constantly readjusting doctrine to cope with events and requirements both unforeseen and unexpected; and the problems attendant to coping with rapidly shifting capabilities and requirements. The period as a whole might well be characterized as "an age of intuitive improvization."

ADDED COMMENTS:

MARINE AND ARMY AVIATION IN THE POSTWAR YEARS A MARINE'S PERSPECTIVE

COLONEL J. E. GREENWOOD, USMC

Dr. Rosenberg narrows "naval air doctrine" by a stipulated definition to "basic tenets of strategy rather than tactical doctrine." He further limits the scope of his paper to the role of the aircraft carrier as an atomic weapons delivery system. In so doing, he slights the Navy's conventional aviation capabilities and virtually eliminates any consideration of Marine Corps aviation, which forms a substantial part of naval aviation.

A much broader, if less detailed, consideration of naval air doctrine seems to be needed. Further, doctrinal ideas do not evolve in a vacuum, but are shaped by the impact of such things as international rivalries, national policies, interservice competition, changing technology, and budgetary constraints. The decade following World War II brought change and instability sufficient to unhinge any established doctrine. Nevertheless, throughout this difficult period of transition, the Navy and Marine Corps maintained balanced aviation capabilities which proved appropriate for the coming conflicts—an accomplishment which suggests an existing, not emerging, maturity.

THE EMERGENCE OF POSTWAR ARMY AVIATION

LIEUTENANT GENERAL ROBERT WILLIAMS, USA (RET.)

The missions of Army Aviation and its organization are so closely related that they must be considered together. Therefore, before focusing directly on Army Aviation, one must understand some of the forces and conflicts that have influenced the evolution of organization in the military establishment.

Centralization vs. Decentralization

Primary among the conflicts is the question of *centralization* versus *decentralization*. In any group engaged in organizing a unit two factions can be identified: one favors centralization, the other decentralization. Those who favor centralization talk of vertical organization based on functions. Those who favor decentralization talk of horizontal organization based on missions. Let me explain this by some examples.

On the broadest level the proponents of centralization (vertical structure) would put all aircraft in the Air Force, all ships and boats in the Navy, and all ground vehicles in the Army, and then let each of the services support the others as necessary. This would give vertical organization based upon the functions of air power, ground power, and sea power.

Within the Army, there are artillerymen who would propose that all weapons except small arms be organized vertically in an artillery organization under the direct command and control of the Army artillery officer. Some signal officers have contended that all communications down to the last radio operator should be organized within the Signal Corps, and Transportation officers would have all vehicles operated by the transportation Corps. Such arrangements would give vertical organization based on the functions of firepower, communications, and transportation.

The general arguments used in favor of centralization are: better logistical support, closer technical supervision, more flexibility in shifting the assets, and improved *technical* training.

Counter to the functional group is the faction that believes in decentralization (horizontal organization) and favors placing within each organization everything that it requires to do its mission.

On the interservice level, the proponents of decentralization would leave the Air Force with SAC (Strategic Air Command), a few tankers, and a few fighters to protect the bombers (for the mission of the air war), transfer TAC (Tactical Air Command) to the Army in support of the ground war, and divide MAC (Military Airlift Command) among the Air Force, Army, and the Navy. From the Army the Air Force would gain a slice of the Corps of Engineers and bits of pieces of other organizations. Air Defense could go to either service. The Navy is already self-contained, and the only addition that comes to mind is part of MAC.

At a lower level, within the Army the proponents of decentralization would slice up the units that now support divisions and place them under the command of the division commander. This could result in an enormous division organization, with each division having organic heavy maintenance units, long range communications, all sizes of helicopters, and a few fighter aircraft for close air support and air defense.

The arguments in favor of decentralization are: closer integration of effort, unity of command, all elements more responsive to the commander who has responsibility for the mission, and improved *tactical* training.

The conflict of organizational concepts is not restricted to the Army. For example, in the Air Force there has been continual debate as to whether tankers should be organized centrally or on a decentralized basis. TAC long contended that it required tankers organic to TAC to refuel their own aircraft. SAC, on the other hand, argued that they were the primary users of tankers and that it would be more efficient and economical to have all of the tankers in SAC, with SAC providing support to TAC. SAC won.

In a general sense, the Air Force is organized primarily on a highly centralized vertical basis, with each major command having world wide responsibility. The Army is organized primarily on a horizontal basis that is highly decentralized; the major commands each contain most of the capabilities required to carry out land warfare in its area of responsibility. Actually, in the organization of the Department of Defense, the services, and units within services, present a desirable mix of centralization and decentralization. In each case, whether it be the total Department of Defense or a small unit, a balance has been reached. I think you will see this balance illustrated in later discussion on the organization of Army Aviation *vis-à-vis* the Air Force.

We should bear in mind that the issue of centralization and decentralization has been influenced significantly by advanced technology.

Advanced technology has provided us with equipment of greater capability—usually larger, more complex, more expensive, and more difficult to maintain. This type of new equipment gives more weight to centralization. Advanced technology has also provided some equipment with new capabilities that is smaller, lighter, more dependable, and easier to maintain. Such equipment has made decentralization more practical. Keeping these basic conflicts of interest in mind, along with the arguments in favor of each and the influence of advanced technology, will make it easier to understand aviation in the military services.

The Evolution of Army Aviation

The first airplane was introduced into the Army in 1909. From 1909 to 1911 there was little cause to be concerned about centralization versus decentralization since the Army only had one aircraft. The primary purpose of aircraft in these early days was for surveillance and observation, and they fell logically under the control of the Signal Corps. The beginning of World War I witnessed the impact of technology as new aircraft demonstrated additional capabilities. The vehicles that were originally procured for observation proved capable of delivering firepower and bombs and of fighting each other in the air. This is, of course, an example of a situation that recurs throughout military history: where an item of equipment, once obtained, demonstrates additional capabilities that generate new requirements and applications.

By the end of World War I, there was a proposal that the air service be composed of two distinct forces. One was to consist of squadrons attached to ground armies, corps, and divisions under the control of ground commanders. The other force was to consist of large aeronautical groups for strategic operations against enemy aircraft and enemy materiel at a distance behind the actual lines. In the postwar years, however, the strategic force was disapproved.*

It was in the period between the world wars that the Air Corps, led by Billy Mitchell, declared its hand in favor of centralization—at least for those missions that are related to the air war as opposed to the ground war. Between World War I and World War II there was a steady increase in the capability of aircraft, particularly for the strategic mission. The farsighted airmen, visualizing the great potential of aircraft, concentrated their major efforts on obtaining the type of aircraft that would permit them to accomplish the mission of strategic bombardment. Most believed this would be the *primary* mission of the air arm. The airmen fought for independence from the ground commander. At the same time the ground

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*Ed. note: This was true until the formation of the GHQAF, or General Headquarters Air Force, in 1935.

commanders concentrated on keeping aircraft under the control of the ground commander for immediate support. Here was the first confrontation in the aviation field between the centralization and decentralization concepts. The airmen believed that their primary mission was the air war and wanted all air power centralized under an air commander. The ground commanders believed that the ground war was predominant and that they could get adequate air support only if the aircraft were decentralized and under their command and control. The Air Corps won its point at the beginning of World War II and became the Army Air Forces, coequal with the Ground Forces. Air power was truly centralized.

Of special importance to ground operations and hence Army commanders was the observation or surveillance mission. In 1941 that mission belonged to the Army Air Forces. This mission started prior to World War I using the most elementary of aircraft, but by 1941 observation aircraft technology had advanced to the O–47 and the O–52. These were comparatively fast aircraft for the period; they were large, quite sophisticated, and required what was considered in those days to be considerable facility support. They had to operate from well-established air bases, and they had to be maintained by a large crew of technically qualified personnel. Thus, as technology applied force toward centralization, the aircraft was removed from the influence or control of the artillerymen it was to support. By this time, however, technology had also provided another aircraft—the Piper Cub; this was technology applied in the second area. The Piper Cub was an aircraft of sufficient simplicity that it could be operated and maintained in the field. It was also an aircraft with flight characteristics permitting it to operate in and out of rudimentary fields and, hence, able to live in the field with an artillery battalion. The artillery seized on this as a means of elevating the ground observer in an aerial platform to accomplish better the same job he had accomplished on the ground.

The introduction of the "Cub" (designated the L–4) as an organic part of the field artillery at battalion level is the true beginning to what we now call Army Aviation. It demonstrates the two precepts which have been the foundation of Army Aviation organization and mission. The first of these is that the Army introduces aircraft into the Army system to accomplish missions that traditionally have been accomplished by the Army but in the past have been accomplished by ground means. For example, the Cub in the artillery battalion did not add a new mission; it lifted the forward observer to where he could see. The second precept of organization is that aircraft should be made organic to the lowest using unit that has a full time requirement for the aircraft and the capability of operating and maintaining the aircraft in its area of operations. It was on this basis that the L–4 became part of the battalion.

An important milestone in Army Aviation occurred in the late 1940s when the Army picked up the helicopter from a commercial development and tested it for Army missions. Technology had provided a major breakthrough in a vehicle with flight characteristics that permitted operation with the units in the field on a decentralized basis. The helicopter could be integrated into the Army organization at all levels. This development has permitted the expansion of Army Aviation into the fields of airlift, medical evacuation, expanded reconnaissance, and direct fire support.

While technology brought the helicopter into the Army, it is interesting to note that the application of advanced technology in the Air Force has very nicely accommodated this expansion of Army Aviation. For example, each improved, more modern version of the Air Force fleet of aircraft is larger, more complex, and requires far more facilities. Thus the application of advanced technology to aircraft being procured by the Air Force demands more centralization and reduces the ability to operate beside, or as a part of, ground forces.

The Future of Army Aviation

The potential for application and growth of Army Aviation has in the past and will in the future be found in two areas. The first is in replacing or supplementing ground vehicles in traditional Army missions. In this area Army Aviation grows and prospers as newer and more capable aircraft are employed more and more for reconnaissance, command and control, medical evacuation, artillery support, tactical troop transport, and fire support. Since the field is competitive, voids in needed capability are not likely to occur. The second area in which Army Aviation has and should continue to expand is in filling voids created by the natural proclivity of the Air Force to move to larger, faster, more sophisticated aircraft.

This Air Force trend created the first void in air observation and permitted the birth of Army Aviation. A new void is now appearing in transport aircraft capability. In World War II the primary transport aircraft were the C–46, C–47, and C–54. After World War II the Air Force developed the C–123, C–124,and C–133 to replace the older aircraft. The Army introduced the helicopter. The next generation of Air Force transports were the even larger C–130, C–141, and C–5A. To meet its requirements, the Army procured larger helicopters and the Caribou, which eventually went to the Air Force. The Air Force has now phased out the C–123 and Caribou from its active forces, and the AMST is planned to replace the C–130. This raises the floor on the Air Force capability to

aircraft in a high gross weight category.* The Army will probably expand its organic aviation to fill the void being created since troops in the field will still require air support.

This paper has focused, albeit briefly, on observation and air transport as related to Army Aviation. A similar analysis of how the increasing sophistication and centralization of the Air Force's aircraft and systems have created voids now filled by Army Aviation on a decentralized basis can be made in the functional areas of firepower, reconnaissance, communications, and medical evacuation.

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*A similar situation has evolved in civil transportation. The major airlines, like the Air Force, have moved to larger and larger aircraft. The void thus created has rapidly and effectively been filled by new second and third level carriers operating the smaller aircraft.

ARMY AVIATION: A SHORT BIBLIOGRAPHY

BRIGADIER GENERAL JAMES L. COLLINS, USA

General Collins pointed out that while much remains to be done in the history of the "development of tactical and/or organic air capabilities after World War II," Army historians have at least broken ground in several areas. He suggests the following as beginning sources for those interested in close air support operations from the ground forces' perspective:

Appleman, Roy E. *South to the NAKTONG, North to the Yalu.* (*The U.S. Army in the Korean War*). Washington: Department of the Army. 1961.

"Effectiveness of Tactical Air Support in WWII and Korea." DOD Study under the auspices of the U.S. Army Command and General Staff College. June 1961.

Fisher, Ernest F., Jr., and Richard P. Weinert. "Combat Data Concerning the Effectiveness of Close Air Support." Washington: Office of the Chief of Military History. 1974.

"History of Close Air Support." Prepared by Continental Army Command. 1961.

"History of Close Air Support Operations." Prepared by the U.S. Army Task Force Component of the DoD Close Air Support Study Group. February 1972.

Kugler, Richard C. "Air Force Statistical Data on Missions Flown in Support of the Army (U)." Washington: Office of the Chief of Military History. 1964.

Mossman, Billy. *Ebb and Flow, November 1950-July 1951.* (*The U.S. Army in the Korean War.*) Washington: Department of the Army. To be published.

Tolson, Jack. "Air Mobility, 1961–1971." OCMH Vietnam Studies Series. Washington: Department of the Army. 1973.

Weinert, Richard P. "History of Army Aviation, 1950–1962." Fort Monroe, VA: Historical Office, U.S. Army Training and Doctrine Command. 2 Vols. 1976.

VI

AIR POWER LIMITS IN LIMITED WAR

One of the leading military historians in the world, Professor Theodore Ropp of Duke University, chaired this session on the employment of United States air power in the years since 1945.

The session opened with an overview by General T. R. Milton, USAF (Ret) whose biography (in the rear of this volume) shows that he served, for the purposes of the symposium committee, in the right place at the right time throughout his career. General Milton portrayed the difficulty of trying to predict trends in air power and argued for future flexibility in outlook and technological development. As Theodore Ropp commented, "General Milton claims not to have learned much history at West Point, but his history is deeply informed, with special attention to psychological pressures and the peacetime military learning process."

The dominant topic in this session was expected to be Vietnam, and the planners called on a knowledgeable former colleague, Colonel Ray L. Bowers, USAF (Ret), who had served in the war as a squadron navigator in tactical airlift and, afterwards, as Chief of the Southeast Asia branch of the Office of Air Force History. Commenting later about Colonel Bowers' paper, Professor Ropp accurately observed, "His opening sentence shows how far air power historians have moved from 'Look, Ma! I'm flying!'" Bowers reviewed the strategic and tactical employment of air power in the war and concluded his "tentative appraisal" with the judgment that, despite many problems, "airpower was successfully employed in countless battles and campaigns." For political reasons, however, the proposition of "whether or not air power could have ended the war on satisfactory terms was not tested."

Another retired Air Force veteran, Major General Edward Lansdale, whose military career followed a pattern very different from that of most of his contemporaries, spoke next. The famous practitioner of the psycho-political aspects of warfare raised the disturbing question of whether or not his fellow countrymen had understood the kind of war in which they found themselves.

The foregoing perspectives did not include the insights an airman might have gained at the level of the Joint Chiefs of Staff. Aware that a former Vice-Director of the Joint Staff at an important point in the war, Lieutenant General John B. McPherson, USAF (Ret), would be in the audience, the symposium committee asked him to write a comment for this volume on the air war against North Vietnam. His reply reflects his first-hand experience; its scholarly nature is a reminder that General McPherson is also President of the Air Force Historical Foundation.

Amidst the sea of Air Force blue in this session, one well-known civilian scholar, Professor Dennis Showalter of Colorado College, surfaced a challenge during the discussion period to the positive tone of Colonel Bowers' paper. The replies of both Bowers and General Milton agreed with Showalter's call for a critical examination of air operations, but General Milton went on to stress the influence of Secretary McNamara and his civilian staff on those operations as a topic deserving an especially careful examination.

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FROM THE BERLIN AIRLIFT TO VIETNAM AND BEYOND: A PARTICIPANT'S VIEW

GENERAL T. R. MILTON, USAF (RET)

Even after four decades it seems best to draw a veil over my scholastic record at West Point. From those years—I have always hoped they were not formative—certain bits of knowledge have stuck. Predictably enough, all the wrong bits.

I remember, for instance, learning that the Polish cavalry would deal some very hard, perhaps even decisive, blows to an invading force of Germans if Hitler ever made that unwise move. With equal clarity, I recall the knowledge I gained about the relative strengths of the German and French armies. Given the superior leadership, training, and marvelously constructed defenses of the French, it was clear where the advantage lay. It was during that same period that I grasped other solid bits of higher education: the diesel engine, for instance, while admirably suited to heavy machinery, could never be adapted to the passenger car: the laws of aerodynamics seemed to argue against crossing the sonic barrier.

Curiously enough, in this pre-World War II education of mine, I don't recall being taught, one way or another, about the future role of air power in war. When we studied the situation in Europe, then on the brink of World War II, it was through the eyes of traditionalism. What was good enough for Napoleon was good enough for us.

It is probably just as well, for I was spared having to learn the immutable theories of Giulio Douhet, who was to be proved, later on in that same World War II, less than infallible. And yet, in some ways, he was a pretty good prophet. No one can dispute that air power played a decisive—perhaps *the* decisive—role in World War II, first in the Battle of Britain, then in the long air campaign preceding D-Day, and finally in bringing about the capitulation of Japan. It was not as Douhet visualized things—it turned out the bombers did need protection, a lot of protection, before daylight bombing became affordable—but air power nevertheless played a decisive role in that war.

It was such a major role, in fact, that air power enthusiasts came out of that war prepared to go it alone in any future conflict. I remember a movie produced by the Strategic Air Command, in those halcyon days when we had a monopoly on the atomic bomb and the bomber ruled as the supreme military instrument, which showed how a few bombers made superfluous all the other expensive paraphernalia of war. In this movie, troops, warships, fighter planes were all neatly crossed out, as a strategic bomber, majestic and invincible, cruised across the screen, prepared to take care of things. The film was produced for the education of Rotary Clubs and other public forums. Happily, it was suppressed at birth by a wise Air Force Chief of Staff, General Thomas D. White.

Nevertheless, the feeling was strong in the early fifties that the air power which had done so much to win World War II could do still more if employed with imagination. It was during this period that the Air Force undertook an ambitious study called Project Control. The theme of Project Control was, essentially, the use of air power, rather than ground forces, as a basic means of controlling hostile territory. The idea for this study came from the remarkable success the RAF had enjoyed, during the twenties and early thirties, in controlling dissident tribes in the Middle East.

At any rate, Project Control occupied the time and energies of a sizeable group at the Air University for the better part of a year. The believers in that project were ardent. Had Vietnam come along about then the theory would undoubtedly have been given a test. There was, of course, no such laboratory available in 1954, and so Project Control, after some exhaustive and exhausting briefings, went quietly into the archives, never to be heard of again. Well, perhaps that is not quite true. Eisenhower's Open Skies proposal does owe something to a study which set out to show how Japan and Germany could have been controlled by the pressure of air power in the thirties, or failing that, by air power in the war itself—air power not tied to a surface strategy.

Like most—maybe all—attempts at constructing a philosophy of war, whether Mahan, Douhet, or the Pentagon theologians who grind out those dreary papers on the doctrinal precepts of the true faith, be it that of the Army, Navy, Air Force, or Marines, Project Control went a little overboard. Nevertheless, there was a considerable amount of solid thinking done in the course of that year's study. Considering our present and apparently aimless strategy in the Pacific, it might be a good idea to resurrect Project Control for another look. Our forces, with the exception of the soon to be withdrawn Second Infantry Division in Korea, are air and naval. They are highly trained and ready forces. The question is, ready for what? The answer is not as easy as it once was when any right

thinking American could promptly answer, when asked a similar question, "To stop the spread of Communism."

Air Power in the Cold War

But to get back to the early years after World War II, years which saw the triumphs quickly supplanted by the new Soviet challenge.

In the disorderly demobilization which came on the heels of V–J Day, we lost all vestiges of the great American wartime military machine. The troops left in Europe and Japan were occupation troops, neither trained nor motivated as fighting men—a fact that would be brought sadly home to us in the first days of the Korean War. And so when the first challenge came from the Soviets over the matter of access to Berlin, we were in a pickle. We could do everything, which is to say we could hit the USSR with nuclear bombs with no fear of retaliation, having first confirmed their warlike intentions by trying an armed convoy to Berlin, or we could do nothing—simply withdraw from that island in the Soviet Zone as being too much trouble. We chose a middle ground, that of supplying Berlin by airlift, meanwhile deploying some B–29s to England as a quiet reminder of another option at our disposal. In a curious sort of way, the Berlin Airlift was a means of controlling a hostile environment by air alone. The peaceful transports lumbered unmolested over enemy airspace because of the threat of the bombers in England. The fact that the Airlift was, by seeming to legitimize the ground blockade, an extremely elaborate and expensive scheme to evade the issue is not really material. It was a demonstration of the use of air as a means of controlling a situation which might otherwise have ended in war.

In all honesty, however, the Berlin Airlift was notable more for its organizational aspects than for any military lessons we might have learned. Air traffic procedures, approach lighting, and weather minimum thresholds were tinkered with in what was essentially a giant laboratory operated under tightly controlled conditions. We learned that 200 foot ceilings and one half mile visibilities were about the limit for the equipment of the time, although we did operate lower (100 foot ceilings and one quarter mile visibility) at two airports with flat approaches. Thirty years later, despite all aviation's advances, these are still the practical landing minimums so long as a pilot, and not an electronic robot, is at the controls.

Thus, the Airlift made some significant contributions to aviation as it carried out that endless round of coal and food deliveries to Berlin. Charles J. V. Murphy, a distinguished journalist with *Fortune* Magazine,

described the Airlift as "a Rolls-Royce delivery to the world's biggest poorhouse."[1]

From the military standpoint we did not benefit as much, although we thought we had at the time. In fact, soon after the airlift ended, a large maneuver was laid on in North Carolina. It was given the name "Swarmer," and it involved two Army airborne divisions, tactical air forces, and a large contingent of air transport from both tactical troop carrier and Military Air Transport forces. Fresh from the Airlift, I was made commander of the air transport forces to the evident dismay of some fairly grizzled troop carrier types. Our mission was to supply an isolated airhead held by friendly troops who had parachuted in and seized the airfield. The members of the troop carrier persuasion were appalled to learn that our resupply plan was patterned after the Berlin Airlift. No formation flying, just a steady stream of individual transports. The enemy fighters were in ecstasy. They visualized the world's biggest and easiest turkey shoot. Happily for us, the former commander of the Airlift was also the man making the rules for the exercise. The transports were essentially put off limits, protected by some invisible but nonetheless impenetrable defense.

Lt General Lauris Norstad was the Exercise Commander for Swarmer, and he was evidently pleased with a briefing I gave him on our operation plan. At any rate, he dispatched me up to Mitchel Field on Long Island to give the briefing to the fearsome General Ennis Whitehead, who might have been a little out of sorts. His Continental Air Command forces were in the exercise, but he was not. Whatever the reason, General Whitehead cut me off in the middle of my act, almost as if I had been given the hook on a vaudeville amateur hour. "Never show that briefing," he said, "to anyone who has ever experienced combat." He then walked out. Well, I had experienced combat, maybe more than he had, and thus was a little hurt, but there I was, stuck with my charts like Lucky Pierre with his piccolo.

As things turned out, General Whitehead was wrong in his denunciation of our operation. The Korean War came along soon after, and after the initial confusion, air transport began to play an important role in our military resurgence there. The operation plan developed for this air transport was modeled closely after the Swarmer Exercise plan. We had air superiority—indeed, air supremacy—over Korea, and it made good sense to use airlift in the most efficient way. But airlift, in a situation where enemy air is present, has always been a perilous affair. The Germans learned this in their failed air resupply of Stalingrad. We, luckily

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[1] *Fortune*, Nov. 1948. "The Berlin Airlift", Charles J. V. Murphy

enough, have never been faced with a situation where any major airlift of ours has had much enemy air opposition to contend with.

But then, that is the whole history of our air power in the conflicts since World War II. Such aerial combat as we have had in those years, and specifically in Vietnam and Korea, has come only at our insistence. In Korea, our F–86s had to go to Mig Alley for an engagement. The air south of the Yalu was ours alone to use as we wished—for B–29s, transports, or close support. We have raised two generations of soldiers who, while acquiring chests full of combat decorations, have never seen, let alone been attacked by, an enemy airplane. Those rare enemy sightings have been reserved for our fighter pilots who have sought them out.

Air Power's Albatross

Korea taught us some things about interdiction, about close support, and, for that matter, about jet air combat, but it fell short of being an air war in which the question of air superiority had to be decided. Instead, after the early days of pandemonium and retreat, Korea became a war of attrition and, finally, stalemate.

It was a war in which air was never really given a chance to function in a decisive way. Had we been allowed to cross the Yalu and attack airfields, transportation choke points, and other targets critical to the Chinese support of the war, instead of viewing the Yalu as the border of a sanctuary, it is at least arguable that Korea would today be unified. As it was, the air campaign in the Korean War was doomed to inconclusiveness, as was the war itself, a fact marked by the never-ending confrontation at Panmunjon. Of course, it can also be argued, as it was then—and persuasively—that attacking across the Yalu would simply have led to all-out war.

That has been the albatross around the neck of air power since World War II: the fear that attack from the air is too provocative. Where, in World War II, we were, if anything, too uninhibited in our use of air power—I have in mind such targets as Dresden, Hamburg, and Nagasaki, as well as the no holds barred rules of engagement on strafing and targets of opportunity that existed after 1943—we became in the years after that war excessively cautious. The thing we knew best how to do became the thing we were afraid to do.

It was this attitude that governed our initial foray into Vietnam. As it happened, I was a member of the Taylor-Rostow mission sent out in

November 1961 by President Kennedy to survey the deteriorating situation in South Vietnam. At the time I was commanding the 13th Air Force in the Philippines, a job which provided my credentials for inclusion on the mission. The report we prepared for President Kennedy—or rather, the report General Taylor and Walt Rostow submitted after considering the inputs of various people like myself—was an exercise in cautious adventurism. The U. S. Mission in Vietnam would be reorganized to give the senior U. S. military man more authority. So far as the air side of things went, we would sponsor a Tactical Air Control System to give the Vietnamese Air Force more responsiveness, and we would beef up the advisory role. There would be nothing beyond that: no use of U. S. air power, no crossing of borders to get at the enemy who was using Laos freely, and certainly no attacking North Vietnam itself.

Well, the original Taylor-Rostow recommendations looked pretty modest in a few years as thousands of U. S. troops poured into South Vietnam on their mission of search and destroy. But as the war heated up and American casualties rose, our air power remained shackled, much as it had been in Korea.

From the beginning of our overt entanglement in Vietnam, which is to say about 1963, there was never any doubt as to the military value in hitting some targets in North Vietnam and Laos—targets such as the harbor dredge in Haiphong which was continuously occupied in keeping the fast-silting channel open. It would have been a simple matter to sink that clumsy vessel at some point in its shuttle, and, as it happened, CINCPAC had a plan to do just that. It was, of course, too provocative.

Everything was too provocative, even after the Rolling Thunder bombing campaign of the North began in earnest. Targets were selected "at the highest level," as the euphemism for the White House goes, for their psychological rather than for their military value. We lost pilots and airplanes, and condemned those who survived being shot down to years of imprisonment, all in the name of giving signals to an enemy. It was only during the Chrsitmas bombing of 1972 that we began to show Hanoi what we could do. Yet, that brief foray into a sensible use of our air power became a victim of an impossible political climate.

And so once again we found ourselves concluding an unsatisfactory war. Once again we, who had dropped the atomic bomb on Japan on the reasonable grounds that it would end a bloody war and would, in the long run, save lives, refused to use our conventional, let alone our atomic, air power to end, or even shorten, another bloody war.

Vietnam thus became, in the judgment of the casual or biased observer, a failed test of air power. We had this immense superiority in the

air, and we couldn't even put down an insurgency, let alone defeat a third-rate power like North Vietnam.

Some Lessons From Vietnam

There were, of course, a few occasions in that war where people could have gotten an inkling, at least, of what conventional air power could do given the chance. The Battle for Khe Sanh in early 1968 was such an occasion. All the ingredients, including massive and careful preparations by General Giap, the hero of Dien Bien Phu, were there, save one. At Dien Bien Phu the French Air Force was too weak to be effective, whereas at Khe Sanh air power was available in abundance. Even more important, the command and control mechanism was in place, and the air crews were highly trained and battle-tested. The results were spectacular. The JCS Chairman, General Earle Wheeler, reported enemy casualties at more than 10,000. Our own losses, by comparison, were minor.

One of the more significant operational achievements of that unhappy war has received far less than its share of recognition. That is the routine use of air tankers to extend the range and the bomb load of fighter aircraft. It is a technique that made fighter sorties of three and a half hours possible, even routine, from the bases in Thailand. The tankers cruised out every day over the jungles of Thailand and Laos for their rendezvous with the fighter-bombers. It was one of the great military sights of modern times to see the fleet of tankers followed by the fighters edging up to the refueling boom like so many humming birds. It was no stunt, no sometime maneuver performed in an emergency, but a part of the daily air war routine. If Vietnam did nothing else, it established air refueling as an integral part of tactical air warfare. Refueling has long since become a standard adjunct to tactical deployments. Crossing the Atlantic is no longer a week-long business of island hopping and sweating out weather. Fighter wings now cross non-stop, just like the airlines.

There are a lot of implications for the future in this tanker-fighter partnership. A fighter wing which can move from Idaho to Korea in less than a day is pretty mobile by anyone's standards. An F–111 wing did just that in the tense period following the tree-cutting murders at Panmunjon. When a fighter outfit can fly ten hours or more non-stop, it can deploy quickly to very distant places. And when that same wing can operate against targets located well beyond their airplanes' unrefueled radius of action, new vistas open up for the military planner.

The Mediterranean, for instance, could be covered by F–4s operating out of, say, Spain, with tanker support. Or they could operate out of Germany, or Italy, or Greece, or Turkey, for that matter. They could even, for some purposes, be based in England. I am not proposing, mind

you, that the tanker-fighter combination replace the carrier, but it does seem to offer some interesting options in a place like the Mediterranean.

The Airborne Warning and Control System, or E-3A AWACS, is another bright spot in the tactical forces' future and one more basis for comparison between land-based and carrier aviation. The E-3A releases tactical air forces from their dependence on fixed ground radar systems. Like the carrier task force, the tactical air task force can now take its control with it. All of which would seem to add up to an important future for land-based tactical air.

Unhappily, we seem determined not to exploit that future. Our present NATO strategy requires tying down a considerable portion of our tactical forces to a European base complex, in fixed numbers and precisely located by the Soviets. Base hardening, to include aircraft shelters, does help, but the fact remains that these forces are extremely vulnerable to a surprise attack.

The present NATO radar defenses are wholly inadequate for low-level detection. The E-3A, when it is available to NATO in sufficient numbers, will help in extending the warning time. Nonetheless, putting such a sizeable share of our tactical air forces on the front lines, so to speak, is not very prudent. These forces are, after all, irreplaceable. There is no World War II production line turning out aircraft on a mass production basis to replace battle losses, nor will there ever be again. There is not, nor will there be again, a training base for large numbers of replacement pilots. Deploying aircraft in Spain, Portugal, the U.K., or even the U.S. would seem to be a better way of exploiting this modern tactical mobility in the interest of conserving forces.

The next time around is going to be a different experience, even a unique one, to a nation that has generally been able to operate its air forces, land or sea, from safe havens. In World War II it was a hard day's ride from England to Schweinfurt and back. The same distance nowadays is no trip at all. The warning time the radars could give the Germans of our coming in World War II was enough to get the defenses alerted, the fighters airborne, and even the smoke generators working. Those European distances haven't changed, and radar, while improved, still operates on line of sight. What was for the Luftwaffe of World War II an hour or two of warning and time to get ready has now been reduced to a scant few minutes for the Allied air forces in Germany. AWACS will give us a little more edge. Moving back, and exploiting tankers, would give us even more.

The Return of Rationality

The past three decades began with the Berlin Airlift, the opening shot, so to speak, of the Cold War. It was closely followed by the Korean

War and the almost simultaneous creation of NATO, an organization that really came to life as Korea made clear the threat to Western Europe.

Then there came the years of our strategic supremacy and, finally, the great expectations, followed by the even greater disillusionment, of Vietnam.

We are beginning to put that disillusionment behind us and along with it the absurd self-flagellation that accompanied any mention of the failed Vietnam experiment—and it was really an experiment as much as it was a war. The subject of national defense is once more being debated rationally instead of emotionally as the enemy reemerges in clear focus. Well, fairly rationally.

There are a few amateur strategists loose in the land who see little future for land-based tactical air forces, but it is not a widely held view, especially by the non-amateur strategists. Air power remains very high on the priority list of those nations most likely to be involved in a war, notably the Arabs, the Israelis, the Nationalist Chinese, and the Communist Chinese. Our own adversary, the Soviet Union, is going all-out to modernize its tactical air forces.

We are doing pretty well ourselves. The F–15, F–16, the new tanker—although one could wish for greater numbers and some of the Congressional enthusiasm so far reserved for the nuclear carrier—are great additions to the tactical capability. The imaginative readiness training which employs aggressor squadrons and realistic combat conditions has almost certainly given the United States the most highly trained tactical forces in aviation history.

The next thirty years are as hard to predict as the last thirty were. No one, in 1948, foresaw the things that lay ahead of us any more than anyone can now. Almost certainly our great demobilization and general state of unreadiness contributed to our problems of the past era. It is something to think about as we look ahead.

In summary, none of us knows where we are headed. It is some small comfort that we didn't know thirty years ago—did not, in fact, have even an inkling—and we muddled through one way or another. There is, however, one significant change that thirty years has brought. The world is now a smaller and more dangerous place. If we are going to get through the next three decades with anything like a whole skin, we are going to have to face them far better prepared than we have ever been before.

AIR OPERATIONS IN SOUTHEAST ASIA:

A TENTATIVE APPRAISAL

COLONEL RAY L. BOWERS, USAF (RET)

The conflict in Southeast Asia was ultimately one of wills, a test of determination among the peoples of the two Vietnams and the United States. The Americans conceived that they could bend the will of the enemy by a cumulative strategy—one combining political, psychological, and military pressures. Military actions were intended to punish the enemy, to raise the costs of his war effort, and to deny him victory. Air power did exactly these things in every campaign, with considerable effectiveness. But the cumulative strategy had little apparent effect on Communist determination until late 1972, when the North Vietnamese saw their army defeated in the South, their homeland defenseless before the B–52s, their ports closed, and the rail lines from China under daily guided-bomb attack. Meanwhile, the well-armed South Vietnamese population stood at least passively behind its regime, while improved American ties to Peking and Moscow worked against Hanoi's diplomatic base. By 1972, however, American determination had been worn away, and the American leadership used the situation to exit from Vietnam with merely an appearance of success.

The heavy use of air power throughout the long conflict came naturally to the United States. Air power reflected this nation's technical strengths and its historic approach to war since 1940. Air operations did not directly challenge the major Communist powers, and they could be easily increased or decreased to fit diplomatic purposes. Finally, air power complemented the manpower strengths of Asian allies and promised to be economical in American lives.

For the airmen, there were not one but many air wars—in South and in North Vietnam, in southern and in northern Laos, in Cambodia—each changing in character from year to year, from wet season to dry, indeed from daylight to darkness. Challenges of weather, mission, and enemy reaction were infinite in variety. Effectiveness varied between wide extremes. However, several general propositions can be stated as preface to this paper.

1. The air weapon could deliver potent nonnuclear ordnance anywhere in Southeast Asia on short notice, especially after improvements

were made in the ability to find targets, to hit them with precision, and to strike in darkness and in bad weather.

2. The Communists severely reduced the effects of air power by their camouflaged and dispersed system of tactics and logistics, by moving and fighting at night, and by exploiting the heavily forested terrain.

3. Extended ground-versus-air battles were fought to determine whether air could operate freely at the altitudes and in the locales necessary for effective attack.

4. The Americans were resourceful in adapting aircraft to uses unforeseen in prewar doctrine.

5. The most effective tactical air strikes were generally those against enemy forces engaged or concentrating for battle; air interdiction programs and strike operations against remote base areas, although often worthwhile, were far less efficient.

6. Air was always important in the Allied strategy of cumulative pressures, but it became the primary instrument only in December 1972.

Rolling Thunder: the Bombing of North Vietnam, 1965–1968

In the Cuban Missile Crisis of 1962, a determined but controlled American response apparently faced down the Soviets. The concept thus gained acceptance among American theorists that in conflict the object was not to destroy the opponent but rather to convey that the alternative to a settlement was certain escalation and defeat.[1]

The "tit-for-tat" air strikes against North Vietnam in early 1965 and the first Rolling Thunder missions of late March were intended to warn of heavier punishment. Then, in crucial decisions in early April 1965, President Lyndon Johnson—deeming that the early strikes had hardened Hanoi's attitude—shifted the air attacks almost exclusively to LOC (lines of communication) targets in the southern part of North Vietnam. Such strikes seemed useful for hindering movements of materiel south, but were unlikely to put serious coercive pressure on Hanoi. The decision to deploy American ground units into South Vietnam brought the related ruling that, although Rolling Thunder would continue, first priority for the employment of air forces would be for tasks inside South Vietnam.[2] Although hopes remained that Rolling Thunder might "contribute marginally, and perhaps significantly to the timing of a decision (in Hanoi) to end the war,"[3] the bombing became just one element in a four-part American strategy of graduated pressures intended to bend the will of the Communists by (1) stepped-up operations on the ground in South Vietnam, (2) civil, political, and economic programs in the South, (3) a slowly escalating Rolling Thunder, and (4) offers of negotiations and aid in postwar economic development.

Several factors lay behind the 1965 decision against fast escalation of the air campaign. There was concern that South Vietnam was so weak

that it might collapse early, especially if heavier bombing caused Hanoi to raise its effort in the South. There was fear of provoking Chinese intervention or Soviet retaliation, possibly in Berlin. History seemed to show that populations stiffened under all but the most devastating air offensives. President Johnson, Secretary Robert McNamara, and advisor McGeorge Bundy all later described their awareness that agricultural North Vietnam was a poor target for persuasive air operations. Finally, the Americans did not have the stomach to punish North Vietnamese civilians the way they had once punished civilians in Germany, Japan, and North Korea.[4]

The United States gradually escalated the air campaign after 1965 and, by diplomatic contacts and intermittent bombing pauses, tried to convince Hanoi to negotiate. Sorties from bases in Thailand and carriers in the Gulf of Tonkin reached 12,000 a month in late 1966, double the rate of a year earlier. The POL (petroleum, oil, lubricants) strikes of mid-1966 penetrated the Hanoi-Haiphong area. By 1967, attacks on electric power, airfields, certain industries, and the rail lines leading from China added up to a campaign of measured but undeniably strategic air pressure. Still, even in 1967, a majority of the strikes continued to hit interdiction targets, few of which were economically suited for attack by expensive high-performance aircraft. Throughout the campaign Hanoi remained intransigent, doubtless stiffened by growing anti-war dissent in the United States.

North Vietnamese counteractions may provide valuable guidance for future populations under air attack. Hanoi exploited the bombing as the basis for a worldwide propaganda campaign and as a rallying point to cement the nation behind its Politburo's leadership. The North Vietnamese dispersed part of their industry, population, and materiel, and mobilized wholesale their labor force. Tens of thousands of workers served in the transportation system and repaired damaged route segments. Like the North Koreans fifteen years before, the North Vietnamese learned to move by night and to hide vehicles and supplies by day. Soviet equipment made possible a modern air defense system, and the regime armed its citizenry with light weapons for throwing up barrages against low-flying planes. The all-out resistance innoculated the nation psychologically and physically to resist every American escalation.[5]

Rolling Thunder became a classic campaign of measures and countermeasures, as each day airmen and defenders fought ground-air battles of great intensity. Conventional antiaircraft gunfire accounted for a majority of the U. S. planes downed in the North; the guns were most dangerous during the pilot's dive bombing run, which began at about 13,000 feet over target. The effectiveness of Soviet-built SA-2 surface-to-air missiles (SAMs) at the higher altitudes obliged the American air-

men to penetrate to the target area at low levels, where they were exposed to ground fire. One reply to the SAM was the Wild Weasel (or Iron Hand) fighter, equipped with radar-detecting gear and radar-homing Shrike rockets for low-level attacks on SAM sites. Even more effective were the radar-jamming pods later installed on the strike aircraft themselves. The pods ended the need for low-level penetration. The Communist MIG force was a lesser threat; the air-to-air score during Rolling Thunder favored the Americans, 116 to 55 (most kills were by F–4 two-seaters firing radar-guided or heat-seeking missiles). In reply to the well-controlled Communist triad of guns, missiles, and fighters, the Americans developed an array of special-purpose support equipment: fighters for MIG cover, Wild Weasels, electronic countermeasure aircraft, radar picket ships and aircraft, tankers, and reconnaissance craft. Losses over North Vietnam were about 2 planes per 1,000 sorties; but the rate was much higher for missions near Hanoi, and the need to hold down losses became a consideration in scheduling targets.[6]

Authorization to hit particular targets required White House approval; proximity to civilian areas was often an overriding consideration. Rules of engagement were tight. (Pilots could attack a SAM site located near a dike, for example, only if the site was actually firing.) Nevertheless, visitors to North Vietnam reported considerable nonmilitary damage. Most such destruction reflected (1) the difficulty of bombing accurately while maneuvering under gun and missile fire and (2) the proximity of many SAM and gun sites to civilian structures. Bombing accuracy improved to an average circular error of about 400 feet when Air Force pilots (better practiced in techniques for lobbing nuclear weapons) improved their skills in the older dive-bombing methods and used improved bombsights. In 1967, the era of "smart bombs" opened as Walleye TV-guided bombs improved the effectiveness of naval aircraft.[7]

American airmen were scarcely happy with the drawn-out campaign. One spokesman was Colonel Jack Broughton, veteran of over a hundred F–105 missions over North Vietnam, who retired after a court-martial stemming from the strafing of a Russian vessel in Haiphong harbor. In his angry book, *Thud Ridge*, Broughton criticized the policies that prohibited attacks on enemy fighters on the ground, that allowed the Communists to build SAM launch sites without interference, and that forfeited tactical surprise by inflexibility in route and target assignments. Broughton voiced the feelings of many still on active service whose comrades languished in the Hanoi Hilton. Few airmen had patience for the theory that power worked best if the truly sensitive targets were left undamaged. Throughout the Rolling years, the Joint Chiefs of Staff and its Air Force member, Chief of Staff General John McConnell, consistently urged that force be applied faster and in greater intensity. Most postwar analysts

seem to agree that gradualism "robbed air power of its effectiveness by violating the principles of concentration and surprise."[8]

Rolling Thunder admittedly achieved some gains. The bombing stiffened resolve in Saigon and in other Asian capitals; it inflicted pain and heavy labor costs on the enemy and limited his ability to fight a much larger war in the South; and it showed the world the willingness of the United States to act with restraint under provocation. Relief from the bombing in 1968 apparently induced Hanoi to start what proved to be meaningless negotiations in Paris.

These gains, however, scarcely balanced the failure of Rolling Thunder to achieve more important results. The four-part American strategy, of which Rolling Thunder was one part, wholly failed to persuade Hanoi to cease its actions in the South. The dose of strategic air pressure in 1967 was too half-hearted or came too late to coerce a totally committed foe. Meanwhile, the effects of the air interdiction campaign were minimized by the enemy's countermeasures, his speed-up of supply and reinforcement during the bombing pauses, and his ability to control the tempo of fighting in the South. Measured by its unsatisfactory outcome and by the more than 900 American planes lost in North Vietnam, the controlled application of air power that was Rolling Thunder stands as a sad failure.

Would earlier, faster, and greater escalation of the air war have succeeded in bending the will of Hanoi? Or, before reaching the necessary critical level of pain, would such escalation have triggered retaliation by the Soviet Union or Communist China? This was a risk American leaders were unwilling to take.

The In-Country War, 1961–1972

The war in South Vietnam began as a struggle for the loyalty and control of the population. The Communist-controlled National Liberation Front (NLF) spread its strength countrywide by propaganda and selective intimidation to the extent that the regime of President Diem ruled only the ground on which its forces stood. Saigon organized programs designed to win loyalty and assert governmental authority in the countryside. But nation-building required general security against the armed Viet Cong, ideally including forces for (1) local defense of hamlets, (2) supporting outposts under attack, and (3) finding and hitting the enemy in his remote base areas. The air weapon seemed especially suited for the second and third roles.

Pressed by President John F. Kennedy, the American military services in 1961 addressed problems of low-grade conflict and counterinsurgency. The Air Force's response, Project Jungle Jim, had the personal attention of Chief of Staff General Curtis E. LeMay. When Kennedy

dispatched to Vietnam a diverse force of American-manned helicopters and transports in late 1961, a detachment of propeller-driven strike planes from Jungle Jim deployed to Bien Hoa. The mission (under the cover of a training role) was to assist the South Vietnamese in their counter-insurgency and to develop tactics and equipment suitable for situations elsewhere.[9]

In the years of low-intensity conflict before 1965, the most effective expression of air power in Vietnam was the transport airplane, represented by several squadrons of USAF C–123s and a variety of other Air Force, Army, Marine, and Vietnamese fixed-wing and helicopter transport units. President Diem understood the importance of linking his nation by air and had developed a network of airstrips capable of handling twin-engine transports. The air transports carried civilian passengers, government development teams, troops and their equipment, and cargo ranging from livestock to large munitions. The Allied Special Forces camps, for example, which were positioned to challenge the Communists in remote regions, depended almost entirely on air transport for resupply. The C–123s joined ancient C–47s as flareships to illuminate outposts under night attack. The success of the flareships led to further development of transports as side-firing gunships; the AC–47, the first in a series of successful gunships, reached Vietnam in 1964. Converted transports also dispensed chemicals to clear vegetation alongside roads to reduce the danger of ambush. A crash during a leaflet mission in 1962 temporarily ended C–47 psychological warfare (psyops) missions, but later in the war leaflets delivered from the air became the principal way Viet Cong defectors learned of the government's amnesty program. The C–47 and C–123 units carried out several traditional paratroop assaults, none of which brought tactical success. Meanwhile, U. S. Army crews demonstrated the feasibility and worked out the tactics of helicopter assault.[10]

Although aircrews at Bien Hoa, flying T–28s, B–26s, and A–1s, were often effective in supporting the defense of outposts, they had few clearcut successes in seeking out and hitting the enemy. The air and ground crewmen were resourceful and highly motivated, but accidents and ground fire caused depressing losses to their elderly low-performance planes. One constructive early development was the revival of the airborne forward air controller (FAC). Discarded after the Korean War in the belief that slow-flying observation planes could not survive over a modern battlefield, the FAC in Vietnam eventually was a key in applying our tactical air against the elusive foe.[11]

Less praiseworthy was American staff work in Vietnam and the Pacific, marred by severe rivalry between the U. S. Air Force and Army over the latter's expanding aviation role. The interservice conflict at times

overshadowed the war against the Viet Cong, since officers of both services knew that practices in Vietnam could become permanent doctrine and could affect future campaigns in other theaters.

The political instability in Saigon after the death of Diem in late 1963 seriously weakened efforts against the Communists. It gradually became clear that the NLF, now strengthened by increasing support from the North, was capable of victory. With the landmark decision in early 1965 to introduce American troop units into Vietnam came simultaneous decisions to expand supporting air forces. There were no challenges to the increases in air units, for the need for air support in proportion to deploying troop units was accepted as axiomatic.

After 1965, air power was used in South Vietnam essentially as a complement to or a substitute for ground artillery. Although Army and Marine artillery eventually blanketed most of the country with guns up to 175mm, tactical air offered several advantages: it could deliver much heavier blows (with 500-pound bombs and napalm, for example) and could concentrate a full effort in whatever province or region was in immediate need. Air power and artillery became complementary, and arrangements for coordinating fire requests and for sharing airspace were worked out. Allied infantry tactics were often designed primarily to find and to hold enemy units for destruction by air and artillery firepower.[12]

The sustained and regular use of heavy bombers against tactical targets had been unforeseen in prewar doctrine. The B–52s bombed in all the main battles in the South, in interdiction work in Laos, and in the secret strikes along the Cambodian border in 1969–1970. A single B–52 could haul 30 tons of 500-pound and 750-pound bombs—five or more times the load of a tactical fighter-bomber. B–52 strikes were from high altitude, guided day or night by precision radar on the ground. Targets could be changed after the crews were already airborne. Although the Communists could have early warning by monitoring radio frequencies, their best countermeasure was dispersion.[13]

Month after month, fighter-bombers, B–52s, gunships, and armed helicopters took their toll in what became a war of attrition. Allied troops in contact with the enemy could expect fast response to strike requests via the overhead FAC. Many hundreds of strikes attended the Army's major search-and-destroy operations and the 1967 battles at Dak To, Con Thien, Khe Sanh, and Loc Ninh. In the Khe Sanh campaign of 1968, in a situation resembling Dien Bien Phu fourteen years before, air power (in conjunction with air-supplied troops on the tactical defensive) won a clear victory.

To minimize the effects of Allied air power, the Communists moved and fought primarily at night, used camouflage and dispersion, and

learned how to dig in. They were patient in their preparations for local attacks and were skilled in breaking away from difficult situations. Allied intelligence, which used information from ground patrols, prisoner interrogations, and airborne reconnaissance, was seldom able to pinpoint enemy units. As a result, air strikes away from regions of immediate fighting were not often effective; probably a majority of B–52 strikes in remote areas hit nothing of significance.[14]

The Americans were innovative. The turboprop C–130, for example, was used to drop 15,000-pound bombs to clear vegetation just before helicopter assaults. Helicopters proved valuable in numerous roles—in short-haul resupply, casualty evacuation, aircrew rescue, relocation of artillery, and patrol work. Helicopters gave the infantry mobility for local search-and-destroy operations where ground fire was light, but helicopter losses in the Laos incursion of 1971 underlined the vulnerability of low- and slow-flying craft over hostile terrain. Not all innovations worked; when the Allies seeded roadways with detergents in the rainy season to create impassable mud, the Communists bypassed the affected road segments or surfaced them with logs. An elaborate, computerized airlift scheduling and control system, attractive on paper, proved a costly waste.[15]

The Americans tried to limit hardships to the civilian population. Early in the war, Secretary McNamara directed the air commander in Saigon not to "take a chance on killing innocent people in order to kill a few Viet Cong." Although the rules of engagement varied from time to time, strikes generally had to be approved by Vietnamese authority. American pilots routinely refused to bomb in seemingly compelling circumstances if the necessary clearance was unavailable. Infantry requests for preparatory strikes on villages targeted for ground operations were denied, with the stipulation that strikes would be approved if the troops were fired upon. Although the hamlets hit in reply to such fire often contained some innocent people, the use of firepower was far from indiscriminate.

How great were the counterproductive aspects of applying large quantities of firepower in an ally's own country? A significant minority of U. S. Army generals (29 percent of those polled) responded that, considering the nature of the war, air power and artillery had been overused. Especially, unfortunate was the refugee situation, in part a concomitant of our aggressive ground tactics and heavy use of firepower. Many of those living in refugee camps had been deliberately induced to leave their homes by Allied warnings, bombings, or crop destruction. The Allied concept had been to deny the Communists the support of the populace and to create free-fire zones, but the plight of the refugees benefitted the Communist propaganda effort and mocked the idea of nation-building in the depopulated areas.[16]

Even given the wasteful nature of much of the air effort and the counterproductiveness in bombing supposedly friendly territory, by 1967 the tide of the war in South Vietnam clearly favored the Allies. The crescendo of offensive operations on the ground and the sustained pounding from the air created a bleak outlook for the Communists and contributed to their decision to launch the costly 1968 Tet offensive. Communist losses in Tet and the vigorous Allied pacification efforts thereafter led to a steady improvement in security throughout the South. Although American air and ground units were progressively withdrawn, well-armed local defense forces now protected the populated areas. By 1972 the Communists seemed plainly to have lost in the countryside and were again ready to try a change of strategy.

In their 1972 Spring offensive, the North Vietnamese battered across the DMZ (Demilitarized Zone) separating North and South Vietnam in an overt, direct invasion spearheaded by heavy artillery and armor. Other North Vietnamese forces simultaneously opened multi-divisional operations in the Central Highlands and in the rubber-plantation region around An Loc, fifty miles north of Saigon. The attackers employed hundreds of tanks, 130mm artillery, and antiaircraft weapons in quantities unprecedented in the South, including portable heat-seeking SA–7 SAMs. Forced to stay above 10,000 feet in the battle areas, the nonjet A–1s, gunships, FAC planes, and helicopters of the South Vietnamese Air Force (VNAF) had little effect. To support the South Vietnamese, the United States returned tactical air units to South Vietnam, reinforced those still in Thailand, and expanded the carrier strength of Task Force 77 offshore.

There were now few problems in finding targets. Pilots in the DMZ area were amazed to spot through the clouds convoys of 100 or more vehicles moving openly by daylight. The senior American advisor in the Highlands, John Paul Vann, called the air strikes of early April near Dak To "the most lucrative I've seen in the past six years." B–52s bombed from high altitude with effects at least as deadly as at Khe Sanh in 1968. Jet fighters pressed attacks through the enemy defenses. Some of the AC–130s now carried a 105mm gun, effective from the higher altitudes and capable of destroying tanks; Vietnamese troops fighting in the streets of An Loc and Kontum repeatedly radioed for help from the "big gun." To resupply isolated An Loc and Kontum in the Central Highlands, USAF C–130s used new techniques for high-altitude paradrops. Although VNAF helicopters were seldom able to get through, U. S. Army helicopter gunships destroyed enemy tanks inside An Loc.[17]

The 1972 campaign was the high point for air power in the in-country war. In all regions, air forces battered and broke the otherwise victorious North Vietnamese. A parlor war-gamer can easily show that the outcome

without American air power was fast and complete victory for the North. The testimony of the U. S. Army advisors on the ground at An Loc makes it clear that air power saved that campaign. In the words of one senior artilleryman, the 1972 victories were "monuments to air power."[18]

Air Interdiction in Southern Laos

Systematic air interdiction operations against Communist movements in the Laotian Panhandle began in 1965 and became an important complement to Rolling Thunder interdiction in North Vietnam. The same Air Force and Navy jets used in Rolling Thunder also flew against enemy trails in Laos, usually when weather was unsuitable for missions east of the mountains. Targets were often preplanned and included suspected storage sites or chokepoints, the destruction of which would back up traffic and provide lucrative targets. B–52s delivered saturation strikes against similar objectives.

The air-ground battle picked up each evening when the Communist trucks began moving under the heavy forest. Air Force and Army FACs flew around the clock using sensors such as the starlight-scope light amplifier to seek out targets and direct strikes. Where antiaircraft opposition was light, nonjet aircraft were especially effective because of their maneuverability and endurance. Converted transports worked as flareships in coordination with B–57s, Korean war-vintage A–26s, and other aircraft. A unit of C–123s carried sensors and dropped cluster bomblet munitions. Command-and-control C–130s orbited overhead carrying one or two Laotian officers to speed the process of getting strike approvals. Spray planes flew defoliation missions against known routes; helicopters inserted and withdrew ground patrols whose mission was to gather intelligence and call in air strikes.[19]

A special study group proposed a more sophisticated effort in 1966—an electronic anti-infiltration barrier across southern Laos, which would employ acoustic and seismic sensors capable of detecting enemy movements and transmitting them to relay aircraft overhead. By late 1967, sensors and various kinds of mines had been planted by air along enemy routes in Laos, and orbiting EC–121s were relaying data from the sensors to the computers of an Infiltration Surveillance Center in Thailand. The venture, known as Igloo White, applied advanced technology to one basic dilemma of earlier interdiction in Southeast Asia—the scarcity of worthwhile fixed LOC targets and the difficulty of finding fleeting ones.[20]

The end of Rolling Thunder in 1968 permitted a larger air effort in Laos. The trails were always busiest in the winter months when the regions west of the mountains were dry; and during the winter interdiction campaign of 1968–1969 (Commando Hunt 1), the Americans employed the Igloo White system along with most of the resources used before.

Also used were jet-augmented AC–119s (with 20mm side-firing Gatlings) and the new AC–130 gunships (some with 40mm guns). The AC–130s carried a wide variety of sensors and laser equipment for marking targets; they were acknowledged the war's most effective truck-killers. Gunship, B–52, and fighter sorties averaged over 400 per day. But the Igloo White electronic system was only partially successful: although it gave useful information for planning each night's strike effort, it failed to provide the kind of instantaneous and dependable data needed for hitting specific targets.[21]

The North Vietnamese employed about 50,000 men in operating, maintaining, and defending the trails system. They moved heavy construction equipment into Laos to improve the dirt roads and to build alternate routes. Each driver travelled back and forth his particular road segment, thus becoming familiar with every feature. Before dawn each morning, all trucks were unloaded and parked in dispersed sites. By 1970, the North Vietnamese had more than 2,500 trucks in Laos, with even larger numbers stockpiled in North Vietnam. Antiaircraft capabilities steadily increased, and the Americans were forced to withdraw some of the slow-moving aircraft and to raise operating altitudes for AC–130s and other aircraft. The Communists also built a POL pipeline, used waterways where available, and made covert transport flights to strips in Laos and Cambodia. Their strong reaction to the South Vietnamese 1971 incursion (Lam Son 719) confirmed the importance to them of the Laotian lines of communication.[22]

Although American fighter sorties gradually decreased as units left Southeast Asia, increases in B–52 and gunship activity and steady improvements in technique kept up the pressure on the trails. During Commando Hunt 3 (winter 1969–1970), the Americans judged that about one-third of the 54,000 tons that entered Laos reached South Vietnam; the other two-thirds were destroyed, consumed, or stockpiled in Laos. In Commando Hunt 5—a crucial campaign because of the closure of the Communist sea route to Cambodia, which had supported enemy forces in southern Vietnam—the Americans estimated that only one-ninth of some 61,000 input tons actually reached South Vietnam. The number of attack sorties sharply declined in Commando Hunt 7 (winter 1971–1972), and calculations were that the North Vietnamese were getting one-sixth of their supplies through. The Americans further estimated that they had damaged or destroyed about 10,000 enemy trucks in Commando Hunt 3; 20,000 in Commando Hunt 5; and 10,000 in Commando Hunt 7.[23]

Flaws in the official picture became evident later. American intelligence officers came to realize, for example, that the Communists salvaged and rebuilt many supposedly burned-out trucks. Seismic indications originally interpreted as evidence of bulldozers were actually caused by

tanks moving down the trails. Meanwhile, the nebulous basis of some raw data tended to be overlooked in numerical reports to higher authority. Finally, if the official data were even roughly correct, how could the enemy have succeeded in building up for his 1972 push?[24]

One analyst, Colonel Herman Gilster, noted that intelligence officers accepted the possibility of error in their data by a factor of two. Gilster's own conclusions, however, indicated that the data was not that inaccurate. He determined that the enemy's consumption of equipment, ammunition, and weapons in South Vietnam and Cambodia prior to 1972 was only about thirty-five tons per day (excluding food, which was mostly obtained locally). The official estimates thus appear at least sufficient to allow for the enemy's buildup for 1972.[25]

If the interdiction was less complete than was believed at the time, it nevertheless achieved much. It imposed heavy costs upon the North Vietnamese, made difficult their buildup in the South and limited its extent, and gained time to prepare the South Vietnamese for self-defense. The 1972 offensive had only a few weeks' stamina and wholly lacked a capacity for reinforcing success. The Commando Hunt campaigns were conducted while harming relatively few civilians, without risk of great power retaliation, with relatively little outcry from the world community, and with far fewer losses in men and planes than during Rolling Thunder. The elaborate and imaginative Laos Interdiction after 1968 deserves to be regarded as a relatively inefficient but worthwhile complement to U.S. extrication strategy in that period.

The Linebacker Campaigns

Aware of an enemy buildup in the southern parts of North Vietnam, the Americans intensified "protective reaction" air strikes in that region during winter 1971–1972. On 6 April 1972, in response to the Spring Offensive, fighter-bombers began daily strikes against North Vietnam, mostly against the southern panhandle. B–52s made four raids north during April, among them a major strike against rail and POL tragets in Haiphong. Although thirty-five SAMs were fired that night, the B–52s were undamaged, and the ability of the heavy bombers to penetrate to well-defended targets seemed proven.[26]

A North Vietnamese remark in Paris, that "wars aren't fought to have a ceasefire, but a victory," foreclosed any hopes for an immediate settlement. On 8 May, President Richard Nixon announced his decision to mine major North Vietnamese ports and to expand the bombing offensive, henceforth known as "Linebacker." Administration spokesmen pointed out that measures against the civilian population were being ruled out, although a few days earlier the President had termed the dikes of North Vietnam "a strategic target and indirectly a military target." In

a memo to Secretary of State Henry Kissinger, Nixon chafed at the "timidity" of the Pentagon's planners in calling for a bombing effort little beyond that of 1967.[27]

Greatly enhancing the effectiveness of Linebacker strikes were guided bombs—2,000-pound and 3,000-pound conventional weapons fitted with television- or laser-guidance systems. (The television system homed on a point designated by the aircrew just before release; the laser system required continuous laser illumination of the target by a designator aircrew during the time of fall.) Both systems required visual conditions, but both gave outstanding precision, thereby cutting down on the number of sorties needed to destroy a particular target. Using guided bombs, the 8th Tactical Fighter Wing, based in Thailand, dropped more than 100 bridges during the spring. The Paul Doumer rail and highway bridge at Hanoi fell on 11 May; the Thanh Hoa rail bridge, which had been hit repeatedly during Rolling Thunder but never downed, fell two days later. Guided bombs dropped and re-dropped dozens of bridges on the rail lines from China and made it possible to attack electric generators and other valuable targets prohibited earlier because of nearness to dikes or heavily populated sites.[28]

During the summer, the Americans made known their willingness to accept a ceasefire without prior removal of North Vietnamese troops from the South. Hanoi, in late September, dropped their insistence on removing President Thieu; at that point Kissinger believed "we've got a deal." Linebacker strikes continued, however: Nixon was unwilling to remove the pressure without definite diplomatic results. But final agreement faltered in October, essentially because Thieu will unwilling to allow North Vietnamese forces to remain in the South. The Americans began Project Enhance Plus, a crash effort to bolster Saigon with war materiel and to bring Thieu to accept the in-place ceasefire. When in December Hanoi harshened its October position, Nixon ordered around-the-clock bombing of the Hanoi-Haiphong area. During this operation, called Linebacker II, tactical fighters hit by day, often with guided bombs; the B–52s struck at night. Simultaneously, Nixon informed Thieu that the Americans would make a separate peace if Saigon remained intransigent.[29]

The ten nights of B–52 strikes against Hanoi and Haiphong represented for air power the climactic moment of the war. Crews approached their targets generally from the northwest at about 30,000 feet; aiming was by the self-contained radar bombing systems. The giant bombers attacked each night in three waves several hours apart. Targets for the 740 B–52 sorties included rail yards, dock areas, power plants, munitions stores, and POL storage areas. Other units gave support: EB–66s transmitted ECM, F–4s dispensed chaff (to confuse enemy radar operators),

and escort fighters guarded against MIGs; at lower altitudes, Wild Weasels hit SAM sites and fast-moving solo F-111s attacked airfields and SAM sites. The SAMS nevertheless brought down eleven B–52s during the first four nights. A change to less rigid tactics (according to Nixon, prompted by the President's own intervention in the matter) helped to hold down losses thereafter. Also, the enemy apparently ran short of missiles; he fired 200 SAMs the first night and 180 the second, but an average of only about 20 nightly after the fifth night. On the final two nights, 28 and 29 December, no B–52s were damaged. The enemy's defense had apparently been broken.

With Congress scheduled to reconvene in five days and with Hanoi apparently now ready for agreement, Nixon called off the campaign. Despite widespread damage on the ground, civilian casualties had been light. Hanoi reported about 1,500 dead, roughly the number killed in a single night at Coventry in 1940. The low figure reflected the partial evacuation of Hanoi as well as the conduct of the B–52 crews, who achieved precision often while they were under heavy SAM attack.[30]

Why was such strong medicine needed to coerce Hanoi to terms only a little different from those apparently acceptable the previous October?

Several factors acted to stiffen Hanoi after October: the Enhance Plus buildup, the knowledge that Congress would soon end the war by mandate, and the end of the illusion that Nixon needed a negotiated settlement to assure reelection. The decision in Hanoi to swallow Enhance Plus and new references to the DMZ in the ceasefire text was probably narrow. The Linebacker II heavy bombing produced this decision, brought the prisoners of war home, gave the Americans an illusion of success, and lent credibility to future American warnings against breaking the ceasefire.[31]

The British analyst Sir Robert Thompson believes that the United States "had the war won"—that continuation of Linebacker II would have soon forced Hanoi to bring its army home. Unsubstantiated hints by Communist diplomats give some support to his argument.[32] But Nixon's lack of congressional support ruled out this option. The Paris ceasefire correctly reflected the wishes of the American people; and it only thinly disguised the reality that Hanoi's determination ultimately to prevail was unchanged.

The Final Debacle—What Happened to Air Power?

The ceasefire of 1973 left the North Vietnamese free to rebuild their forces in the South without interference from the air. In the process, the Communists moved large numbers of SAMs and antiaircraft guns into their areas of South Vietnam. The hazards to Allied aircraft thus far

exceeded anything known earlier in the South. Meanwhile, all U. S. air units left South Vietnam, and most departed from Thailand.[33]

The South Vietnamese Air Force (VNAF) remained the world's fourth largest air force. VNAF pilots were competent, and maintenance benefitted from substantial contract assistance. The VNAF was, however, far inferior to the American air forces that had once operated in Southeast Asia; VNAF had nothing comparable to the B–52, no advanced interdiction capability, and no high-performance fighter capable of a sizeable bomb load. The loss of several dozen ships to Communist missiles in 1973 and 1974 made clear to VNAF pilots their vulnerability in SAM areas. Forward air controllers were simply unable to fly in most regions where troops were in contact with the enemy. A–1s and A–37s bombed only from above 10,000 feet to avoid the SA–7 missiles. The fixed-wing gunships and helicopters were almost worthless. To make matters worse, control of the strike aircraft was divided among the four regional corps commanders, making fast reaction difficult in case of a crisis in one region. Reductions in American funds to South Vietnam in late 1974 were a heavy psychological blow and forced cuts in the number of active squadrons and in flying time.[34]

The North Vietnamese assault on Ban Me Thuot in March 1975 happened too quickly for the VNAF to have much effect (although one unlucky VNAF strike knocked out the defenders' main communications). In the ensuing hasty withdrawal from the Highlands, the VNAF failed even to destroy its own materiel being abandoned at Pleiku. Chaos was even worse in the closing days at the DaNang air base, amid shellings, uncontrolled troops, and crowds of frightened refugees. The VNAF itself became infected with the "family syndrome," whereby officers and men put safety of family ahead of performance of duty. In several battles further south, the VNAF won praise for air strikes against battlefield targets, and pilots pitched in to load their own bombs. But the weight of effort was far too thin. Interdiction strikes against the North Vietnamese columns driving south were either nonexistent or were defeated by Communist weapons, which now included SA–2 missiles accompanying the truck convoys.[35]

A serious VNAF weakness lay in tactical airlift. In past Allied campaigns in the Highlands, for example, streams of American C–130s had hauled brigades and large quantities of supplies into the region; but in 1975 the VNAF had only about ten operable C–130s. Unable adequately to reinforce and resupply the Highlands, President Thieu had no good alternative to his apparently crucial decision to withdraw. Some of the VNAF C–130s served as bombers in the final days, substituting for the absent B–52s; the converted transports dropped 15,000-pound bombs, strings of 500-pounders, and, in one instance, a special weapon that killed over 200 enemy troops by exploding an incendiary cloud.[36]

Convinced that the United States would not intervene, the North Vietnamese moved their units openly and rapidly across the South. Success was reinforced from the homeland; indeed, the small North Vietnamese air transport force made landings at captured southern fields with maps and other supplies. Just before the end, North Vietnamese pilots flying captured A–37s bombed Tan Son Nhut airfield. President Gerald Ford, meanwhile, tried to secure funds from Congress for extra last-minute aid for Saigon, and U. S. transports continued landing with materiel almost to the final hours. To Thieu's direct request for the return of American air power, however, Ford's personal emissary gave the sad reply that such measures were out of the question. Having neutralized American air power politically, the North Vietnamese were free to neutralize the VNAF with weapons and the velocity of their offensive. Only massive U. S. air intervention, at least on the scale of 1972, could have once again saved South Vietnam.[37]

Conclusion

The conflict in Southeast Asia included many other aspects of air power deserving further study. The operations in northern Laos, for example, exemplified the United States' hope of supporting an Asian ally with materiel and air power but no American troop units. Air power took the place of artillery in most of Laos and supplied sizable friendly forces in rugged terrain, often well inside Communist-controlled territory. Other important studies will be those on Vietnamization, the air war in Cambodia, and the airlift bridge across the Pacific.

During the war years, historians of Project CHECO (Contemporary Historical Evaluation of Current Operations) and the Air Force's command history program produced contemporary accounts of operations. Late in the war, the Air Force undertook a serious internal examination of its Southeast Asia experience: Project Corona Harvest analyzed the technical and managerial conduct of the war. For a broader understanding of where air power succeeded and where it failed, we await the results of the work of my former colleagues at the Office of Air Force History. I salute the current work of Jacob Van Staaveren on Rolling Thunder, of Bernard Nalty on the Commando Hunts, John Schlight on the in-country war, Dick Sexton and Vic Anthony on Laos, and the projects past and present of Elizabeth Hartsook, Earl Tilford, William Buckingham, Ralph Rowley, Jack Ballard, Roger Fox, and Riley Sunderland. All of us owe a special debt to the early work of Frank Futrell.

As the final American helicopter departed from Saigon, our humiliation and loss of honor seemed complete. Yet the nation has accepted defeat easily—to have been President when Southeast Asia fell became for Gerald Ford an asset, not a liability. Professional airmen can at least

take satisfaction that in no previous conflict were their loyalty, resourcefulness, and flying skills greater. The sacrifices and conduct of the airmen prisoners-of-war reminded our people of their past moral strengths. That the air weapon was successfully employed in countless battles and campaigns is beyond question. Whether or not air power could have ended the war on satisfactory terms was not tested.

Let us hope that we as a nation will come to know ourselves better from the whole Vietnam experience; for in the last analysis, it was our ignorance of ourselves that was at the root of the tragedy.

Notes

1. Robert F. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907–1964*, Aerospace Studies Institute, Air University, 1971, pp. 645–646, 676–677.

2. Lt Col William E. Simons, "Coercion in Vietnam," Rand RM–6016–PR, May 1969; *Pentagon Papers*, GPO Edition, Vol. IV, iv.c.3, pp. 99–102; *Pentagon Papers*, New York Times Edition, Bantam Books, 1971, p. 407.

3. Memo, W. W. Rostow to Sec State, Dep Sec Def *et al.*, 6 May 1967.

4. Donald S. Zagoria, *Vietnam Triangle: Moscow, Peking, Hanoi*, Pegasus, New York, 1967, see especially p. 29; Eric Goldman, *The Tragedy of Lyndon Johnson*, Dell, New York, 1968, p. 477; Marvin Kalb and Elie Abel, *Roots of Involvement: The U.S. in Asia, 1784–1971*, W.W. Norton, New York, 1971, p.198; Henry F. Graff, *The Tuesday Cabinet*, Prentice-Hall, Englewood Cliffs, N.J., 1970, pp. 70–71; Pentagon Papers, GPO Edition, Vol IV; *Pentagon Papers*, New York Times Edition, pp. 330–331.

5. Harrison E. Salisbury, *Behind the Lines—Hanoi*, Bantam Books, New York, 1967, p. 61, 183, 188; Oleg Hoeffding, "Bombing North Vietnam: An Appraisal of Economic and Political Effects," Rand RM–5213–ISA, Dec 1966; Brig Gen J. M. Philpott, DCS/Intellig, Hq 7th AF, "An Assessment of the Impact of Air Power on Enemy Strategy," in EOT Report, 30 June 1966–6 December 1967; Pentagon Papers, GPO Edition, Vol IV, iv.3.3, pp. 136–140, Vol VI, iv.c.7(a), pp. 9–12.

6. Hist, 355th Tact Ftr Wg, Jan-Jun 1966, July-Dec 1966; R. F. Futrell *et al.*, *Aces and Aerial Victories*, Air Univ. and Off/AF History, 1976, pp. 3–12; Rprt, Col Robin Olds, Cdr, 8th Tact Ftr Wg, EOT Rprt, 15 August 1967; Major Norman Wells, "Air Superiority Comes First," in *Air University Review*, Nov-Dec 1972; Maj Paul Burbage *et al.*, *The Battle for the Skies over North Vietnam, 1964–1972*, in USAF Southeast Asia Monograph Series, Vol I, Maj A.J.C. Lavelle, ed., GPO, 1976, pp. 112–146; Gen William W. Momyer, ret., "Observations of the Vietnam War, July 1966–July 1968, for Proj Corona Harvest, pp. 2; Gen William W. Momyer, "The Evolution of Fighter Tactics in Southeast Asia," in *Air Force Magazine*, July 1973, pp. 58–62; Dr. Larry Addington, "Duel over Vietnam: Antiaircraft Artillery Versus the Fighter-Bomber," in *Army*, Dec 1973, pp. 18–19; General William W. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 89–99, 111–159; Raphael Littauer and Norman Uphoff, eds., *The Air War in Indochina*, Beacon Press, Boston, 1972, pp. 21–22.

7. General William W. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 16–17, 133–135; Raphael Littauer and Norman Uphoff, eds., *The Air War in Indochina*, Beacon Press, Boston, 1972, pp. 24–26, 37; Vice Adm. W. Cagle, "Task Force 77 in Action off Vietnam," in *Naval Review*, 1969, pp. 66–108; Maj John P. O'Gorman, "Battles are Bloody Maneuvers: a View from the Cockpit," in *Air University Review*, Sept-Oct 1967, pp. 21–28; Lt Col Bernard Appel, "Bombing Accuracy in a Combat Environment," in *Air University Review*, Jul-Aug 1975, pp. 39–52.

8. Col Jack Broughton, ret., *Thud Ridge*, J. B. Lippincott, Philadelphia and New York, 1969; Col William Holt, Cdr 355th Tact Ftr Wg, EOT Rprt, August 1966; *Air Force Magazine*, April 1966, pp. 42–54, September 1971, pp. 82–83; Adm T. H. Moorer, CJCS, speech at Las Vegas, Nev., 8 Sept 1971; Maj Gen Dale O. Smith, ret., "Flexible Response vs. Determined Retaliation," in *Air University Review*, Jan-Feb 1965, pp 69–71; Gen W. W. Momyer, "Observations of the Vietnam War, July 1966-July 1968," for Proj Corona Harvest, Pentagon Papers, GPO Edition, Vol. IV, see especially iv.c.3, pp. 90–93; Gen Curtis LeMay, speeches of March 26, 1967 and October 3, 1968, in Clyde E. Petitt, *The Experts*, Secaucus, N.J., 1975; quotation from W. Scott Thompson and D. D. Frizzell, *The Lessons of Vietnam*, Crane, Russell, 1977, p. 152; General William W. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 338–339.

9. R. F. Futrell, "Air Operations in South Vietnam, 1962–1964," in *The United States Air Force in Southeast Asia, 1961–1973*, Carl Berger, ed., Off. AF Hist, 1977, pp. 15–35; Col Robert L. Gleason, "Quo Vadis—The Nixon Doctrine and Air Power," in *Air University Review*; Maj Victor B. Anthony, *USAF in SEAsia: Tactics and Techniques of Night Operations*, Off/AF Hist, March 1973.

10. Col Ray L. Bowers, *USAF in SEAsia: Tactical Airlift*, Off/AF Hist, in final review, 1978; Maj Victor B. Anthony, *USAF in SEAsia: Tactics and Techniques of Night Operations*, Off/AF Hist, March 1973; Lt Col Ross E. Hamlin, "Side-Firing Weapon Systems," in *Air University Review*, Jan-Feb 1970, pp. 77–88; Lt Col Jack S. Ballard, *USAF in SEAsia: Development and Employment of Fixed-Wing Gunships*, Off/AF Hist, Jan 1974; Kenneth

Sams, *First Test and Combat Use of the AC–47*, Proj CHECO, PACAF, 30 Sept 1966; Col Robert L. Gleason, "Psychological Operations and Air Power: Its Hits and Misses," in *Air University Review*, March-April 1971, pp. 34–46; Lt Gen John J. Tolson, *Airmobility, 1961–1971*, D/Army Vietnam Series, pp. 25–40, 1973.

11. Maj Ralph A. Rowley, *USAF in SEAsia: FAC Operations, 1961–1965*, Off/AF Hist, Jan 1972; Maj John P. O'Gorman, "Battles are Bloody Maneuvers: A View from the Cockpit," in *Air University Review*, Sept-Oct 1967, pp. 22–24; R. F. Futrell, "Air Operations in South Vietnam, 1962–1964," in *USAF in SEAsia, 1961–1973*, Carl Berger, ed., Off/AF Hist, 1977, pp. 15–35; Lawrence J. Hickey, "Night Close Air Support in RVN, 1961–1966," Proj CHECO, PACAF, 15 March 1967.

12. Maj Gen David E. Ott, *Field Artillery, 1954–1973*, D/Army Vietnam Studies, 1975, pp. 42–179; Gen William B. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 265–280; Col John R. Stoner, "The Closer the Better," in *Air University Review*, Sept-Oct 1967, pp. 29–41; Raphael Littauer and Norman Uphoff, eds., *The Air War in Indochina*, Beacon Press, Boston, 1972, pp. 4, 12–13, 80.

13. Robert R. Kritt, "B–52 Arc Light Operations," in *USAF in SEAsia, 1961–1973*, Carl Berger, ed., Off/AF Hist, 1977, pp. 149–160; Robert M. Kipp, "Counterinsurgency from 30,000 Feet," in *Air University Review*, Jan-Feb 1968, pp. 10–18; Gen William W. Westmoreland, *A Soldier Reports*, Doubleday, Garden City, N.Y., 1976, p. 157, 204, 283. For a contrary view from Hanoi, see Lt Gen Nguyen Van Vinh, "The Vietnamese People on the Road to Victory," published in *Hop Tac* (Hanoi) printed in doc. 7 of Donald S. Zagoria, *Vietnam Triangle: Moscow, Peking, Hanoi*, Pegasus, New York, 1967, p. 257.

14. C. William Thorndale, "Battle for Dak To," CHECO, PACAF, 21 June 1968; Bernard Nalty, *Air Power and the Fight for Khe Sanh*, Off/AF Hist 1973, pp. 68–88; Maj Gen Robert N. Ginsburgh, "Strategy and Air Power: The Lessons of Southeast Asia," in *Strategic Review*, summer 1973; Dr. Harold Brown, "Air Power in Limited War," in *Air University Review*, May-June 1969, pp. 4–5; Gen William W. Westmoreland, *A Soldier Reports*, Doubleday, Garden City, N.Y., 1976, pp. 203–204, 336–347; Moyers S. Shore II, *The Battle for Khe Sanh*, Hist Br, USMC, 1969.

15. Col Ray L. Bowers, *USAF in SEAsia: Tactical Airlift*, Off/AF Hist, in final review, 1978; Jac Weller, "Helicopters—The American Experience," in *Army Quarterly*, July 1973; Lt Gen John J. Tolson, *Airmobility, 1961–1971*, D/Army Vietnam Series, 1973; General William W. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 321–326.

16. Raphael Littauer and Norman Uphoff, eds. *The Air War in Indochina* Beacon Press, Boston, 1972, pp. 5, 57–64; Douglas Kinnard, *The War Managers*, University Press of New England, Hanover, N.H., 1977, pp. 47–52; Raphael Littauer *et al.*, *The Air War in Indochina: Preliminary Report*, Cornell Univ. Center for Intl. Studies, Oct 1971, pp 4–10 to 4–21; Guenter Lewy, "Vietnam: New Light on the Question of War Guilt," in *Commentary*, Feb 1978, pp. 30–33; L. E. Paterson, *Evolution of the Rules of Engagement for Southeast Asia, 1960–1965*, CHECO, PACAF, 30 Sept 1966, pp. 9–72; Major Richard E. Porter, "Making Sense of Vietnam," in *Air University Review*, Nov-Dec 1976, p. 95; Frances Fitzgerald, *Fire in the Lake: The Americans and the Vietnamese in Vietnam*, Little, Brown, Boston, 1972, pp. 166–167, 455–456; Edward Lansdale, "The Opposite Number," in *Air University Review*, July-Aug 1972, pp. 22–33; Lt Col Roy K. Flint, "Campaigning with the Infantry in Vietnam," in *Air Force Magazine*, August 1970, pp. 47–51; Gen W. W. Westmoreland, *A Soldier Reports*, Doubleday, Garden City, N.Y., 1976, pp. 285–288, 330; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, 1978, p. 74; Jonathan Schell, *The Village of Ben Suc*, Alfred A. Knopf, New York, 1967, pp. 11–17.

17. J. A. Doglione *et al.*, *Airpower and the 1972 Spring Invasion*, USAF Southeast Asia Monograph Series, Monograph 3, A.J.C. Lavalle, D. D. Frizzell, and R. Bowers, eds., in full; Gen William W. Momyer, ret., *The Vietnamese Air Force, 1951–1975, An Analysis of its Role in Combat*, USAF Southeast Asia Monograph Series, Monograph 4, Lt Col Charles McDonald and A.J.C. Lavalle, eds., GPO, 1975, pp. 45–52. Maj Jerome R. Daley, "The AH1G versus Enemy Tanks at An Loc," in *Armor*, July-Aug 1972, pp. 42–43; Edgar Ulsamer, "Air Power Halts an Invasion," in *Air Force Magazine*, Sept 1972, pp. 60–72; Edgar Ulsamer, "The SA–7—a Nasty Technological Surprise," in *Air Force Magazine*, Oct 1972, p. 37.

13. Maj John D. Howard, "They were Good Ol' Boys: An Infantryman Remembers An Loc and the Air Force," in *Air University Review*, Jan-Feb 1975, pp. 26–39; Maj Gen David E. Ott, *Field Artillery, 1954–1973*, D/Army Vietnam Studies, 1975, pp. 222–224; Adm T. H. Moorer, CJCS, at Las Vegas, 8 Sept 1973, in "Supplement to AF Policy Ltr for Cdrs,"

Nov 1973; Sir Robert Thompson, *Peace is now at Hand*, David McKay Co., Inc., New York, 1974, pp. 109–112.

19. Jacob Van Staaveren, "Interdiction in the Laotian Panhandle," in *The USAF in SEAsia, 1961–1973*, Carl Berger, ed., Off/AF Hist, 197 pp. 101–109; Capt Michael J. C. Roth, "Nimrod—King of the Trail," in *Air Force Magazine*, October 1971, pp. 30–32; Gen Wm. W. Momyer, ret., *Air Power in Three Wars*, GPO, 1978, pp. 192–207; Raphael Littauer et al., *The Air War in Indochina: Preliminary Report*, Cornell Univ., Center for Intl. Studies, Oct 1971, ch. v.

20. Robert S. McNamara, Sec Def, Draft Memo for Pres Johnson, "Action Recommended for Vietnam," 14 October 1966, in Pentagon Papers, GPO Vol V, sect. iv.c.6(a), pp. 65–85,114; John Frisbee, "Igloo White," in *Air Force Magazine*, June 1971, pp. 48–53; Col Jesse C. Gatlin, *Igloo White (Initial Phase)*, CHECO, PACAF, 31 July 1968.

21. Remarks of Gen George Keegan, in W. Scott Thompson and D.D. Frizzell, *The Lessons of Vietnam*, Carne, Russell, 1977, pp. 137–142; Col Herman L. Gilster, "The Commando Hunt V Interdiction Campaign," in *Air University Review*, Jan-Feb 1978; Jacob Van Staaveren, "Interdiction in the Laotian Panhandle," in *The USAF in SEAsia, 1961–1973*, Carl Berger, ed., Off/AF Hist, 1977, pp. 109–118; Gen Wm Momyer, ret., *Air Power in Three Wars*, GPO, 1978, pp. 211–215. George Weiss, "AC-130 Gunships Destroy Trucks and Cargo," in *Armed Forces Journal*, Sept 1971; General William W. Momyer, *Air Power in Three Wars*, GPO, 1978, pp. 211–214.

22. Colonel Herman L. Gilster, "Air Interdiction in Protracted War: An Economic Evaluation," in *Air University Review*, May-June 1977, pp. 7–11; Col Ray L. Bowers, *The USAF in SEAsia: Tactical Airlift*, Off/AF History, in final review, 1978.

23. Data from 7th AF Commando Hunt reports, presented in Col Herman L. Gilster, "Air Interdiction in Protracted War: An Economic Evaluation," *Air University Review*, May-June 1977, pp. 13–18.

24. Insights from personal discussions with former intelligence officers who served in SEAsia during the Commando Hunt years.

25. Col Herman L. Gilster, "Air Interdiction in Protracted War: An Economic Evaluation," in *Air University Review*, May-June 1977, pp. 13–18.

26. Robert R. Kritt, "B-52 Arc Light Operations," in *The USAF in SEAsia*, 1961–1973, Carl Berger, ed., Off/AF Hist, 1977, pp. 165–166; Marvin and Bernard Kalb, *Kissinger*, Little-Brown, Boston and Toronto, 1974, pp. 287–292.

27. Marvin and Bernard Kalb, *Kissinger*, Little-Brown, Boston and Toronto, 1974, pp. 298–303; Richard Nixon, *RN: The Memoirs of Richard Nixon*, Grosset and Dunlap, New York, 1978, pp. 606–607; William Safire, *Before the Fall*, Tower, New York, 1975, pp. 417–427.

28. Edgar Ulsamer, "The Flyable Smart Bomb—Adding Another Dimension to Airpower," in *Air Force Magazine*, Aug 1972, pp. 30–32; Edgar Ulsamer, "Airpower Halts an Invasion," in *Air Force Magazine*, Sept 1972, pp. 67–68; Col Delbert Corum *et al.*, *The Tale of Two Bridges*, USAF SEAsia Monograph Series, Monograph 1, Col D. Waddell and Maj N. Wood, eds., 1976, pp. 78–92; L. Edgar Prima, "Smart Bombs and Menacing Mines," in *Sea Power*, June 1972; Sir Robert Thompson, *Peace is Not at Hand*, David McKay Co, Inc., New York, 1974, pp. 113–115.

29.Tad Szulc, *The Illusion of Peace: Foreign Policy in the Nixon Years*, Viking Press, New York, 1968, pp. 539–642; Richard Nixon, *RN: The Memoirs of Richard Nixon*, Grosset and Dunlap, New York, 1978, pp. 697–737; Marvin and Bernard Kalb, *Kissinger*, Little-Brown, Boston and Toronto, 1973, pp. 349–357; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, 1978, pp. 24–29.

30. Maj Paul Burbage, *et al.*, *The Battle for the Skies over North Vietnam*, Lt. Col Gordon Nelson and Maj N. Wood, eds., USAF SEAsia Monograph Series, Monograph 2, GPO, 1976, pp. 175–188; W. Scott Thompson and D.D. Frizzell, *The Lessons of Vietnam*, Crane, Russell, New York, 1977, pp. 155–195; Wayne Thomas, "Whispering Death: The F-111 in SEAsia," in *Air Force Magazine*, June 1973, pp. 22–27; Robert R. Kritt, "B-52 Arc Light Operations," in *The USAF in SEAsia 1961–1973*, Carl Berger, ed., Off/AF Hist, 1977, pp. 166–167; Richard Nixon, *RN: The Memoirs of Richard Nixon*, Grosset and Dunlap, New York 1978, p. 737; Lt Col Thomas E. Bearden, "What Happened in the Air Defense Battle of North Vietnam," *Air Defense Magazine*, Apr-Jun 1976; Sir Robert Thompson, *Peace in Not at Hand*, David McKay Co., Inc., New York, 1974, pp. 134–136.

31. Tad Szulc, *The Illusion of Peace: Foreign Policy in the Nixon Years*, Viking Press, New York, 1978, pp. 642–658; Marvin and Bernard Kalb, *Kissinger*, Little-Brown, Boston

and Toronto, 1973, pp. 349–408; Richard Nixon, *RN: The Memoirs of Richard Nixon*, Grosset and Dunlap, New York, 1978, pp. 697–741; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, 1978, pp. xi, 55, 93–94, 135.

32. Remarks of Sir Robert Thompson, in W. Scott Thompson and D.D. Frizzell, *The Lessons of Vietnam*, Crane, Russell, New York, 1977, pp. 104, 144; Sir Robert Thompson, "Military Victory—Political Defeat—The Failure of U.S. Strategy in Vietnam," in *International Defense Review*, June 1974; Alan Dawson, *55 Days: The Fall of South Vietnam*, Prentice-Hall, Englewood Cliffs, 1977, p. 123.

33. John L. Frisbee, "The Communist Buildup in Vietnam," in *Air Force Magazine*, April 1974, pp. 32–35; Gen Van Tien Dung, *Our Great Spring Victory*, John Spragens, tr., Monthly Review Press, New York and London, pp. 13–15, 38–41.

34. William W. Momyer, *The Vietnamese Air Force, 1951–1975: An Analyses of its Role in Combat*, USAF SEAsia Monograph Series, Monograph 4, 1975, pp. 53–72; Lt Cols T. G. Tobin, A.E. Laehr, and J. F. Hilgenberg, *Last Flight from Saigon*, USAF SEAsia Monograph Series, Monograph 6, Lt Col D. R. Mets, ed., 1978, pp. 1–7.

35. R. L. Bowers, "The Final Collapse," in *The War in Vietnam*, Salamander, London, in press, 1978; Alan Dawson, *55Days: The Fall of South Vietnam*, Prentice-Hall, Englewood Cliffs, N.J., pp. 49–54; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, pp. 136, 181–182, 206, 210, 272–273, 335; William W. Momyer, *The Vietnamese Air Force, 1951–1975:An Analysis of Its Role in Combat*, USAF SEAsia Monograph Series, Monograph 4, 1975, pp. 73–80; Gen VanTien Dung, *Our Great Spring Victory*, John Spragens, tr., Monthly Review Press, New York and London, 1977, pp. 139–142.

36. Col Ray L. Bowers, *The USAF in SEAsia: Tactical Airlift*, Off/AF Hist in final review, 1978; Alan Dawson, *55 Days: The Fall of South Vietnam* Prentice-Hall, Englewood Cliffs, N.J., 1977, pp. 47, 114–115, 300–304; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, pp. 179–180, 193, 416–417.

37. Alan Dawson, *55 Days: The Fall of South Vietnam*, Prentice-Hall, Englewood Cliffs, N.J., 1977, pp. 65, 176, 320–321; Gen Van Tien Dung, *Our Great Spring Victory*, John Spragens, tr., Monthly Review Press, New York and London, pp. 136, 212–222; Frank Snepp, *Decent Interval*, Random House, Vintage Books edition, pp. 93, 137, 177, 284, 462.

COMMENTARY

MAJOR GENERAL EDWARD G. LANSDALE, USAF (RET)

For all of us, let me express our warm gratitude to General Ross Milton and Colonel Ray Bowers for their remarks about our recent military past. It isn't easy to go into the jungle of records and remembrances of our "limited war" era and find some guideposts that make sense to us today. These speakers did so, though, with considerable skill and clarity. I trust that their remarks will stimulate further seeking out of the truth along the paths they have explored for us. Thank you both!

They opened up one topic, however, that deserves much more attention than they had time to give it. As the "Tail-End Charlie" in this session, perhaps I can be most useful by devoting my own brief time to it. That topic is the strategy the U.S. employed in waging "limited wars" in Korea and Vietnam—or, more accurately, the lack of successful U. S. strategy.

Ross Milton commented that U. S. air power remained shackled in Vietnam much as it had been in Korea. Ray Bowers cited some details of this shackling in the Vietnam War. The corollary, of course, is the proposition that the U. S. should have devised and followed a strategy that would have made fuller and more conclusive use of our military capabilities, particularly those of our air power.

It is worth remembering that we Americans fought our last two "big wars," World Wars I and II, with firm aims of toppling the enemy's despotic leadership, especially Kaiser Wilhelm and Adolf Hitler. The wars ended with their own people turned against these leaders. The people sought peace with us, and we made it with them, not with their former leaders.

This is in stark contrast to what we did in the subsequent "limited wars" we fought. We seemed to ignore the enemy's leadership as targets in these later struggles. We allowed them to continue their self-imagery as the spokesmen and the chosen leaders of their people, without any real challenge by us to the obvious flaws in these claims. We even accepted Ho Chi Minh's portrait of himself as a kindly and beloved old "uncle" with a wispy goatee, often pictured with little children. Skilled use of misinformation and psychological campaigns that entered our own news

communications helped cover up the true nature of the members of the enemy's Politburo and the heartless savagery of their decisions. Ignoring the people, eventually we made our truces with this very leadership.

Let us suppose that we had recognized the political nature of the Vietnam War and had used a political strategy, supported by armed forces, when we waged it. In such a strategy we could have striven to block Communist military force with our military force, while also singling out the enemy leadership, the Politburo in Hanoi, as our most crucial target. We could have undertaken a major effort to discredit the Politburo. We could, for example, have exposed its responsibility for specific acts of aggression and justly used these aggressions as a rationale for our acts of retribution against North Vietnam's war-making capabilities until the Politburo ceased its aggressions. If discredited strongly and convincingly, the Politburo could well have lost its control of the people and been overthrown, and we could have made our peace with the North Vietnamese citizenry.

We could have borrowed from the ethics of the War Crimes trials at Nuremberg and Manila and could have established a tribunal in Saigon made up of jurists from the U. S. and our allies in the war. Each act of Communist aggression and terror could have been verified by the tribunal, which could then have brought specific charges against the Politburo as the responsible party for crimes committed by units under its authority. The findings could have been arrived at in open sessions attended by journalists and foreign observers, for the attention of the world.

The bombing of targets in North Vietnam then could have been in response to specific acts of aggression and terror in South Vietnam as substantiated by the international tribunal in Saigon. The people of North Vietnam could have been informed by leaflet and radio of these specific acts and of the guilt of the Politburo in ordering them committed, and advised that there would be counteractions to destroy the Politburo's ability to make war. The people could have been warned to stay clear of potential targets, since we wouldn't want them hurt while we were forcing the Politburo to stop its aggression. We could have urged the people to convince the Politburo to stop making such fratricidal war in the people's name. When the Politburo's aggression would have stopped, the war would have stopped.

A strategy along these lines could have greatly increased the effectiveness of our air power, even making it the decisive element in the war. Further, such a strategy would have expressed American morality and would have won wide support not only from the American public but from much of the rest of the world. All of us would have understood what we were doing in Vietnam. We would have been the guys in the white hats.

Now, the point of my remarks about strategy is not to Monday morning quarterback a past war. Rather, my point is that we failed to identify a potentially fatal flaw in the enemy camp and failed to devise a strategy to defeat him through that flaw. The point remains pertinent today. In Korea and Vietnam, we fought against enemies who were totalitarian states, whose purpose and will and actions were directed by committees—their politburos. Today, we strive to ready ourselves for possible future conflict. Our greatest potential enemy again is a totalitarian state, whose purpose and will and actions are directed by a committee—a politburo. If we failed to succeed in our struggles with like systems in the minor leagues, what is going to happen to us in the major leagues?

My remarks are intended only to stimulate further thought. Somewhere between a strategy of wearing an enemy down by attrition and a strategy of destroying him with cataclysmic blows, there must be a strategy more suited to the American genius. Surely the time is upon us when our wisest and most talented thinkers should be devising strategies to bring conclusions in a truer American mode for whenever we must deploy our armed strength again. I feel that this is urgent business for Americans!

DISCUSSION

Prof Dennis Showalter (Colorado College): This is perhaps as much an editorial comment as a question, and as such is addressed to General Lansdale or Colonel Bowers. Both of their comments reminded me very strongly of the kind of memoirs that German generals published after World War II, the kind that devote the first 400 pages from June 1941 through 1942 and then cover from Stalingrad to the Battle of Berlin in the last twenty. Both commentators suggested that the operation in Vietnam was a success—although the patient died—ascribing that, primarily, to strategic failure, strategic weaknesses.

The American military experience has always drawn a sharp line between strategy and tactics. The Germans, on the other hand, have a grey area in between called "Operations"—involving grand tactics or battlefield strategy; and I think that if historians, whether military or civilian, are going to be of any use in identifying the lessons of Vietnam, it's going to be in digesting some of the operational problems of the Vietnam war. In the case of air power, this approach would focus on the problems we had in using air power effectively under the conditions imposed by the American government and the Joint Chiefs of Staff. One might ask, for example, at the risk of relying on hindsight, how was it possible to mistake tanks for bulldozers; and, if one can do that, doesn't the mere fact that bulldozers can appear outside of Saigon indicate something about an interdiction campaign? Similarly, how can an interdiction campaign that is as successful as this one is described allow an aggressor to build up resources for at least two major offensives?

If official history, or semi-official history, is to be useful, we are going to have to spend a lot more time discussing what went wrong than what went right. What went right, I think, most of us in an audience like this can tell ourselves. What we need to know is what went wrong. This is where the military and civilian historians have to cooperate closely, as opposed to the development of general lines of strategic doctrine, which no American government is likely to turn over to its military anyway.

Col Bowers: I would say the historians are working on what went wrong technically and on what was wrong in terms of specific operations. It seemed to me in a paper of this length that it was probably not suitable to get into great detail. The business of the tanks and bulldozers resulted from the nature of the seismic and acoustical sensors. The misinterpre-

tations were not visual mistakes; they stemmed from the technology that was used.

I did try to address the question of our belief in the success of our nine-to-one through-put ratio and how one squares that with the apparent Communist success in building up to the 1972 offensives in the two southern main regions. Moreover, in an essay in *Air University Review*, Colonel Gilster analyzed and tried to determine how much materiel was used by the Communist forces in the South during the three or four years after the TET offensive and before 1972. He determined how much they needed, how much they consumed, and then how much the logistic flow allowed them to build up further stocks. By his numbers he does show that, by a narrow margin, even using these official statistics of through-put, the Communists could have built up sufficiently to have done what they did in 1972.

There is no question that intelligence was not perfect. Incidentally, one thing that I did omit was an evaluation of the Igloo White system as a whole. A somewhat controversial figure, General George Keegan, recently Air Force Chief of Intelligence, has a viewpoint which is certainly well informed and I would certainly accept. He feels that Igloo White did a great deal. It gave the intelligence people a reasonably accurate idea of what was going on. But the hope that somehow the Igloo White all-electronic system could allow immediate real-time knowledge, was, he says, illusory and never expected by those who understood the system. This seems a fairly reasonable assessment. A great deal of effort was put into Igloo White. We were trying to apply the newest technology to war, and it didn't do all that was hoped.

General Milton: I agree that serious analysis of the operational aspects of the Vietnam war is of crucial importance to understanding this conflict. Without harping too much on the issue, I would suggest that one of the most important things which historians will have to keep in mind as they study the Vietnam war is the degree to which military professionals were not in charge of that aspect of national defense that is their field of expertise and their very purpose for existence. I am referring, of course, to the planning and execution of combat operations.

This was particularly true of the air war in Vietnam. In his recent book, *Strategy for Defeat*, Admiral U.S.G. Sharp, Commander in Chief, Pacific, during the years of Rolling Thunder, discusses, with documentation and without hyperbole, the degree to which Secretary McNamara and his civilian "experts" in the Department of Defense and elsewhere in the administration intruded not only into strategy but even into tactics—determining not only targets but also flight patterns and sizes, attack approaches, times, and types and numbers of bombs.

I am aware that such an argument is often dismissed as the "sour grapes" justification of military men unable to accept defeat; but I am firmly convinced that as more and more of the evidence becomes available, this will prove to be a well-founded argument. While it is certainly true that Washington has often imposed restrictions as well as demands upon its military field commanders, the extent to which uninformed civilians overcontrolled the air war against North Vietnam makes this experience unique in American history and must be weighed in any consideration of the operational aspects of the Vietnam war.

John C. Currey (Colorado Springs) responded to General Lansdale's comments on psychological operations. He noted that in 1956 President Eisenhower had become very concerned that our government was not considering the psychological and political effects of actions that could result in war. Attempts to establish an organization to focus on this problem were unsuccessful, however, because those assigned to study the problem were unable to overcome two obstacles. First, Secretary of State John Foster Dulles thought such a group would impinge on the State Department's prerogatives. More importantly, in Mr. Currey's words, "it floundered on a semantics problem. President Eisenhower himself referred to it as the psychological office of warfare, but he said, 'I don't want the word "warfare," and I don't like the word "psychological".' And we never did come up with what to call this type of thing."

General Lansdale: I, too, have tried to come up with different names, but they have been just as unacceptable to top leadership as anything in the past; and I am sorry to say that we aren't much further today. We have changed some names; we did use the term "psychological operations," for example. But our main psychological operations agency has dropped that term and has taken up another, and it is now staffed by people who are very happy, as they put it, to get out of the cold war era.

What concerns me, and what should concern everyone in this room, is that we were subjected during Vietnam to a political, psychological campaign by the enemy that was filled with disinformation to make us believe something that wasn't true; and we actually came to believe it. Ho Chi Minh, for example—who had been a classmate of Stalin's at the Lenin Academy in Moscow, who had helped to form the Communist party in France, and who was certainly one of the most skilled and effective Communist leaders in the world—was a very tough propagandist. He was very successfully portrayed to Americans as a kindly old gentleman with a wispy goatee who often played with little children. Now, who is going to make war against such a kindly image as that?

Let me give you another example of our failure to deal adequately with psychological aspects of the struggle in Vietnam. We based our

policy in that war on the idea that we could punish the enemy leaders until they gave in to our demands. Yet most of the Politburo members were almost completely unknown in the United States. We knew little about their past and even less about their personalities or how they would react to our actions. The result was sheer folly. Not only did the Communist leadership in North Vietnam not succumb to our military strength, they turned it against us in propaganda campaigns throughout Europe and even in the United States.

I regret that we did not do more during the Vietnam conflict in terms of psychological operations. We had agencies to do that. We had military groups to do that. Unfortunately, we had commanders who felt that psychological operations consisted entirely of dropping leaflets when the enemy was penned in to give them the option to surrender. We had many people in Vietnam who saw their main duty as explaining the war to the American people rather than waging a war against the enemy. Perhaps the American people did need more understanding, but the explaining was often done to reporters whose views were sunk in concrete and which weren't about to be changed either by words or by visible proof in the war itself.

I feel very strongly about the subject of psychological aspects of war, as you can tell. I think the opponents we are likely to face in the future are far more skilled at such things than are we and are subjecting us to things that we had jolly well better become aware of and take into consideration in the planning and execution of our national policy and strategic planning.

AN ADDED COMMENT:

VIETNAM: THE PERSPECTIVE OF A FORMER VICE-DIRECTOR OF THE JOINT STAFF

LIEUTENANT GENERAL JOHN B. McPHERSON, USAF (RET)

At a National Security Council meeting on 6 February 1965, called because of major communist attacks on the U. S. Army barracks at Pleiku, South Vietnam, President Johnson said:

> We have kept our gun over the mantle and our shells in the cupboard for a long time now, and what was the result? They are killing our men while they sleep in the night. I can't ask our American soldiers out there to continue to fight with one hand tied behind their backs.[1]

The attack at Pleiku, which killed nine Americans and wounded more than one hundred, was the third since those in the Gulf of Tonkin in August 1964. The two previous attacks were a mortar bombardment against the Bien Hoa airbase followed by the destruction of five U. S. airplanes, and the bombing of a U. S. officers' billet in Saigon.

On 7 February, McGeorge Bundy, who had just headed a team of State, Defense and Security Council personnel to Vietnam, reported to the President. Essentially, Mr. Bundy said, the situation in Vietnam was bad and getting worse; the United States had responsibilities that it had to face up to; the burden could not be unloaded on the Vietnamese; and we could not negotiate ourselves out of Vietnam.

Bundy believed that a policy of "graduated and continuing reprisal" was "the most promising course available." Underlying the policy was his belief that:

> The best available way of increasing our chance of success in Vietnam is the development and execution of a policy of *sustained reprisal* against North Vietnam—a policy in which air and naval action against the North is justified by and related to the whole Viet Cong campaign of violence and terror in the South.[2]

On the very same day, the National Security Council (NSC) unanimously supported the program of sustained reprisal against the North; however, there was no agreement within the NSC on how to conduct the program. The Joint Chiefs recommended a program of strong attacks from the outset, while other officials favored a gradual response. Several times during the fall and winter of 1964–1965, the Joint Chiefs repeated their recommendation in response to various reviews of the situation in Vietnam and requests for proposed courses of action.

The approval by the NSC of the Bundy team's recommendations meant that the die had already been cast when the Viet Cong continued their provocations on 10 February 1965 by blowing up an enlisted mens' barracks in Qui Nhon, killing twenty-three Americans and seven Vietnamese and wounding twenty-one American soldiers.

In March 1965 the program of sustained attacks against North Vietnam got underway. As the President said: "The policy of gradual but steady reprisal against North Vietnam for its continuing aggression in the South had been put into action."[3]

Although strong words had been spoken and the U. S. Government seemed determined to take firm action against North Vietnam, those who were directly involved in the planning of the air strikes and the operational conduct of the missions soon realized that this was not to be the case. The Secretary of Defense refused to allow air power to assume a decisive role. The excellent papers of General Milton and Colonel Bowers cover many of the considerations and influences that brought about such a misuse of air power, a critical national capability.

It might have been expected that the Korean experience of the not too distant past would have left an everlasting impression of the dangers and frustrations of pursuing a policy of indecisiveness. As General Milton points out, "Korea became a war of attrition and, finally, stalemate"; yet no open debate transpired that would have highlighted the application of lessons learned in Korea in formulating policy for the U. S. air effort in Vietnam.

Throughout the fall of 1964 and into 1965, the Joint Chiefs of Staff were well aware of the dangers of demonstrated indecisiveness and continuously stressed the need for a campaign of heavy air strikes followed by sustained pressure. They submitted almost weekly (or so it seemed to those of us who were staffing the papers) unsuccessful recommendations for the conduct of decisive air operations against North Vietnam. In any case, and as discouraging as the gradual reprisal program was to the commanders in the field and to the JCS, they believed that they had no choice but to go to work and make the most of the air action that the political authorities permitted.

There was a clue in these first strikes as to how the air campaign against North Vietnam would be pursued, and it seemed that most of us in the Joint Staff of the JCS who did the staff work either failed to recognize it or simply could not believe it. Instead of getting on with the first Rolling Thunder missions in a positive and determined manner, the overriding concern of the administration was to insure the participation of the South Vietnamese Air Force. This concern predominated despite the declared policy of gradual but sustained reprisal, the fact that Amer-

icans and South Vietnamese were continuing to be killed by sneak attacks, and the fact that the North Vietnamese obviously were not impressed by any actions taken against them thus far.

Rolling Thunder mission number one, then two, three, and four, were successively canceled because the South Vietnamese Air Force (VNAF) couldn't participate with the U. S. forces. Instead, the South Vietnamese Air Force was totally occupied in keeping its aircraft (a few at a time) airborne around the clock at strategic locations, such as Saigon, to help suppress the possibility of a coup. In our efforts to get the Rolling Thunder campaign launched, we pleaded with our counterparts in Hawaii and in Saigon to do something to get a few Vietnamese planes and crews in condition to fly. This finally happened on the fifth Rolling Thunder mission when 19 VNAF aircraft accompanied 104 U. S. Air Force aircraft.

In these early stages of the Rolling Thunder campaign, we thought that the importance of timely and decisive offensive action against meaningful targets would soon be recognized as the *sine qua non* for the air campaign. Actually, just the opposite was to be the case. A never-ending ritual of submitting for approval a recommended target list that had been laboriously developed within 7th Air Force and the Pacific Fleet and sent up through CINCPAC and thence to the JCS, was required in the hopes of getting approval to attack targets of some recognizable significance. Approval often was denied for various reasons, and the process would begin over again.

An example of this process was the attempt to obtain authority to strike the Thai Nguyen steel plant, a target of significant value to North Vietnam's war effort. The steel plant had been recommended many times for attack, and finally, in November 1966 approval was given; before the strikes could be launched, however, authority was withdrawn. A senior official of the U. K. was departing London for Moscow, and he had sent a message to the State Department indicating that he hoped nothing untoward would happen in Vietnam while he was in Moscow. We assumed that part of his mission to Moscow was to discuss the situation in Vietnam with the Soviets, possibly to explore possibilities for an accommodation of some sort in South Vietnam. We never learned whether anything was accomplished in Moscow, but we were able to monitor the official's return to London, whereupon we asked for reinstatement of the authority to strike the steel plant. Needless to say, it seemed as though the authority had never existed and the approval process for this particular target started all over again. Authority was not received until four months later.

The increasing concern of American authorities in South Vietnam and Washington over the South Vietnamese government's ability to contain likely Viet Cong actions prompted a presidential policy review in

April 1965. Additional American ground forces were accordingly deployed to South Vietnam, an action which laid the basis for offensive ground operations. However, there was no change in the policy concerning the conduct of the air war.

Commenting on the need to make the reprisal program a forceful one, Admiral U.S.G. Sharp, Commander in Chief of the Pacific Command and the field commander responsible for the conduct of the air campaign, advised the JCS:

> *While it may be politically desirable to speak publicly in terms of a 'graduated* reprisal program,' I would hope that we are thinking in terms of a 'graduated pressure' philosophy which has more of a connotation of steady, relentless movement toward the objective of convincing Hanoi and Peiping of the prohibitive cost to them of their program of subversion, insurgency, and aggression in Southeast Asia.[4]

Despite such expressions of concern from military leaders, the early Rolling Thunder strikes were inconsequential and against minor targets. Ambassador Maxwell C. Taylor called the strikes meaningless and urged that the tempo and intensity be stepped up "in order to convince Hanoi authorities they face the prospect of progressively severe punishment."[5]

The new mission for U. S. ground forces stirred support from the Director of the CIA, John McCone, for the JCS position of heavy and damaging strikes against North Vietnam. McCone warned of the ineffectiveness of the policy of a slowly ascending tempo while opposition from the American public, the press, the United Nations, and world opinion was certain to grow over time. In McCone's view, if the rules for the conduct of air strikes against North Vietnam were not changed to allow for more decisive action, the mission of the ground forces should not be changed.[6] No change in policy occurred, and the air strikes against North Vietnam—beset by postponements, standdowns, and limited and belated efforts against targets of value—continued through to the cessation of the bombing in March 1968.

The many attempts by the JCS in Washington and the commanders in the field to obtain authorization for a more meaningful program eventually resulted in a series of strikes in the spring of 1967 that extensively damaged high value targets in the Hanoi-Haiphong sanctuary and severed main LOCs. The North Vietnamese were hurt by these attacks and were unable to move supplies and equipment out of the Hanoi-Haiphong area. Photo reconnaissance flights showed supplies, equipment, and other material stacked up throughout the area.

Much to the chagrin and consternation of the JCS and the operational commanders and their forces, the authority to strike these important targets was soon withdrawn. North Vietnam's clever propaganda cam-

paign against the bombing through the worldwide press significantly influenced the U. S. decision to cut back on its bombing program.

The commanders in the field and the JCS continuously debated the need for an expanded air campaign against North Vietnam with those who wanted to stop the bombing and to begin negotiations. Admiral Sharp summed up the argument of military men in his recently published book, *Strategy for Defeat:*

> In any kind of endeavor, avoiding the difficult decision, treading the mushy ground of the middle road, is guaranteed to produce something less than notable success. In war it is guaranteed to produce a true strategy for defeat.[7]

The Tet offensive of January 1968, while a military defeat for the North Vietnamese, was a major political victory for them. Since American public opinion opposed continuation of the war, the President was determined to bring the North Vietnamese to the negotiating table and, in March 1968, stopped the bombing above the 20th Parallel. By October, the continued unravelling of support for the war among the American public and the President's advisers led to a halt of all bombing of North Vietnam.

The North Vietnamese gave no indication of negotiating seriously or substantively and, as during previous halts, took advantage of these bombing halts. Describing enemy logistical operations following the March bombing halt, General William W. Momyer, commander of U. S. Air Forces in Vietnam, wrote:

> These frantic efforts by the North Vietnamese to move as much material to South Vietnam as the system could take were indicative of their intention to settle the future of South Vietnam on the battlefield, not at the negotiating table.[8]

Continued intransigence by the North Vietnamese at the peace negotiations in Paris led the new administration under President Nixon in May 1972 to authorize resumption of bombing north of the 20th Parallel. The objectives were clearcut:

> (1) Restrict resupply of North Vietnam from external sources; (2) destroy internal stockpiles of military supplies and equipment; (3) restrict flow of forces and supplies to the battlefield.[9]

When Nixon halted the campaign in October 1972, that bombing campaign, Linebacker I, seemed to have accomplished its objectives.

Again, the North Vietnamese procrastinated and showed no interest in a negotiated settlement of the war. To force a settlement, President Nixon directed an all-out air campaign against North Vietnam in December 1972. Air power, both strategic (B–52s) and tactical (USAF & USN), was concentrated against critical North Vietnamese targets and caused

maximum disruption. This eleven-day campaign, called Linebacker II, forced North Vietnam to seek a cease-fire.

In summary, I defer to General Momyer, citing his recently published book, *Airpower in Three Wars*. From a background of experience in World War II, Korea, and Vietnam as a pilot, operations officer, and staff planner at all levels, and as the senior air commander in Southeast Asia from July 1966 to August 1968, General Momyer arrived at the following conclusion about strategy:

> The development of air strategy in World War II, Korea, and Vietnam was a repetitious process. In each case, planners first perceived air power as a subordinate part of a joint strategy that would employ an extensive ground campaign to end the war on favorable terms. On the other hand, airmen came increasingly to believe that air power, in its own right, could produce decisive results. The validity of such a view was suggested by results of the Allies' combined bomber offensive in Europe and by the surrender of Japan in the 1940s. Additional evidence came from the skies over Hanoi in December 1972. In a concentrated 11-day test, our air strategy persuaded a determined adversary with a remarkably elaborate air defense system that overt aggression could not be sustained in the presence of unrestricted U. S. air power.[9]

It took almost eight years, to December 1972, before a decisive air campaign was launched that forced a recalcitrant Hanoi to conclude a peace treaty. The conduct of a decisive campaign from the outset would have required less force than that used in 1972. More importantly, it would have convinced the North Vietnamese Politburo that the United States was serious in its intent to prevent subjugation of South Vietnam and would take the necessary steps to do so.

It should be a challenge to historians to attempt to understand and explain why the United States chose such an indecisive, irresolute policy in the conduct of the air campaign against North Vietnam. The choice was made despite the early and oft repeated advice against it by the military, from the commanders in the field to the Joint Chiefs of Staff.

Notes

1. Lyndon Baines Johnson, *The Vantage Point*, (New York: Holt, Rinehart and Winston), p. 125.
2. Ibid., pp. 126–127.
3. Ibid., p. 132.
4. Admiral U. S. Grant Sharp, USN, (Ret.), *Strategy for Defeat: Vietnam in Retrospect*, (San Rafael, Cal.: Presidio Press), p. 61.
5. Ibid., p. 64.
6. Ibid., pp. 72–74.
7. Ibid., p. 131.
8. General William W. Momyer, USAF, (Ret.), *Airpower in Three Wars*, (Washington: Government Printing Office), pp. 27–28.
9. Ibid., p. 33.
10. Ibid., p. 34.

VII

A MAJOR PIONEER LOOKS AT AIR POWER

The senior air power pioneer on the program, Lieutenant General Ira Eaker, USAF (Ret), presented an address at the symposium banquet which combined previously unrecorded reminiscences with an uncompromising reminder of the challenges facing the United States. In introducing General Eaker to the 330 people at the banquet, the Superintendent of the Academy, Lieutenant General K. L. Tallman pointed out that the speaker's contributions to air power and national security—both in uniform and in a very active retirement—extended across the entire period of America's search for the best role for air power in its national defense scheme.

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INTRODUCTION

LIEUTENANT GENERAL K. L. TALLMAN, USAF

Distinguished guests—all of you, distinguished guests—members of the Academy community. It's a real pleasure for me to welcome all of you to the Eighth Military History Symposium banquet. There are numerous events that draw us together throughout the year as an Air Force community, but it is a rare privilege tonight to come together in the company of those who helped make Air Force history.

This evening can be termed an historical moment in itself. We have men and women here tonight who represent the past, present, and the future of the Air Force—past leaders, current policy makers and implementers, and, in our cadets, the leaders of tomorrow. And it is most appropriate to recognize the historians among us—those who are evaluating the past and recording the present so that the future, hopefully, won't be quite as much of a surprise.

For this audience we are particularly fortunate to have an individual with us who not only lived through early Air Force history, but who helped to make it and now is sharing his wisdom and his insight with Air Force and government leaders. I am speaking of Lt General Ira C. Eaker. There are few men who have accumulated the wealth of experience and are as equipped to speak from an historical perspective as General Eaker.

Born in 1896, educated at Oklahoma Southeastern State Teachers College, commissioned in the infantry in 1917, Ira C. Eaker soon transferred to the infant air service. His flying career in the United States and the Philippines between the wars was closely linked to the maturing of the air arm as a decisive instrument of war. He was second in command of the epic Pan-American Friendship Flights of 1926–27. In 1929 he helped to demonstrate the concept of air-to-air refueling as a crew member of the Question Mark, flying six days, six hours, and forty minutes without landing. He flew the air mail; he served with the Navy on the old carrier USS *Lexington;* and he made the first blind trans-continental flight to demonstrate improved instrument flying. He served in important executive positions with such pioneers as Generals James Fechet, Mason Patrick, and "Hap" Arnold.

Earning a degree in journalism from the University of Southern California, he wrote three books on air power with General Arnold.

When war came, Ira Eaker was one of the first Air Corps officers promoted to the general officer ranks. He flew the first American bombardment mission against Hitler's Europe and commanded the bombers of the Eighth Air Force. He flew the first shuttle mission from Italy to Russia, and he commanded the four Allied air armadas which made up the Mediterranean Allied Air Forces.

After serving as Deputy Commanding General of the Army Air Forces and Chief of the Air Staff, where he directed the planning for the strategic deterrent forces we know today, he retired from the Air Force in 1947 with the rank of lieutenant general.

Since then, he has continued to provide the nation with the benefit of his experience as an officer of Hughes Tool Company and Douglas Aircraft for many years, and as a syndicated columnist on military affairs. In his role as an opinion maker, commentators, readers, and critics alike respect him as forthright, persuasive, and dedicated totally to our nation's defense.

Ladies and gentlemen, it is my very great pleasure to introduce General Ira C. Eaker.

SOME OBSERVATIONS ON AIR POWER

LIEUTENANT GENERAL IRA C. EAKER, USAF (RET)

Since 1917, I have been an interested and concerned observer of the development and application of air power. Thirty years of that period were spent on active duty, mainly in the Army Air Corps, and now thirty-one years in retired status, but I still maintain an undiminished interest in air power development, weapons, and tactical and strategic employment. My remarks this evening will be in three parts: Part I, the development of U.S. air power prior to 1942; Part II, air power application and development from Pearl Harbor to the present; and Part III, a brief look at air power in the future. Obviously, to cover sixty years of aviation history in less than thirty minutes requires great selectivity.

Air Power Developments to 1918

Since this year marks the 75th Anniversary of the Wright Brothers' first powered flight—17 December 1903—it is appropriate that we should review that time span, assess the results of those flights, and catalogue some of the major events which those flights initiated.

Prior to World War I, the principal item in U.S. air power development was the employment of the 1st Aero Squadron, Aviation Section, Signal Corps, U.S. Army, in support of General Pershing's Punitive Expedition against Pancho Villa, the Mexican bandit. That squadron (incidentally the only squadron the Army had), commanded by Captain Benjamin D. Foulois, had limited success in its observation missions due to the difficulty of maintaining its primitive planes and engines in the sand and wind of the Western desert. This poor showing was due to lack of popular interest and Congressional support in the fourteen years following 1903. When the First World War came in 1914, the U.S. was thirteenth among nations in military aviation. Even Mexico had more military planes than the U.S.

Then came American involvement in World War I. The most significant legacies of World War I to air power developments in the U.S. included:

a. Public interest in aviation as a result of the daily news releases on air operations. The lurid stories of the battles in the skies caught the

popular fancy; the names of the leading British, French, Canadian, and American aces became household words.

b. The 200,000 pilots and technicians the U.S. trained for that conflict became the nucleus for postwar development, civil and military. They were the gypsy pilots who bought war surplus aircraft and carried aviation to every village in the country. They provided the pilots and maintenance crews for the early air mail and the small but enthusiastic air components of the Army, Navy, and Marine Corps.

c. From the opportunity given our air leaders to meet their European counterparts, exchange ideas, and compare lessons learned came the early evolution of the theories of air power, its organization, tactics, and strategy.

d. The war demonstrated the need for the best planes, engines, machine guns, bombs, and communications, and provided the essential aviation laboratories and airplane and engine factories for postwar development.

All things considered, World War I was the greatest stimulus to the air world up to that time.

Aviation Developments from 1918 to 1941

Many events and individuals were responsible for the growth of U.S. air power during this period. Some of the most significant events, certainly, must include the First Flight Around the World, the Pan American Goodwill Flight, the Question Mark Flight, the experiments with refueling in air, the first non-stop Flight to Hawaii, and the many successive records set for speed, altitude, and endurance. The Army Air Corps also engaged in semi-annual maneuvers designed to test developing theories of the proper organization, technical improvements, and application of air power.

In May of 1927, Charles Lindbergh's non-stop flight from New York to Paris caught the popular fancy as no other aviation event had done. The fantastic response to this feat, here and abroad, gave an unprecedented stimulus to civil and military aviation development. It immediately inspired civil transcontinental airlines and plane and engine factories. The 1931 depression hindered but by no means stopped this development.

The campaign of General Billy Mitchell attracted much publicity and, as controversy always does, made leading headlines and won political partisans pro and con. His court-martial in 1925 stimulated popular, news media, and Congressional interest in military aviation. Historical studies

of the Mitchell episode, concluding with his trial, demotion, and retirement from the Army, do not always report this event accurately.

Some report, for example, that General Mason M. Patrick, then Chief of Air Corps, was antagonistic to Mitchell and his efforts to obtain an independent Air Force. I occupied an office, as Assistant Executive, between General Patrick's and General Mitchell's offices from June 1924 until long after the trial, and I can testify that our Chief and Assistant Chief conferred frequently, that each admired the other, and that they were jointly supportive of much the Army Air Corps was doing in those dramatic times.

When the trial began, General Patrick gave me a directive which was to make me, in effect, an assistant counsel in Mitchell's defense. He said, "I want General Mitchell to have any records in our files needed for his defense, but I also want to assure that we get them back. I have told Colonel White, Mitchell's chief military counsel, that you will be responsible for furnishing him any official files he wants." This gave me an opportunity to observe much of this dramatic event.

General Mitchell has also been represented as having been unfairly crucified by a hostile War Department and a prejudiced court-martial. As a matter of fact, Billy Mitchell deliberately goaded President Coolidge and the War Department into bringing him to trial. He was determined to use the trial as a public relations forum to convince the people and Congress that the Army and Navy were deliberately neglecting their air arms to such an extent that national security was dangerously compromised.

General Patrick has not received the credit he deserves for the part he played in the development of U.S. air power at a critical time. He was a West Point classmate of John J. Pershing. He stood at the top of the class; Pershing was having trouble scholastically, and Patrick was assigned as his tutor. Pershing never forgot his helpful classmate, took him to France, made him Chief of Air Service when Mitchell and Foulois fell out, and also made him the first Chief of the postwar Air Service, later Air Corps. Patrick was the leading advocate for many of our cherished Army air ambitions and plans at this time. He was a gifted public speaker and testified before Congress in our favor on many occasions, as well as making many appearances before important groups ably advocating our cause.

During this period, many boards and commissions, beginning with the Lassiter Board and followed by the Baker Board and the Morrow Board, examined the claims of the "young Turks" (some called us Bolsheviks) in the Air Corps and usually approved some part of our demands.

Another aspect, seldom mentioned and never given sufficient credit, was our relationship with the chairmen of the principal committees of Congress—the Military Affairs and Appropriation Committees of the House and Senate. Our successive Chiefs of Air Corps provided these Congressional leaders air transportation back to their home states or districts, enabling them to make more speaking engagements and public appearances. This gave their especially selected pilots an opportunity to insure that their political passengers became knowledgeable and interested in air matters. Most of them became powerful air power advocates.

In July 1926, Congress passed the Aviation Act authorizing Assistant Secretaries for Air for the War, Navy, and Commerce Departments. The first appointees to this new task were F. Trubee Davison (War), David Ingalls (Navy), and William McCracken (Commerce). Each became able advocates of aviation in their departments. Secretary Davison brought with him a professional newspaperman whose salary he paid. (In those days public relations men were not authorized in Civil Service ranks.) He taught us many "tricks of the trade" in this important area.

In 1935, as a result of constant publicity and Congressional pressure, the War Department authorized the GHQ (General Headquarters) Air Force. This was the first recognition that there might be a mission for military aviation other than tactical air support for armies and navies. General Frank M. Andrews, designated as the Commander of GHQ Air Force, was an ideal selection for this critical new assignment.

A skillful and experienced pilot since 1919, with service on the War Department General Staff and a recent graduate of the Army War College, General Andrews immediately established the organization and set about proving that there was a task for air power far beyond the arena of contending armies and navies. Andrews pushed the development and testing of the B–17 Flying Fortress and sent the first of these planes on spectacular missions, such as the six-plane flight to Argentina and the mission to photograph the new Italian liner, *Rex*, four hundred miles at sea. The Air Corps officers who commanded groups and wings in the GHQ Air Force became the commanders and staffs of the sixteen worldwide Air Forces of the Army Air Forces in World War II.

We must not overlook the major contribution of the Air Corps Tactical School to the development of Air Force doctrine in the years between the wars. Its able, specially selected, instructors became the nucleus of General Arnold's planning staff in 1941. The war plans they prepared provided for the 2.3 million airmen, the 150,000 planes they manned and supported, plus the great industrial base we established, all of which played a prime role in the conquest of Hitler's Third Reich and the Japanese War Lords.

General Arnold recognized that the Spanish Civil War—where Germany and Russia tried out their latest planes, weapons, and tactics—was but a prelude to World War II. He and his staff eagerly reviewed all data reported from the air battles of that conflict. When Hitler's *Blitzkrieg* bypassed the Maginot Line and conquered France, Arnold sent observers to cover and report every phase of that conflict. When France fell, our observers witnessed Dunkirk, then went to England where they observed the Battle of Britain.

Another great contribution to U.S. preparedness for our entry into World War II was a series of maneuvers the U.S. Army and its Air Corps held in Texas, Louisiana, Georgia, and the Carolinas in 1940 and 1941. General Arnold told me that General Marshall had said one of the prime purposes of these maneuvers was to observe, select, and train the ground and air commanders for World War II.

Arnold had a full appreciation of the value of public relations. For example, he invited Hanson Baldwin, military editor of the New York *Times*, Deke Lyman of the New York *Tribune*, Ernie Pyle, and many others to witness the air element of these maneuvers. It was not accidental that Army Air Force operations in World War II were adequately reported.

Another evidence of Arnold's genius was the relationship he established with Harry Hopkins, the closest adviser to President Roosevelt. This resulted in Roosevelt's dramatic radio speech announcing that the U.S. would build 50,000 planes in 1940–1941. Arnold used this declaration to start a vast program of pilot and technical schools even before Congress had appropriated the money. Arnold also encouraged the British and French to buy U.S. planes for their hard-pressed air forces. The money from these purchases started that great expansion of the aeronautical industry which produced 100,000 planes and 250,000 engines in a single year, 1944.

These were some of the principal events prior to Pearl Harbor which affected the development of U.S. air power. These dynamic events also suggest the names of the political, military, and industrial leaders who played the leading roles in them.

Air Power in World War II

World War II provided the stage for the greatest test of air power thus far. In that war, Allied air leaders were, for the first time, given the resources to validate the theories of earlier air advocates, such as Trenchard, Douhet, and Mitchell.

Allied air power in Europe between 1941 and 1945 accomplished three essential missions:

a. It destroyed the German Air Force.

b. It supported the Allied armies and navies, enabling them to accomplish their indispensable missions.

c. It successfully demonstrated its strategic capability by destroying much of the weapons-making and war-waging capability of Hitler's Third Reich. These air operations were often interrelated and mutually supportive; combined, they were absolutely essential to victory in Europe.

In April 1942, General George Marshall came to the 8th Bomber Command's temporary headquarters during a visit to the British Chiefs of Staff. After hearing my report on our plans at that early date, he said to me, "Eaker, I do not believe a cross-Channel invasion of Europe will ever be possible until the Luftwaffe is destroyed. Do your plans provide for that?" I answered in the affirmative, assuring him that destruction of the German Air Force was our prime intermediate objective. As our bombers began their attacks on fighter factories, oil production, ball bearing plants, and other key elements of weapons production, Hitler would demand that Goering's Luftwaffe intervene. The ensuing air battles would result in virtual destruction of the Luftwaffe, I explained.

Again, at the Casablanca Conference in February 1943, General Marshall asked, "Do you still believe that the German Air Force will not seriously interfere with our cross-Channel invasion next year?" I replied, "If the heads of state and their chiefs of staff approve the Combined Bomber plan just presented, and give us the air resources it calls for, I am certain the Luftwaffe will not be a serious factor in that operation."

I was in Russia on the Joint Shuttle Bombing Mission, 6 June 1944, when Eisenhower's forces crossed the Channel. I asked General Dean, Ambassador Averell Harriman's senior military aide, about the air resistance. He said that early dispatches did not mention it, but he would send a signal to find out. Back came the cryptic reply, "The Luftwaffe did not show today." That moment represented my greatest personal satisfaction in World War II.

The German Air Force did not interfere with our landing, as General Marshall had feared. Neither did it seriously challenge the subsequent land battles as our armies advanced into Germany. Instead, our Allied air forces won and held air superiority throughout, inflicted many thousands of casualties upon the enemy, stopped all road movement by day, and eventually denied the German Army required fuel and weapons, resulting in their unconditional surrender.

I have always assumed that Albert Speer, Hitler's Armament Minister, was the best authority on the effect of Allied air power on Germany

and her war effort. In that belief, Dr. Arthur Metcalf, founder of the U.S. Strategic Institute, and I spent the afternoon of 21 October 1976 with Speer in his ancestral home on a mountain top above Heidelberg. He was fully responsive to our questions.

For example, at one point I said, "Aside from the bombing of German industry, a very high priority with the Allies was the destruction of the Luftwaffe. Since the Luftwaffe did not show on 6 June 1944, when that great invasion armada appeared off the three invasion beaches, we thought we had positive evidence that our Allied air offensive had largely destroyed the German Air Force." Speer answered, "I think your surmise is essentially correct. I was still turning out the required number of fighter planes, but by that time we were out of experienced pilots. We were so short of fuel that the incoming pilots in our flying schools only received three and a half hours of flying training per week. These poorly trained and inexperienced pilots were suffering heavy losses. A pilot only survived for an average of seven missions against your bombers and their accompanying long-range fighter escort."

I recently received a copy of an article Speer wrote on 9 August 1978, soon to be published, which gives further information on the effect of our bombing. From this I quote a few paragraphs.

First,

> Your bomber offensive against Germany actually opened a second front long before your invasion of the Continent. Because of the unpredictability of your daily target selection, we had to keep a million men at home to defend against them. These defenses also required 20 thousand anti-tank guns as flak. Other thousands of people were required as fire fighters and to repair damaged factories. Those men and munitions could have provided another 60 divisions for use against Russia or to oppose your invasion in France.

Another significant Speer observation:

> In January 1943 our losses from your bombing of our war-making industry I estimated at 5.4%. In December 1943 it had climbed to 28%.The short fall in critical weapons, according to a memorandum I made at the time, amounted to 36% for tanks, 30% for military aircraft and 42% for trucks.
>
> Thus the losses inflicted by the American and British air fleets constituted for Germany the greatest lost battle of the war, far exceeding our losses at Stalingrad, in the Winter campaign in Russia or during the retreat from France.
>
> The truly decisive factors were the weakening of the German defensive strength and the immobilizing of German planes and tanks caused by the American and British Air Forces. Even before the encirclement of the Ruhr, the collapse was already final.

Can there any longer be doubt about the conclusion of the Strategic Bombing Survey:

> Allied air power was decisive in the war in Western Europe. Its power and su-

periority made possible the success of the Normandy invasion. It brought the economy which sustained the enemy's armed forces to virtual collapse.

Prime Minister Churchill told me in January 1944, "The prediction you made to me at Casablanca last February about our combined bomber missions, including around the clock bombing, are now being verified. I no longer have any doubt that they will prove completely valid." That for me was the second great satisfaction of World War II in Europe.

The phenomenal courage and gallant persistence of the combat leaders and crews of the RAF and U.S. Air Force were the main reason for the success of that effort. There were other reasons, such as sound plans, the support of the Heads of State, Churchill and Roosevelt, and their Chiefs of Staff, our overwhelming weapons-making capacity, and the complete support of our civilian population at home. But, if the morale of the bomber crews had ever failed, all the rest would have been to no avail. That is why I shall always give the combat airmen the prime credit for the decisive air victory.

With our victory in Europe assured, Japan remained. General Marshall sent me on a twenty-day trip around the world in May 1945, with a directive to visit each theatre, consult the commanders, and report to him how much of our air power in Europe did we need to move to the Pacific Theatre, and, of equal importance, how much could they accommodate logistically.

Generals MacArthur and Kenney, with their ground and air forces, and Admirals Nimitz, Halsey, and Spruance, with their naval forces, had been accomplishing remarkable results, despite limited resources, against the Japanese War Lords while the war in Europe was our Number One priority. Now that MacArthur and Nimitz were to have available all the needed resources from the European Theatre, plus our undivided weapons-making effort—now at maximum capacity—the result was no longer in doubt.

There was still the fear of heavy casualties in the invasion of Japan's home islands. Instead, as we all know, Japan surrended in three months before any Allied soldier had set foot on Japanese soil. The naval blockade and air power's destruction of their weapons-making industry made it impossible for them to go on. For the first time in history, a powerful nation had surrendered without invasion or occupation. The theories of early air power advocates like Trenchard, Douhet, and Mitchell had been largely vindicated.

What are the prime lessons learned from World War II?

1. That free men make better soldiers, sailors, and airmen than the minions of totalitarian dictators.

2. That sound strategic plans, steadfastly pursued by determined national leaders, are essential to victory in war.

3. That the united support of civilian populations on the home front is a decisive factor.

4. The obvious lesson, from the final days of the war against Japan, is that, by the proper employment of sea and air power, a land invasion of enemy territory can be avoided, saving heavy and unnecessary casualties.

This last observation quite naturally raises the question of whether an invasion of Germany would have been required had adequate air power been available. Marshal of the Royal Air Force Sir Arthur Harris, in musing on this possibility, points out that only 17 percent of Allied resources were devoted to air power, 33 percent to the sea war, and 50 percent to the armies. Had these resources been distributed between the three services equally, 33–⅓ percent to each, the RAF could have had 1,000 bombers and the 8th Air Force could have had 1,000 bombers and 1,000 long-range fighters in 1942. In that event, he speculated, a land invasion of the continent might not have been necessary. All the armies would then have had to do was provide an occupation force in Germany as in Japan.

Before leaving World War II and moving on to our subsequent wars in Korea and Vietnam, I propose to pay a deserved tribute to General Carl Spaatz, particularly appropriate before this audience here at the Air Force Academy. He was our senior strategic air power commander, both in Europe and in the Pacific. He was the only general present at the surrender ceremonies both in Berlin and aboard the battleship *Missouri* in Tokyo Bay.

I have often said that he was the only general I knew who never made a mistake. His friendship and influence with General Eisenhower was largely responsible for the generally sound tactical and strategic employment of air power in Europe. His standing with President Truman was a prime influence in obtaining a separate Air Force, co-equal with the Army and Navy, and he was the only candidate to be the first Chief of Staff of the U.S. Air Force.

For the last nineteen years of his life, I was privileged to spend much time with him, from which I have many cherished memories. For example, I was with him when he was inducted into the Aviation Hall of Fame and heard him say, "We must always be prepared to control the air and space above the earth, or join the worms beneath its surface." In 1973, I told him that I had been asked to speak at the Air War College and I would like to take a message from him. He said, "How much time

do you have?" When I told him forty-five minutes, he said, with his mischievious chuckle, "Well, you can't do too much damage in that time." He then grew thoughtful and said, "You may tell them, I think we are getting out of the airplane business too fast and not getting into the space weapons business fast enough." Shortly before his death, he said to me, "Partner, I am beginning to worry about you. I think I'll finish my days in freedom, but I'm not sure you will." The memory of that prophesy fills me with foreboding lately.

"Tooey" Spaatz was quiet, reserved, and miserly with words. If he had brought the Ten Commandments down from the Mount, there would not have been ten Commandments, only one—"Always do right." He has not had, to date, half the credit he deserves in the history of U.S. air power. Fortunately, a book is now being written entitled *Andrews, Arnold and Spaatz*, which, hopefully, will remedy that.

Air Power in Korea and Vietnam

In our war in Korea, air power was employed very effectively in a tactical role in support of ground operations. If our available strategic air power had been employed properly, China's entry into the war could have been prevented. All that would have been necessary would have been to destroy the Yalu bridges and to lay and maintain a strip of mustard gas five miles wide along the Yalu River.

To those who cringe at the use of poison gas, I ask would that not have been preferable to 33,600 American dead? I also assure you that Russia has learned and profited by that lesson. The Soviets emphasize the employment of poison gas in all their maneuvers and maintain a growing chemical warfare capability. They obviously would employ it to stop a Chinese invasion.

In Vietnam, there was a gross failure to employ our available strategic air power properly. In the first place, our political leaders elected to wage a massive land war in Asia against the advice of all our most experienced military leaders. Then, they took counsel of their fears and failed to employ strategic air power fully, believing, erroneously, that this would bring Russia and China actively into the conflict.

In 1966, President Johnson sent for me. (In earlier times we had been close friends. I, having retired in 1947, campaigned for him in 1948, when he first ran for the Senate.) He said, "I understand that in your syndicated columns you have been critical of the way in which I am running this war. All right, wise guy, what would you do?" I replied, "Mr. President, with our preponderant military power and resources, when we cannot persuade Ho Chi Minh to abandon his invasion of South Vietnam, we must be doing something wrong." "Be specific," he de-

manded. My reply: "What I would do, after issuing an ultimatum, is mine Haiphong Harbor and break the Red River dams, putting North Vietnam's rice production and many of her principal cities under ten feet of water. If this didn't produce the desired result, I would give Hanoi the Berlin treatment, then progressively destroy her war-making potential and all her rail transportation, preventing the transfer of weapons and supplies from Russia and China." Johnson said, "You know our people would not stand for that." I answered, "I remember when President Roosevelt had considerable opposition at first in World War II. Perhaps if you had done as he did, acted boldly, then carried your case to the people and gotten this war over with in a year—which would have been possible with the fuller use of naval and air power—you could have had a united people behind you."

In retrospect, how much better it would have been, if necessary, to destroy North Vietnam than to lose our first war. That would have saved us 50,000 American dead, 250,000 Allied dead, and, subsequently, the greatest genocide in this century. Already the Hanoi butchers have murdered or starved to death more than three million men, women, and children in South Vietnam, Laos, and Cambodia.

Air Power Employment in the Future

A constructive look at U.S. air power in the future must be based on a sound analysis of the history of air power employment in past wars, plus an appreciation of the probable economic conditions and political leadership which will exist.

Obviously, there must be an accurate and continuing study of what nuclear weapons and advancing technology will do to aerospace warfare. The radical change in the time factor, as a result of nuclear weapons, must be realized. Never again will we have years or months in which to build armies, navies, and air forces, or to convert our industrial capacity to its full weapons-making potential. We shall win or lose with military power available when the war starts, and the kind of military power required to prevent war is exactly the kind required to win any war which is forced upon us.

Political as well as economic considerations may be decisive. The divisiveness which prevails among our people and their leadership is a current danger, one which is the result, largely, of the lack of adequate political leadership at this critical time. We need a Churchill with the eloquence to arouse our people and their somnolent, divided Congress and with the courage to "tell it like it is" about declining U.S. power and the ominously increasing Soviet power.

Our national leaders have been telling our people that we must have "rough parity" or "essential equivalence" in order to promote detente

or in the hope of successful SALT II negotiations. We no longer possess equivalent military power with Russia in either general purpose forces or in strategic nuclear forces. The greatest reason for the current and growing imbalance flows from this decisive fact: Russian leaders are preparing for war, our leaders view nuclear war as "unthinkable."

Warfare today, in a nuclear environment, requires both an offensive and a defensive capability. We have entirely neglected the latter. Russia has put large segments of her defense industry underground; she has provided shelters for her skilled labor force; she has hardened her command and control installations; and all her maneuvers train her military forces to survive and operate in a nuclear environment. We are totally deficient in all these areas.

The CIA has lately admitted that the national estimates of Soviet strength have been low by as much as 50 percent. Thus, if there were a nuclear exchange between the U.S. and the USSR today, at least 100 million Americans would die, while less than 20 million Russians would be killed. Seventy-five percent of our industrial capacity would be destroyed, while more than half of theirs would survive. The knowledge and belief in the Kremlin of the accuracy of these estimates destroys the credibility of our current defense posture.

The most likely scenario for our next and last major emergency may be this: One day, over the hot line from Moscow may come this message to our Commander-in-Chief in the White House. "Mr. President, we order you not to interfere with our operations against Israel. Obviously you will comply for your own Chiefs of Staff will confirm that we have overwhelming military superiority." If present conditions continue much longer, no President of the United States will have any option but to comply with that ultimatum, tantamount to surrender.

Presently, we have, but for only a short time, an alternative. We can begin immediately to regain our military superiority at sea, in the air, and in space. We have ample resources. Only the will and determination of our people and their leaders may be lacking.

VIII

INSIGHTS INTO TECHNOLOGY AND AIR WARFARE: PAST, PRESENT, FUTURE

The theme of the interaction between technology and air power recurs throughout these proceedings, but this session addressed it directly. The chairman was Mr. Michael Collins, the former astronaut and the individual most responsible for the incredible success of a monument to the theme of the session, The National Air and Space Museum. Mr. Collins underscored the dizzying rate of technological progress by noting that only sixty-six years separated Kitty Hawk from the lunar landing.

The historians of the deeper meaning of such progress are too few indeed. Fortunately, three of those rare individuals had promptly accepted invitations to display their intellectual wares.

Doctor Alex Roland, a young historian with the National Air and Space Administration (NASA), analyzed the record of its predecessor, the National Advisory Committee for Aeronautics (NACA), in attempting to answer the question whether war has stimulated or hindered aeronautical progress. He concluded that war "has been a means of supporting aeronautical research, as much as it has been the end of aeronautical research. . . ." The deeper meaning of his paper, though, stemmed from his profound questioning of material that ordinarily might only be part of a routine institutional history.

No one could accuse the next speaker, Robert Perry of the RAND Corporation, of failing to ask meaningful questions. His rich and provocative essay on the relationship between technology and doctrine and the possible consequences of a misunderstanding or misuse of this relationship amounted to a serious criticism of an imbalance between technology and United States Air Force doctrine since World War II.

A pioneer historian of air technology and doctrine, Professor I. B. Holley of Duke University, commented incisively on the papers and highlighted their significance for both airmen and scholars. He carried out his assignment to address the work remaining to be done, but quite appropriately chose not to be as concrete as the other commentators. Professor Holley concentrated, instead, on depicting the exceptional standards demanded of historians who would work in this area and concluded that intellectual history of the highest order has to be their goal.

While historians such as the foregoing speakers seek to master their field, serving airmen struggle to derive immediate military utility from an ever-advancing technology. One of the leaders of this struggle and the next commentator, General Bryce Poe, USAF, the commander of the Air Force Logistics Command, convincingly disputed any generalization that technological advances were inherently advantageous. For those responsible for military forces, General Poe insisted, "technological improvements have little charm until they're shaken down into reliable, maintainable, and most of all, available systems" that will enable those forces to accomplish their mission.

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THE IMPACT OF WAR UPON AERONAUTICAL PROGRESS: THE EXPERIENCE OF THE NACA

ALEX ROLAND

The history of the National Advisory Committee for Aeronautics (NACA) brings to mind the classic controversy staked out by Werner Sombart and John U. Nef. Is war or peace more conducive to technological and industrial development? In *Krieg und Kapitalismus*, Sombart argued that war and the preparation for war have been most productive. Nef countered with his *War and Human Progress*, maintaining that the really critical advances and discoveries have been made in times of peace. Since the NACA was committed to the advance of aeronautics in both peace and war, it would seem to be fertile ground in which to plant this controversy. If, as it claimed, the NACA was working on the frontiers of flight, was it there in uniform or coveralls, working on swords or plowshares, pulling military aviation in the wake of civilian aeronautics or pushing forward the bounds of civil flight behind the shield of military necessity?[1]

Two caveats immediately suggest themselves. Aviation is a twentieth-century phenomenon. Has the century of total war made the question obsolete? Through 1945, the answer seems clear. In the United States, at least, the first half of this century has seen alternating periods of intense warfare and blissful, almost myopic peace. On the eve of the two world wars the United States found itself woefully and dangerously unprepared, and immediately after each it quickly demobilized. Surely in those years the times of peace and the times of war were sufficiently differentiated to make some judgement about how material progress advanced in each era. With respect to the cold war and its permanent state of war or preparedness for war, the issue is less clear. But for reasons I will discuss later, I believe that American aeronautical progress in the cold war has been the natural outcome of the policies established in the first half-century and is of a piece with the earlier period.

Our second caveat is, has this question already been answered? Is there in the literature an authoritative analysis of whether war or peace has been more conducive to aeronautical progress? The answer here is a qualified "no", but the qualification is serious enough to suggest that

the question may not be answerable at all. A substantial body of literature touches upon the subject, but the more critically one examines that literature, the less it satisfies.

War, Peace, and Aeronautical Development—The Literature

There are basically two kinds of studies in this corpus. First are the case histories that examine individual aircraft. These vary in quality from serious analytical studies that try to determine how a particular aircraft came to be—the whence and why of its design—to the patently superficial panegyric of the "Gee Whiz" variety—"the Mustang was the sweetest plane I ever flew." At their worst, these histories can be terrible. Unfortunately, even at their best they do not reveal much about the development of aviation, for by fixing on one aircraft they necessarily miss much of the evolution and transfer of ideas.[2]

At the other end of the spectrum are those studies that attempt to survey all of aviation. Most of these shed little light on technical development, for most are simply a collection of case studies of successive aircraft. Trying to understand aviation that way is like trying to understand Roman Catholicism by examining the attributes of the successive popes. Six of these studies, however, have been of greater help to me and warrant some comment.

By far the most useful is Ronald Miller and David Sawers, *The Technical Development of Modern Aviation*, a sequel to the classic study by John Jewkes, David Sawers, and Richard Stillerman, *The Sources of Invention*. Miller and Sawers attempt to apply to aviation the schema of invention, development, and innovation first worked out by Jewkes and his collaborators. The attempt is compromised for my purposes because it concentrates more on civil aviation than on military and because it too often equates technical success with commercial success, principally in airliners, which are the major focus of the study. Also, Miller and Sawers rely heavily on interviews, but they do not cite these in their sources. While their interpretation thus has the ring of truth and authority, it also falls under the suspicion of received opinion.[3]

The joint DoD-NASA-DoT study, *R&D Contributions to Aviation Progress (RADCAP)*, comes closer to the topic I am addressing. Unfortunately, the conclusions it reaches are too convenient, too close to what one would expect the sponsoring agencies to want, to be above suspicion. As with Miller and Sawers, it relies heavily on unidentified interviews, and it has a much weaker bibliography.[4]

J. L. Nayler and E. Ower, *Aviation: Its Technical Development*, is a plane-by-plane account, though it does have the virtue of being topically arranged in separate chapters on the different kinds of aircraft. Most of

the story of technical development is scattered in these sections, and from them it is difficult to distill an interpretation that is clear and identifiable, though the concluding chapter on "Aeronautical Science" comes close to analyzing the entire field. Again, the bibliography is weak and most of the book draws upon the extensive careers of the authors in British aeronautical science.[5]

Oliver Stewart's *Aviation: The Creative Ideas* is at once the most eccentric volume of the group and the most original. Its strength is that it attempts to discern and explain the seminal advances in aeronautics on their technical merits, whether or not they became widely recognized or incorporated on successful aircraft. Among its weaknesses are lack of documentation, excessive concentration on the author's friends and acquaintances in British aviation, redundant and sometimes muddy prose, and perverse wrongheadedness about the Wright brothers and Clément Ader. Still, it is a stimulating and daring book.[6]

Two more specialized studies, while they do not cover the entire field of aeronautical development, do shed considerable light on important parts of it. Peter Brooks' *The Modern Airliner*, is a minor classic on which all subsequent studies have relied. Robert Schlaifer' *Development of Aircraft Engines*, though now increasingly dated, is a model of how such a study might be presented, though it too suffers from heavy reliance on interviews that are not identified.[7]

All six of these studies are strong and authoritative in their way. The disparity of their conclusions leaves one wondering if there is any real, substantial consensus in the field of aviation history, any agreement on a paradigm of aeronautical progress. As in the aeronautical development they seek to describe, there is a considerable amount of nationalistic bias in all of these accounts, not so much in the sense that any one of the authors seems openly intent on waving the flag of his country or any other, but rather in the sense that traditions have grown up in different countries about the ways in which aeronautical progress proceeded. Where the authors of these studies have relied heavily on interviews, they have inevitably picked up those traditions and incorporated them in their studies as revealed truth. Thus, *RADCAP* lauds the American NACA cowling without mentioning the British Townend ring, while the Nayler and Ower study gives about equal treatment to both, always citing the Townend ring first, and Miller and Sawers—one American and one British—say the Townend was sooner and the NACA was better.[8]

Even within the same country there is disagreement about what the important inventions were and where they came from. Not even the prestigious Collier Trophy bespeaks consensus within the United States. The NACA won the trophy for the NACA cowling and the area rule, but some people felt the Townend ring was superior to the NACA cowl-

ing; Kelly Johnson felt the area rule was overrated and in any event known before Richard Whitcomb "discovered" it; and Orville Wright, himself a member of the NACA and winner of the Collier Trophy, felt that the trophy had become a political plum sought after and won by institutions unsure of their own worth.[9] The experts hold strong views on what was important and what transient in the development of modern aviation, and the outsider risks being seduced by one side or the other if he attempts to penetrate these disputes. The experts cannot see the forest for the trees, but, conversely, the layman cannot see the trees for the forest. It will take an independent, informed, and discerning mind to map these woods without falling into one camp or the other.

One cannot even depend on the experts to give him accurate facts. There is a folklore of aeronautical development—or rather several folklores—to which all of the insiders seem to subscribe. A conventional wisdom grows up about how this or that invention evolved, and most everyone embraces this received opinion, no matter how at variance it may be with documented facts. After World War II, American and British designers claimed to have forgotten that Adolf Busemann suggested sweptback wings in a published paper in 1935; instead they conveniently explained the German work they discovered after the war as an instance of simultaneous invention with their own discoveries. Shaking them loose from this conviction is now almost impossible, even though an impartial historian of ideas would in all probability credit Busemann with the idea and the Germans, Americans, and British with elaboration on it.[10]

With respect to the issue of whether military or civilian influences had a greater effect on aeronautical development, the authors I have cited here are in almost complete disagreement. Brooks attributes almost all of the technological advances in American aviation to the military, an overall conclusion that *RADCAP* warmly embraces, though noting that this has been more true of the period since 1940 than it was previously.[11] Miller and Sawers, however, see the period between the world wars as a time of almost total civilian dominance. Although they see military aircraft as the clear forerunners of the first generation of commercial jet liners, they and others agree that the second generation has owed noticeably less to military development and first use.[12] Stewart agrees with Miller and Sawers that the case for military pioneering in design has been overstated.[13] Even in the field of aircraft engines, where the dominance of military influence is generally allowed, Miller and Sawers approvingly quote A.C. Lovesy of Rolls-Royce on the advantages of developing engines for civilian use and then applying them to military aircraft.[14]

Of course, separating military from civilian development in aeronautics is complicated by the overlapping of the two technologies. The

primary difference over the years seems to be that speed and maneuverability have been most highly valued in military aircraft, while safety, economy, and comfort came first in the civilian field. But as a rule, fundamental advances in one realm have been applicable in the other. As early as 1922, George Lewis, the NACA Director of Aeronautical Research, wrote to the chief scientist at the Committee's Langley Laboratory:

> I have been thinking for some time of problems which we could properly undertake at Langley Field that would apply directly to the development of commercial aviation but so far have not been able to think of a single problem that does not apply to aviation as a whole.[15]

There is simply no clear dividing line between civilian and military aviation. The same plane can carry guns or butter.

But even ignoring the attempt to distinguish between military and civilian aviation, the authors I have mentioned cannot agree among themselves on what the critical inventions in aviation have been. Some, like Miller and Sawers, Stewart, and the *RADCAP* authors, compiled lists of the critical inventions. Comparing these lists, one is struck with how little they agree. Variable pitch propellers, flaps, and jet propulsion appear on all the lists, but even here the authors cannot agree on who made the invention and how it came into use. Miller and Sawers, for example, credit Junkers, Dornier, Rohrbach, Wagner, and Northrop with the stressed-skin metal airplane; *RADCAP* credits only Wagner and Northrop; Steward credits only Oswald Short.[16] All the authors would agree that each of these inventors contributed something to the development of the stressed-skin metal airplane, but cannot agree on which contributions were the most important.

What one misses in these technical accounts of aviation progress is serious and comprehensive research in the primary documentation. The closest that any of the authors come is interviews with the participants years after the fact and examination of technical reports that usually concluded a research project. These are weak sources on which to rely. John V. Becker, who recently retired from a distinguished career in aerodynamic research for the NACA and NASA, is now preparing four case studies in supersonic research. He reports that he is amazed at how faulty the memories of the participants are and how often his own recollections cannot be reconciled with the documents.[17]

Lacking a common paradigm of aeronautical development, the authors I have cited—and others as well—concentrate on the ingredients of development, that is, the successive, incremental technical improvements that have made an aircraft different from, and superior to, its predecessors. Unfortunately, there is more to aircraft development than just ingredients. Using that criterion alone, one gets from each of these

books a succession of Mr. Potato Heads, this model with a different set of ears, that one with a new nose, the next wearing glasses. The DC–3 is repeatedly described as an all-metal, stressed-skin, low-wing monoplane, with twin, cowled engines, variable-pitch propellers, and retractable landing gear. That description easily fits many planes, but gives no real notion of how progress was actually made or why the DC–3 was so much better and more successful than its competitors.

Something is missing from all these accounts, and that something is in the heads of the designers. Aeronautics is part science, part art. Science—more often, engineering—can refine the ingredients, but combining them in a successful aircraft is art. The mind of the designer is at the heart of the intellectual history of aeronautics, but the mind of the designer is a particularly difficult chamber to penetrate. Designers are by nature and habit secretive, jealous of their own creations. They are reticent to reveal how they came by their ideas, let alone where they might have picked them up, even if they themselves know. They believe, with some justification, that although the component ideas behind an aircraft may have come from different sources, their peculiar genius synthesized the parts into a whole machine that would fly. Furthermore, aeronautical design is done increasingly in teams, and, Kelly Johnson notwithstanding, most modern airplane designs show imprints of more than one man's mind, complicating the historian's task geometrically. Added to this, of course, is the human constant that success has many fathers and failure is an orphan. Everyone is quick to proclaim his role in the B–17, but when the original P–38 is mentioned, everyone hunches low over his drawing board,[18]

What we need, then, is more attention to ideas and less to hardware. There is already enough of the latter. We do not need another study of the DC–3, but we do need case studies of the variable-pitch propeller and high-lift devices and streamlining. If we understood more about the evolution of the fundamental concepts underlying these ideas and their change through time, we might come closer to understanding how a particular designer at a particular time took the ideas that were then available and used them in an airplane that made aviation history.[19]

The NACA—A Case Study

Since the extant literature on the technical development of aviation does not permit me to identify, with any degree of assurance, when and where the major technical advances were made, I cannot pursue the traditional course in identifying them as peacetime or wartime contributions. The alternative, though far from satisfactory, is the only one I see: stand the problem on its head. Without ever identifying exactly what aeronautical progress is, let us see if we can identify why it was made.

If one can establish that progress was made for military or civilian purposes, then he is close to determining whether war or peace has been more fruitful.

Only one great leap of faith is required to begin this investigation. It is necessary to believe, as I and the authors I have cited do, that aeronautical research leads to aeronautical progress. If that is true, then one can look to the motives behind American aeronautical research to determine the purpose of American aeronautical progress. Or at least one can reach some conclusions that are suggestive of how and why that progress was made.

The place to look for American aeronautical research policy is to the federal government; for though the experts may disagree about the ingredients of aeronautical progress, they are unanimous in their conviction that this progress depended on government support. The simplest measure of government support is the dollar volume of government investment in aeronautical research. By this criterion alone, military aviation has attracted the lion's share of government support, a seemingly clear case for Sombart. Unfortunately, there are two problems with this formulation. First, much of the military aviation research and development budget went not to research but to clean-up and testing of prototypes, work that improves individual aircraft without necessarily advancing the state of the art. Second, and more important, not all of the research and development money given to the military services was intended solely to advance military aviation. As this paper will attempt to show, the motives behind American aeronautical research policy were more complex than the federal budget by itself would suggest.[20]

The place to look within the federal government is to the National Advisory Committee for Aeronautics, not because the NACA conducted or even administered all aeronautical research, but rather because the Committee took to itself the responsibility of coordinating all research, ensuring that what was needed was done and that there was no untoward duplication among the various public and private institutions involved. But to understand what American aeronautical research policy has been, we must first place it in the context of American aviation policy.

Birth of the NACA, to 1926

In the period 1915–1926, the federal government committed itself to a course of action that has determined the direction of American aviation policy in general, and research policy in particular, ever since. Part of the commitment was conscious, part by indirection. The first step was characteristically hesitant, reluctant, and unsure, and it left a residue of uncertainty. This initial step was the decision to create the National Advisory Committee for Aeronautics (NACA).[21]

The stimulus behind this move came from a group of aviation enthusiasts who were the first to see the potentials of flight. Drawn from all walks of life, military and civilian, the most influential of these early enthusiasts were substantial citizens, men of affairs and connections who sought to have their convictions reflected in public policy. They were true believers, and they spoke in cosmic terms about the impact of aviation on war and commerce. They saw powered flight as a gift from science to civilization that would alter the course of history and meliorate the human condition. They seem not to have been motivated by personal aggrandizement so much as by nationalism and a belief in progress as an end in itself. Most of all they feared falling behind the European nations in aviation development.[22]

Their plea was for government support, not only for military aircraft, which were already being ordered and built in limited quantities, but also for civilian, i.e., commercial, aviation. These men believed, as I do, that progress in aviation flowed from aeronautical research. Too expensive for private venture, that research needed government support. Yet at that time there was no government agency to turn to, for aviation cut across the traditional disciplines and lay in the province of no single department. The departments of the Army, Navy, Post Office, Commerce, and Agriculture all had a potential interest in aeronautics, as did the Weather Bureau, the National Bureau of Standards, and the Smithsonian Institution. But none of these was obviously the one to direct and coordinate the aeronautical research needed to nurture this fledgling art. In Europe, governments were subsidizing both the manufacture and the operations of aviation, and basic research was being supported by the government and by private gifts as well. Something like this was needed here if the United States was to keep up.[23]

Athwart the path of the aviation enthusiasts lay the Progressives. The smoke of the "Great Barbecue," so recently doused by Roosevelt's trust-busting spree, still hung over Washington. In it a knowing and cynical man could smell railroads and land grants, banks and robber barons, senators in the pockets of businessmen and businessmen into the pockets of the taxpayer. The notion of government support for a nascent aviation industry seemed to rise phoenix-like from these same ashes. Cautious politicians kept their distance.[24]

Yet no one denied that flight had potential. It could be ignored only at the nation's peril. The question was, how to support and encourage it without rekindling the barbecue. Direct subsidy in imitation of the Europeans had all the earmarks of another railroad giveaway. Nationalization smacked of socialism and ran counter to the dominant commercial ethic of the time. The arsenal system, producer of army cannons and navy ships, was tainted with abuses of its own and in any case would not solve the problem of commercial aviation.

In this atmosphere several attempts to create a government aeronautical research laboratory died aborning. No one was really against such a laboratory, but neither could any of the schemes proposed for organizing it gain adequate support. Finally, the war in Europe spurred the Congress to do what it was otherwise reluctant to do: create the National Advisory Committee for Aeronautics. The Committee, then, was a child of war. Its organic legislation was a rider on the Navy Appropriations Bill for 1916. Its first offices were in military quarters. Its first chairman was an army aviation officer. John Victory, the chief administrative officer of the Committee throughout its history, even looked upon the NACA legislation as an "exercise by the Congress of its constitutional authority and duty to provide for the national defense."[25]

At the same time the Committee clearly had a mandate from a Congress still rife with Progressive fever to ensure that aeronautical development in the United States proceeded efficiently and judiciously, without favoring any private interests above the general welfare. The NACA began primarily as an advisory body, and the advice it gave was to be in the national interest. Though businessmen were not explicitly excluded from membership on the Committee, Congress made clear that government representatives were to outnumber private.[26] The NACA quickly embraced the tradition that no businessman would sit on the main committee. Private members would be drawn from academia, research institutions, and not-for-profit organizations, but not from the aircraft industry which stood to profit from the NACA's advice.

Congressional intent in this first step toward a national aeronautical research policy is somewhat unclear. Though war was the catalyst, the legislation did not specifically limit the NACA to military aviation. Rather it was committed to the practical solution of the problems of flight, be they military or civilian. Because the NACA came into existence on the coattails of war, there was reason to believe that war was its primary *raison d'être*, and its *raison de continuer etre*. George Lewis, the Committee's first Director of Aeronautical Research, often said that "if the NACA ever gets far away from the Army and Navy it is a dead duck."[27]

Strangely, the NACA did little in World War I to show that it was yet alive to this reality. Instead of undertaking research of use to the military during the war, the NACA concentrated on its own long-term development as a research institution.[28] Most of the increased funds it received during the war years went to the establishment and equipping of a research station in Hampton, Virginia; and, although this station was founded on a military base in coordination with both the Army and the Navy, still it was clear from the outset that both military and civilian research would be conducted there.

Lacking clear instructions from the Congress, the NACA set about doing what its founders and promoters—and the aviation enthusiasts—had envisioned all along: establishing a research institution that would restore preeminence to American aviation. They cared not whether it was civilian or military. The NACA was mindful that Congress's primary interest was in military aviation, but it saw nothing in its charter to preclude its serving civilian aviation as well.

After the war and the rather poor showing of the American aviation industry, a national aviation policy and the place of research within it were as much in doubt as before 1915. What consensus there had been during the war dissolved in the acrimonious debate over the alleged inefficiency and profiteering of the aviation manufacturers, the question of a unified air force, and the issue of how government support for commercial aviation could be effected without fostering another raid on the treasury.

The Interim Years, 1926–1945

Not until 1926 was a national aviation policy finally legislated. Meanwhile, the NACA and the other institutions conducting aeronautical research had to go about their business largely without guidance from Congress. A division of labor evolved fortuitously. Theoretical work would be done in the universities; fundamental or basic research applicable to all flight would be done by the government, especially by the NACA and by the National Bureau of Standards; design and development would be done by the aeronautical industry, for both military and civilian customers; and testing would be done by the armed forces to ensure that aircraft ordered from industry met specifications. Commercial flying was a small and powerless industry, relying largely on war-surplus aircraft. No substantial provision was yet worked out for aeronautical research in this field.[29]

Finally in 1926 Congress passed the Air Commerce Act along with Army and Navy aircraft procurement programs, all of this following close upon the Air Mail Act of 1925. The essence of these laws was that local and state governments would provide facilities for civilian aviation, the federal government would regulate civil aviation through the Bureau of Air Commerce and nurture it with air-mail contracts, and the Army and Navy would sustain the manufacturers as well as their own air branches with contracts for new aircraft.[30] The only research money was in the military services, in their own testing and engineering programs, and implicitly in the experimental contracts they were authorized to make with manufacturers for the development and delivery of new aircraft.

The irony of this arrangement is that the government ended up supporting the manufacturing industry, and indirectly the commercial

operators as well, but through the largely concealed costs within contracts for military aircraft, what I. B. Holley calls the "hidden subsidy."[31] The same companies that benefited from this research would then build better commercial airplanes, not necessarily because they would apply the same technology, though of course some was transferable, but because the capital acquired from military contracts allowed them to pursue civilian projects. So Congress, after years of indecision, had elected to support American aviation by buying military aircraft, putting all the research funds into military research. Only the NACA was left with some flexibility to fund civilian research that seemed to be in the national interest.

A paradox of democratic government lay behind this compromise solution. The Congress wanted America to be strong in aviation, both military and civilian. Since government was the sole customer for military aviation, government had to support the research attendant upon it. But not wanting to nationalize commercial aviation as the Europeans were doing, in effect, Congress called upon private firms to fly the mail while also flying passengers and other cargo. In other words, Congress would support research where it was the sole customer but not where it was one among many customers in the civilian marketplace, even though it was in that marketplace artificially, boosting commercial aviation with the indirect subsidy of air-mail contracts. To include research funds in those contracts would be to upset the forces of the market-place, to the advantage of one private firm over another, while presumably all military contractors were on an equal footing for they all dealt solely with the government, at least for military aircraft. The paradox was between free enterprise on the one hand and equality before the law on the other.

What Congress failed to appreciate was that these two principles, at least in this case, were incompatible. Congress wanted all would-be contractors to stand equal before the government, to be selected on merit alone. Congress also expected the free enterprise system to provide a whole stable of potential contractors bidding for government work and being selected on merit. But the whole point of the free enterprise system is getting ahead; and once a contractor has gotten ahead (presumably on merit), he comes to the next bidding "more equal" than others.

In the case of aviation, where technical progress flows rapidly from research, those bidders who once won a military contract won along with it research money. As a general rule, then, the holders of these contracts would tend to get ahead, in a technological sense, while many of the air-mail contractors, unable to buy or develop new and better aircraft, languished. At all the subsequent biddings, the holders of military contracts had more power, more influence, more experience. In the years leading up to 1926, the dollar volume of military aircraft production far outstripped that of commercial production. After 1926, the large military

manufacturers continued to dominate the growing military market—and the emerging commercial market as well.[32]

This result was a natural outcome of American confusion over free enterprise and equality and the confused aviation policy that flowed from it. If government is really going to distribute only to equals, it must act as a leveler, it must restart the race over and over again.[33] Failing this, it contributes to the very conditions it seeks to prevent. True of most activities in a nominally democratic and egalitarian society, this is especially true of the aircraft manufacturing industry, with its high risks, large capital investments, and huge profits. What was pivotal in American aeronautical development was that in the early, critical years, when the government could sit on the fence no longer, it chose to fund military research instead of civilian. It did so because it was politically more expedient and could be wrapped in the flag and thus tended to conceal the second-order consequences.

When investors and financial leaders saw the drift of things after the appearance of this supportive legislation in 1926, they embraced aviation with a passion. The large Army and Navy aircraft appropriations meant that there was real money to be made in aviation for the first time since the war. Banks invested in the industry. Mergers were effected. Small companies were bought out or forced out. Manufacturers and operators joined in combines like United and North American. An oligopoly of sorts started to appear, just as the critics of American aviation policy had prophesied.[34]

Of course, the late 1920s were boom times anyhow, and aviation might well have prospered even without the banks and the government purchasing programs and the air-mail legislation. But it never would have prospered as it did. The industry enjoyed a dizzying growth in the five years after 1926 that only made the ensuing crash and scandals the more dramatic. By 1934 the bubble had burst, partly because the Depression set in and partly because the five-year buying programs had expired. But also it burst because the industry had been greedy and impatient. Private interests profited unduly from the public purse. Power and influence became concentrated in a few hands. Special interests became cozier with government than was becoming and profited disproportionately. The Congress doubted that the public had profited as well.[35]

On the technical side of aviation, these were the years when the airframe revolution began, when American manufacturers introduced the all-metal, stressed-skin, low-wing, twin-engine monoplane with variable-pitch propellers, flaps, and retractable landing gear. The American aircraft industry stole a march on the whole world and established itself as the leader in commercial aviation, a leadership which it has never relinquished. Only later, however, was this achievement viewed as a source

of national prestige. In the 1930s it was lost amidst growing public concern about charges of corruption in commercial aviation and alleged incompetence in military aviation procurement—both resulting in exorbitant profits for what critics came to call the "air trust." Roosevelt broke up the great mergers and shortly thereafter reorganized the aeronautics branch of the Department of Commerce as well.[36]

Throughout all this boom and bust of the 1920s and 1930's the NACA tried to follow its unclear mandate. Its basic commitment, especially after the passage of the Air Commerce Act, was to do fundamental research. The military was the sure customer for this work, and the military had first claim on the NACA's time and resources. But the NACA was committed to civilian aviation as well, for it continued to believe that strong manufacturing and operating industries were good for American prosperity and a judicious reserve in the event of war. Against the tide of an increasingly powerful and influential aircraft industry, the NACA clung tenaciously to the precept that no business interests would gain undue weight in Committee affairs. There would be no industry representatives on the main committee or on the main technical committees, and only as many on the technical subcommittees as were necessary to ensure that the NACA had access to the best technical expertise in the country. No research would be done for private firms unless the NACA had equipment that was unavailable elsewhere. Then the work would be paid for by the firm, and the results could be published, at the NACA's discretion, for the use of all.[37]

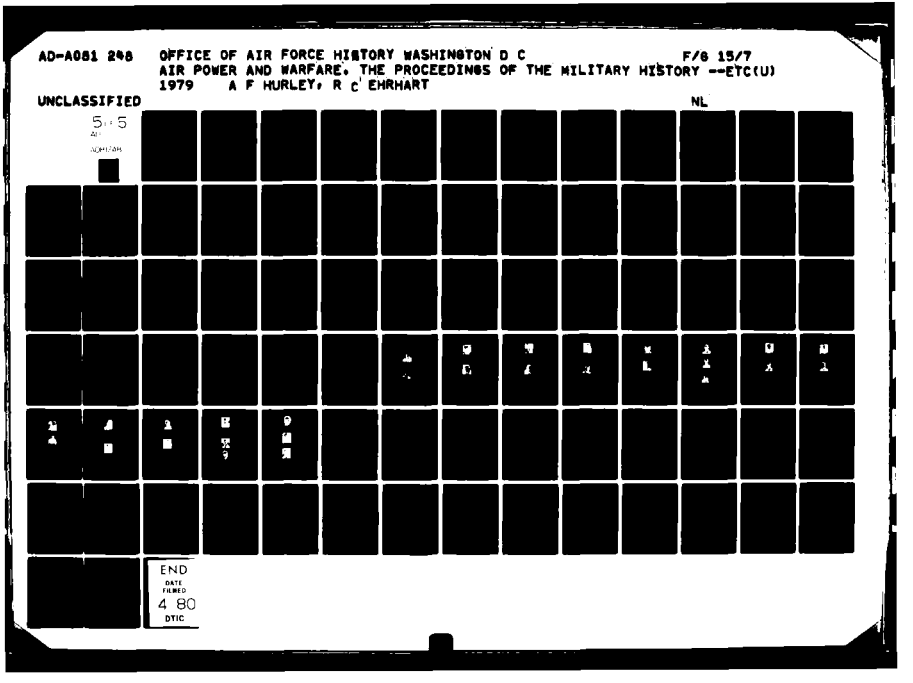
The circumstances of its creation and existence dictated that the NACA would be a weathervane of the political winds in Washington. It was a weak and insecure agency, always operating at the outer limits of its organic legislation and dependent upon the good opinion of Congress just to stay in business. Many in Washington questioned the necessity of an independent organization to conduct aeronautical research, especially when the Army, the Navy, and the National Bureau of Standards seemed to be doing the same thing. The difference between the fundamental research conducted by the NACA and the engineering and testing done by the services was lost on many congressmen. So the NACA relied on the testimonials of its customers and on a studiously cultivated reputation for efficiency, usefulness, and integrity.[38]

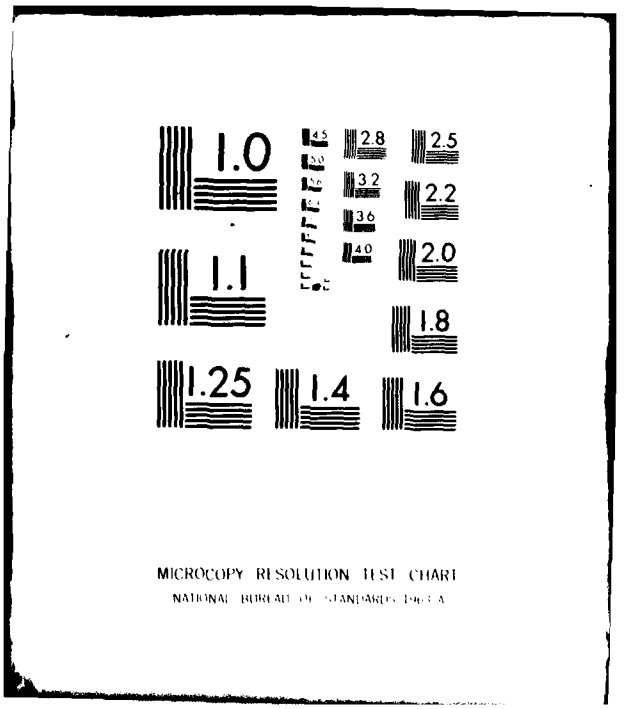
Alive as it was to the drift of politics in Washington and anxious to stay on the right side of Congress, the NACA knew where to stand on the issue of military or civilian aeronautics—on the fence. The members of the Committee knew that the military was at the heart of their mandate, but they also recognized a civilian dimension to their responsibilities. When it was politic to do so, the Committee made much of its contributions to commercial aviation. In the heyday of the late 1920s, for

example, the NACA took great pride in noting its contributions to civil aviation and in claiming some credit for the growth and prosperity of the industry—claiming all the while, of course, that its work benefited American aviation in general and not any particular firm or group. In 1926 it began the tradition of inviting representatives of all branches of the aviation industry to attend an annual conference at the Langley Laboratory, to learn what the NACA was doing and to make their needs and interests known. When the airmail scandals of 1934 broke, however, the NACA quickly retreated behind the skirts of military necessity, claiming the armed forces were its primary customers. The words *safety* and *efficiency* repeat themselves throughout the NACA Annual Report for 1929, while *speed* becomes the desideratum of the mid-1930s. Of course, the first two are primarily commercial concerns, the last primarily military. One of the Committee's critics noted in 1937 that the NACA was "riding two horses," military and civilian aviation, careful all the while to keep the more popular one in the view of Congress.[39]

The important point is that none of this public posturing by the NACA greatly changed what the Committee did. The Committee's research program was based essentially on what the Committee and its staff considered to be in the best interests of aeronautics, both military and civilian. Increasingly, as the issues and the research became more complex, it was the staff which decided what would be done. Military requests for specific investigations were always honored with a research authorization. How actively and enthusiastically that research would be prosecuted seems to have depended on how readily the work could be done and how convinced the staff was that such research was promising. A simple request was always answered quickly; more complicated proposals got better service if the staff believed they were worth pursuing on their merits. Requests from industry were treated less kindly. The Committee considered itself under no obligation to prosecute such investigations and undertook them only when it considered them to be in the best interests of aviation or when the firm making the request was working for the military. Often, if a promising request was received from industry and the Committee wanted to pursue it, it would unofficially ask the military services to make the same request. That way it could always be passed off as being of military importance, even if it were primarily civilian.[40]

The NACA, then, acted in these years as arbiter of what research was best for American aviation and decided whether the aeronautical research within its control would address military or civilian needs. But this was really just a matter of labels, for the Committee basically kept doing the same research, leaning toward the military when it was politic, toward civilian aviation when it could, but always keeping in mind, or trying to, what was best for aeronautics in general. In a way the NACA was doing just what Congress seems to have intended, without having


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said so, but, rightly or wrongly, the Committee felt it had to disguise what it was doing behind the facade of military necessity. In defense of this policy, it must be said that by the mid-1930s the NACA had been magnificently successful. The Committee operated the best aeronautical research laboratory in the world; its reports were widely circulated and respected; and it could well claim to have contributed substantially to the advances in aeronautics that made American commercial aviation the best in the world and American military aviation at the very least competitive.[41]

War upset this balance. Hitler poured vast amounts of money into aeronautical research. Other European nations followed in kind, if not in degree. In the United States, however, the Depression curtailed the program of the NACA and retarded military development as well. Not until the late 1930s did the NACA win approval of a large building program that tripled its physical plant within three years and expanded the staff proportionally. As in World War I, the Committee built facilities on the eve of war that would serve in peace as well. Even as the United States was about to enter World War II, the Committee was looking to the resumption of business as usual in the years of peace to follow, only on a grander scale.[42]

The Demise of the NACA, 1945–1958

World War II, however, left the world a different place, and the NACA found it impossible after the war to resume the role of mediator and independent researcher it had grown comfortable with in its first quarter century. The NACA came out of the war relatively diminished in the world of American aviation. It had failed to discover jet propulsion even as the British made great advances in the field and the Germans nearly produced from it a decisive weapon.[43] During the war the Committee had been diverted from fundamental research into clean-up and testing of military prototypes. This was important, but it was not the basic, long-range sort of role to which the NACA had become accustomed. Now the NACA was more clearly a service agency to the military, and it would have to struggle to regain its former role of arbiter of research and master of the fundamental. Standing in its path was not only a disenchanted military, but an industry grown large and powerful by years of unprecedented war production.

In 1945 aviation was the largest industry in the United States. More importantly for the NACA, it had reached this position in close collaboration with the armed forces. For years the industry had looked to the military for contracts and had grown accustomed to working closely with military officers. During the war this closeness had become almost incestuous, and the NACA had been drawn in as well. Dropping the bar

to industry representation on its principal committees, the NACA between 1939 and 1945 allowed industry representatives to take seats on the main committee and on the main technical committees—even to chairing some of the latter, which were positions of enormous power and influence in shaping the NACA research program. In 1945, in response to pressure from the manufacturers and operators, who were already looking to the resumption of peacetime activities, the NACA created the Industry Consulting Committee, a permanent standing committee through which the industry would be able to make its voice heard in NACA affairs. Private interests achieved something that Congress had not wanted in 1915 and the NACA had eschewed ever since.[44]

Evidence of this new state of affairs was seen most clearly in the Unitary Wind Tunnel Plan of 1949. Even before the war was over, the NACA realized that jet propulsion would push aircraft speeds into the transonic and supersonic ranges, requiring a whole new generation of wind tunnels and other research facilities. Assuming that it would be the agency to conduct this research, which was after all fundamental and applicable to both military and civilian aviation, the NACA prepared plans for a new laboratory, which it called the National Supersonic Research Center.[45]

The military and the industry, however, balked. The Air Force planned a research center of its own, including a capability for supersonic research. The manufacturing industry demanded access to similar equipment to facilitate design and development. The compromise Unitary Wind Tunnel Plan that resulted from this conflict left the NACA near the bottom of the heap. The Air Force won approval of what became the Arnold Engineering Development Center. The NACA did not get the new laboratory it wanted, and the wind tunnels to be constructed at its existing laboratories were to be controlled by industry. In an incredible piece of legislation, Congress provided that the NACA supersonic wind tunnels were primarily for industry use, and the industry would help decide how and when they would be employed. The NACA was to be primarily a service agency.[46] Here was the Progressives' nightmare come true—private interests dictating how facilities built at the taxpayers' expense were to be used. This convolution of congressional intent came about because of a power alliance between the military and the industry, an association that President Eisenhower would later label "the military-industrial complex." No other force was powerful enough to win complete control over American aeronautical research. Almost by indirection, an alliance for the production of weapons had come to control American aeronautical research policy.

The Unitary Wind Tunnel Plan was the handwriting on the wall for the NACA. Although the Committee stayed in existence for almost an-

other decade and made significant contributions to aeronautical progress—the area rule, the research aircraft program, the blunt-body concept—its role as arbiter was compromised. No longer did it have its prewar freedom to decide between military and civilian research needs. The NACA devolved into more of a service agency, even while industry took to itself more of the old discretionary power of the Committee to choose between military and civilian aeronautics. Only now the marketplace dictated which course would be pursued.

With the military-industrial complex dictating the pace and direction of American aeronautical research, one might expect that the cold war would be a time when war had been the motive power behind aeronautical development. Ironically, this has not been entirely true. Industry has used much of its wealth and power to conduct research for civilian purposes, for it could now put some of its large capital resources into such ventures with hope of fair return and without fear of financial disaster. The NACA and its successor, NASA (National Aeronautics and Space Administration), continued to devote resources to civilian aeronautics. And, if anything, the United States has led the world in civilian aviation more consistently than in military. Research and development funded by the military have served as the basis for advances in civilian aviation, not in the sense that the technology of the first flows into the second—for the technology seems to have flowed about equally in both directions—but in the sense that the personnel, capital, and experience accumulated in the production and operation of military aircraft have permitted ventures into commercial aviation that might otherwise have been beyond the reach of the industry and outside the purview of the government.

An Evaluation of the NACA

That the military-industrial complex should come to dominate American aeronautical research and use its power and discretion to advance civilian aviation is a curious harvest of the seeds of ambiguity that were sown by Congress in the crucial years between 1915 and 1926. Faced with a new technology in need of government support and regulation, but mindful of past abuses when government sought to subsidize or otherwise interfere with free enterprise, Congress showed itself willing to support aeronautical research but unwilling to upset the balance of market forces. Perhaps without realizing why, Congress settled upon the expedient of military aviation to extricate itself from the dilemma of these contradictory expectations. It supported military aviation, for which it was the exclusive customer, and supported civilian aviation to the extent of regulating air commerce and paying for air-mail service. Large amounts of government money were invested in aeronautical research through military development and procurement contracts. No like funds were funneled into civilian research. The only federal agency with much flex-

ibility in conducting research of benefit to civilian aviation was the NACA.

Congress never said, and the NACA never knew, exactly what proportion of its research should go to military aeronautics and what proportion to civilian aeronautics. Thus the NACA had to decide for itself. In one sense, this was no great problem, for most fundamental research was equally applicable to both. Where the NACA had discretion to choose, it usually elected to do, first, what was most important for aeronautics in general and, second, what was politic, that is, what seemed to be popular with Congress at the time. The NACA did research for civilian aviation whenever it could and felt that this was in the best interests of aviation and the country. It did research for the military whenever the services needed it or the Congress was in a stingy mood. National security was always the best argument for the NACA's continued existence. Very often the NACA simply did the research it wanted and labeled it "military" or "civilian" as the political climate seemed to dictate.

In World War II this balance changed dramatically. The industry and the military grew large and strong together, while the NACA was reduced to a service role in cleaning up aircraft already in the making. After the war, the NACA was relatively diminished. The military built its own research facilities and became that much less dependent on the kind of research the NACA had done previously. The industry refused to resume the second-class status it had endured in the early years and, instead, assumed an increasingly dominant role in determining what aeronautical research would be undertaken in NACA facilities. In many respects, the NACA had lost the discretionary power it had before the war to choose between military and civilian aeronautics. Such decisions were now made largely by the military and the industry. Since then, decisions about whether to pursue military or civilian research have been dictated largely by the arms race of the cold war and the marketplace of both civilian and military sales.

Has war or peace, then, been more conducive to aeronautical progress in the United States? To the extent that the motives behind the national research program can illuminate that question, the answer seems to be clearly "war". But confusion and indirection have been the hallmarks of American aeronautical research policy since the question first came before Congress in World War I, and much of that policy has evolved fortuitously. Congress has simply endorsed it because it worked, that is, because it gave the nation preeminence or at least parity in both military and civilian aeronautics. For awhile, the NACA was chiefly responsible for perceiving and maintaining this balance; since World War II, the marketplace has performed much the same function. In a larger

sense then, war, which has been the foundation of American aeronautical progress, has been a *means* of supporting aeronautical research, as much as it has been the *end* of aeronautical research—a conclusion in which both Sombart and Nef could take comfort.

Notes

1. Werner Sombart, *Krieg und Kapitalismus* (Munich, 1913); John U. Nef, *War and Human Progress: An Essay on the Rise of Industrial Civilization* (Cambridge, Mass., 1950; New York, 1968).

Though aviation and aeronautics have come to be synonymous, I will use them in this paper the way in which scientists and engineers in the field have tended to use them. Aviation is the more general term, referring to the entire field of making and flying aircraft. It includes such ancillary topics as radar, radio, electronics, and life support systems. Aeronautics is a more limited and more technical term, referring usually only to the science and technology of the aircraft and its propulsion systems, that is, only what is necessary to flight itself.

2. For examples of airplane studies, see Richard G. Hubler, *Big Eight: A Biography of an Airplane* (New York, 1960); Douglas J. Ingells, *The Plane That Changed the World: A Biography of the DC-3* (Fallbrook, Calif., 1966); Carroll V. Glines and Wendell F. Moseley, *The DC-3: The Story of a Fabulous Airplane* (Philadelphia and New York, 1966); and C. Martin Sharp and Michael J.F. Bowyer, *Mosquito* (New and rev. ed.; London, 1971).

3. Ronald Miller and David Sawers, *The Technical Development of Modern Aviation* (New York and Washington, 1970). John Jewkes, David Sawers, and Richard Stillerman, *The Sources of Invention* (New York, 1959). Sawers brought this experience to the aviation volume; Miller brought a background in mathematical economics: see his *Domestic Airline Efficiency: An Application of Linear Programming* (Cambridge, Mass., 1963).

4. John G. Paulisick, et al., *R&D Contributions to Aviation Progress* (2 vols.; Washington, 1972). Hereafter cited as *RADCAP*.

5. J.L. Nayler and E. Ower, *Aviation: Its Technical Development* (Philadelphia, 1965).

6. Oliver Stewart, *Aviation: The Creative Ideas* (New York and Washington, 1966).

7. Peter Brooks, *The Modern Airliner: Its Origins and Development* (London, 1961); Robert Schlaifer, *Development of Aircraft Engines* (Boston, 1950).

8. *RADCAP*, I, p. III-7; Nayler and Ower, *Aviation: Its Technical Development*, pp. 147, 259–60; Miller and Sawers, *The Technical Development of Modern Aviation*, pp. 62–63.

9. Schlaifer, *Development of Aircraft Engines*, pp. 679–80; Edwin P. Hartman to John F. Victory, 6 October 1935, in NASA History Office Archives; Orville Wright to W.R. Enyart, 27 May 1944, in NASA History Office Archives.

10. Though Robert L. Perry seems to believe Theodore von Kàrmàn when he says he forgot about Busemann's 1935 paper, Miller and Sawers are more skeptical. Perry, "Innovation and Military Requirements: A Comparative Study," RAND Memorandum RM-5182-PR, August 1967; Miller and Sawers, *Technical Development of Modern Aviation*, p. 24. It must be noted that Perry is discussing the issue of variable sweep, which Busemann also addressed in his 1935 paper, and Miller and Sawers later allow that American and British experts were genuinely surprised to learn what the Germans had done in sweepback research during the war (pp. 166–71). The point, however, is that they all had occasion to know of Busemann's ideas; and whether or not they consciously recalled them, the ideas were still part of the technical climate in which they worked. A more interesting question, perhaps, is whether Busemann knew about the work that preceded his.

11. Brooks, *Modern Airliner*, p. 141; *RADCAP*, I, II-1 and II-41. In a variation on the *RADCAP* conclusion, Alfred F. Hurley suggests that the military dominated aviation development from 1892 to 1945, with the period after World War II being *less* clear. Personal interview, Washington, 20 September 1978.

12. Miller and Sawers, *Technical Development of Modern Aviation*, pp. 67, 153–57, 200.

13. Stewart, *Aviation: The Creative Ideas*, p. 12.

14. Miller and Sawers, *Technical Development of Modern Aviation*, pp. 207–209.

15. Lewis to Chief Physicist, Langley Memorial Aeronautical Laboratory, 4 May 1922, Washington National Records Center, Suitland, Maryland, Record Group 255, Records of the National Aeronautics and Space Administration, Accession 57 A 415, Box 4, Folder 1-16C, 1921-1922. Similar citations will hereafter be given as 57 A 415 (4), 1-16C,1921-1922.

16. Miller and Sawers, *Technical Development of Modern Aviation*, p. 248; *RADCAP*, I, III-7–III-8; Stewart, *Aviation: The Creative Ideas*, chap. 3.

17. Personal interview, Washington, 10 April 1978. Becker feels that interviews are useful and indispensable, but they must be used cautiously.

18. Oliver Stewart seems to have a similar concept in mind when he speaks of "integrations" of extant ideas as being "responsible for so much development in aircraft inventions." *Aviation: The Creative Ideas*, pp. 174 and *passim*.

19. Charles H. Gibbs-Smith attempts to do this for the aircraft engine, propellers, and control surfaces, but he concentrates more on first use than on the basic principles and how they evolved. *The Aeroplane: An Historical Survey of Its Origins and Development* (London, 1960), pp. 169–83.

20. *RADCAP* reports that federal spending on military aeronautical research and development in the two decades following World War II exceeded that on non-defense aeronautical research and development by an order of magnitude. (Vol. II, appendix 9, p. 10) Comparison of NACA appropriations with military expenditures on experimentation as reported to the Morrow Board in 1925 suggests similar proportions in the period between the world wars (*Aircraft: Hearings before the President's Aircraft Board* (4 vols.; Washington, 1925), vol. 4, pp. 1703–14), though figures prepared by the NACA suggest that the ratio in the 1930s was 5 to 1. R.E. Littell, "Some Statistics on Federal Aeronautical Funds, 1931–1953," 26 February 1953, typescript, NASA History Office Archives.

The military services also spent considerable time and money preparing specifications for aircraft, but Miller and Sawers have concluded that the more detailed the specifications were the more they hindered progress, a pattern that applied to commercial aircraft procurement as well. Their rubric is: "Detailed specifications from any buyer are inimical to progress." *Technical Development of Modern Aviation*, p. 259.

21. The material presented here on the National Advisory Committee for Aeronautics is derived primarily from my archival research for a history of that agency. Rather than cite all of the documentary evidence that supports the generalizations about the NACA made in this paper, I have elected to give some selected examples. These are drawn primarily from two sources: (1) documents collected in the NASA History Office Archives in Washington, D.C., hereafter *NHOA;* and (2)materials at the Washington National Records Center, Suitland, Maryland, which will be cited as in n. 15 above. For a more complete description of the records of the Committee, see Alex Roland, "The National Advisory Committee for Aeronautics," *Prologue: The Journal of the National Archives* (Summer 1978), pp. 68–81.

The secondary literature on the NACA is thin. George W. Gray, *Frontiers of Flight: The Story of NACA Research* (New York, 1948) is a sound, sympathetic study of the Committee's technical achievements prepared by a NACA contractor with the help of the staff. Jerome C. Hunsaker, "Forty Years of Aeronautical Research," and James H. Doolittle, "The Following Years," both printed in the NACA *Annual Report* for 1958, pp. 3–31, survey the Committee's history from the perspective of two of its chairmen. Arthur L. Levine, "United States Aeronautical Research Policy, 1915–1958: A Study of the Major Policy Decisions of the National Advisory Committee for Aeronautics," PhD dissertation, Columbia University, 1963, remains superior to the condensed version that was incorporated in the same author's *The Future of the Space Program* (New York, 1975).

The best single source on the creation of the NACA is "Documentary History of the National Advisory Committee for Aeronautics," typescript, n.d., *NHOA*. The best secondary treatment is Richard P. Hallion, "To Study the Problems of Flight: The Creation of the National Advisory Committee for Aeronautics, 1911–1915," unpublished paper, 1976, *NHOA*.

22. See, for example, Albert F. Zahm, "On the Need for an Aeronautical Laboratory in America" *Aero Club of America Bulletin*, February 1912, p. 35; and "Uses of an Aeronautical Laboratory," ibid., March 1912, p. 151.

23. Some definitions are required here. The aircraft industry in the United States has had two principal branches: manufacture and operations. Manufacture has in turn been divided between airframes and engines. The primary focus of this paper is on the airframe manufacturers, but many of the generalizations apply to the airlines and the engine manufacturers as well. In fact, during part of the period being addressed here, all three of these branches were merged into large combines, making attempts at precise definition even more difficult. By commercial aviation I mean volume transport of passengers or cargo, as conducted by the major airlines. This paper does not address private aviation or small-scale commercial operations, for these fields were comparatively slight in both dollar volume of business and impact on technical development.

24. Arthur S. Link has observed that with the election of 1912 "the country was now overwhelmingly progressive in temper." *Woodrow Wilson and the Progressive Era, 1910–*

1917 (New York, 1954), p. 22. The term "great barbecue" was coined by Vernon Louis Parrington for *The Beginnings of Critical Realism in America, 1860–1920*, vol. III of *Main Currents in American Thought* (New York, 1930; A Harbinger Book, New York and Burlingame, 1958), Book I, part 1, chap. 1, sect. 4.

Of course, the NACA was not the only reflection of the government drift toward science and technology. As A. Hunter Dupree has observed, the National Bureau of Standards, the Bureau of the Census, and the Bureau of Mines were also created in the Progressive era between the turn of the century and World War I, for "in the first years of the twentieth century a government without science was already unthinkable." Dupree also agrees with historians of American aviation that "after the sudden birth of the aviation industry, the government had to provide most of the research." *Science in the Federal Government: A Study of Policies and Activities to 1940* (Cambridge, Mass., 1957), chap. 14, esp. p. 288.

25. Victory to C.C. Thompson, 10 March 1939, *NHOA*.

26. *Congressional Record*, Vol. 52, Part 4, 63d Cong., 3d sess., 1915, p. 4165.

27. Quoted by Charles H. Helms in a manuscript description of NACA-military relations dated 3 August 1948, *NHOA*.

28. Alice M. Quinlan, "World War I Aeronautical Research: A Comparison of the National Advisory Committee for Aeronautics and the National Research Council," NASA History Office HHN–135, 1974.

29. This division of research responsibilities can be traced through the NACA annual reports of the 1920s. Its clearest exposition was in the statement of "Aeronautical Research Policy" prepared by the NACA for presentation to the House Select Committee on Post-War Military Policy, 26 January 1945, *NHOA*.

30. The best treatment of the Air Commerce Act of 1926 is now Nick A. Komons, *Bonfires to Beacons: Federal Civil Aviation Policy under the Air Commerce Act, 1926–1938* (Washington, 1978), pp. 7–88.

31. I.B. Holley, Jr., *Buying Aircraft: Materiél Procurement for the Army Air Forces*, United States Army in World War II, Special Studies (Washington, 1964), p. 24.

32. John B. Rae, *Climb to Greatness: The American Aircraft Industry, 1920–1960* (Cambridge, Mass., 1968), chaps. 1–3. See Holley, *Buying Aircraft*, pp. 6–149, for a lucid discussion of how this paradox of congressional expectations came to be reflected in "mutually exclusive ends" within the Army aircraft procurement program.

33. Garry Wills calls this the "systematization of luck" in *Nixon Agonistes: The Crisis of the Self-Made Man* (New York, 1971), pp. 156–60, 221–26.

34. Rae, *Climb to Greatness*, chap. 3. The critics of American aviation policy in the 1920s attacked the NACA for its role in mediating the cross-licensing agreement of 1917, which they saw as a trust in restraint of trade. See, for example, "A Brief Historical Review Outlining the Origin and Operations of the Manufacturers Aircraft Association, Inc. Following Its Organization at the Instigation of the Government, 1917," typescript, 11 pp., 24 September 1935, *NHOA*.

35. Rae, *Climb to Greatness*, chap. 3; Elsbeth E. Freudenthal, *The Aviation Business: From Kitty Hawk to Wall Street* (New York, 1940).

36. The best treatment of military aircraft procurement is Holley, *Buying Aircraft*, chaps. 2–6. For a more detailed examination of the 1934 altercation between Congress and the Army, see Edwin H. Rutkowski, *The Politics of Military Aviation Procurement, 1926–1934: A Study in the Political Assertion of Consensual Values* (Columbus, Ohio, 1966), which focuses on the widespread confusion over the congressional intent behind the Army aircraft procurement legislation of 1926.

37. On committee membership, see n. 44 below. On the policy for doing research for industry, see "R.V.K." to Colonel [J. Clawson] Roop [Director, Bureau of the Budget], 14 August 1930; Roop to George Lewis, 14 August 1930; Lewis to Roop, 18 August 1930; Minutes, NACA annual meeting, 22 October 1931, all in *NHOA;* and Lewis to C.G. Taylor, 7 December 1931, in 57 A 415 (11), 13–6, General, 1927–1931.

38. See, for example, *Congressional Record*, Vol. 75, Part 13, 72d Cong., 1st sess., 1932, pp. 14024–14027. There were many attempts over the years to do away with the NACA. See, for example, Frank A. Tichenor, "Why the NACA?" *Aero Digest* (December 1930), pp. 47ff; Fiorello H. LaGuardia to Joseph S. Ames, 22 February 1932; and Ames to LaGuardia, 24 February 1932, all in *NHOA*.

39. Harold G. Moulton to William P. McCracken, Jr., 8 November 1937, *NHOA*.

40. An interesting variation on this general pattern arose in 1926 when the staff at Langley Laboratory proposed to undertake research on boundary layer control. Before approving

this research program, George Lewis got from the Navy a request to cover the work. In other words, the idea came from the staff, but the justification came from the military. See E.S. Land to the NACA, 2 December 1926; and Lewis to Langley Memorial Aeronautical Laboratory, 3 December 1926; both in the historical collection of research authorizations at Langley Research Center, Box 3, RA #201.

41. William B. Stout wrote the Committee on 14 May 1935 that the "work of the N.A.C.A. is in my opinion the one outstanding achievement in aviation throughout the world and the primary reason as to why the American airplanes, particularly commercial, lead the world." This quotation is taken from John F. Victory's personal card file of compliments, *NHOA*.

42. The challenge of foreign aeronautical development can be traced through the annual reports of the NACA in the late 1930s. In the *Annual Report* for 1940 (p. 29), the Committee showed that the expansion then under way would have repercussions far beyond the war:

> When the present wars have ended, aviation will have an opportunity to prove its real value to civilization in shortening the distances between nations and in facilitating international trade and commerce. When that day comes the extension of world trade routes of the air will bring some compensation for the awful destruction wrought and to be wrought by military aviation before peace again prevails.

43. The standard account, Schlaifer, *Development of Aircraft Engines*, pp. 321–508, finds the NACA blameless, but the Committee's contemporaries did not. See n. 46 below.

44. In 1938, industry representatives held no seats on the main committee, 10 percent of the seats on the main technical committees, less than 10 percent of the seats on the technical subcommittees, and no committee chairs. In 1948, industry representatives held four seats on the main committee, 44 percent of the seats on the main technical committees, 39 percent of the seats on technical subcommittees, four out of five main technical committee chairs, and over half the technical subcommittee chairs. These figures have been compiled by the author from the NACA membership records held in *NHOA* and the Washington National Records Center.

45. See NACA Memorandum "National Supersonic Research Center," 28 March 1946, *NHOA*.

46. The amazing story of the Unitary Wind Tunnel Plan Act of 1949 deserves a monograph of its own. The following quotation from U.S. Congress, House, Committee on Armed Services, H. Rpt. 1376, 81st Cong., 1st Sess., 4 October 1949, which accompanied the bill to passage, will suggest how seriously the NACA's reputation had been damaged by World War II and how far Congress was prepared to depart from the philosophy that had dominated its halls in the period from 1915 through 1926:

> It would be fruitless to criticize or to impute blame to the able and devoted scientific personnel employed by the NACA during the prewar years for their failure to keep pace with German aeronautical research along all of the various avenues in which progress was made during that period. But it would be the height of folly to close our eyes to the obvious lesson to be drawn from that experience—the lesson that we must not place the bulk of our aeronautical research eggs in one basket—the NACA basket. . . .
>
> Inasmuch as the primary purpose of the facilities to be allocated to the NACA is to provide wind tunnels necessary for testing aircraft and guided missiles under development by industry, it is the sense of the committee that strong language should be incorporated in the bill which will insure that these facilities, although allocated to the NACA on a so-called housekeeping basis and staffed by its personnel, shall be available to satisfy industry's requirements for the testing of experimental models in the course of development of new aircraft and missiles. It is absolutely essential that tests be scheduled and conducted in accordance with industry's requirements and that laboratory time be allocated with proper emphasis upon the requirements of the various contractors engaged in the development of new types of military aircraft for the services.

John Becker maintains that in practice the Unitary Wind Tunnel Plan Act had not the effect suggested by this statement. Most of the work done in these tunnels was divided between the military and the NACA. Committee staff never had any trouble getting time in the tunnels. Industry hardly ever used them for its own projects because most of its work was done on military time and paid for by the military. Part of the reason for the easy access

to the tunnels was that they were never as busy as had been anticipated; the older tunnels did much of the work just as well. Telephone conversation, 12 September 1978.

THE INTERACTION OF TECHNOLOGY AND DOCTRINE IN THE USAF

ROBERT PERRY

Let me begin by offering three of the four propositions I will advance in this paper. First, successful new military weapons routinely derive from proven technology and virtually never emerge from efforts to contrive, shape, or push immature technology in the name of perceived requirements, however well conceived they may be.[1] Second, the evolution of USAF military doctrine since World War II has been very largely driven by expectations about the rate and direction of future weapons development. Third, many—if not most—of the postwar difficulties of Air Force research and development, and many problems of defining and applying appropriate air doctrine, have developed because the consequences of basing doctrine on unrealistic technical expectations are widely misunderstood or ignored.

Some definition of terms may be in order. "Successful," for something like a military aircraft system, means timely delivery of a weapon that satisfactorily performs its assignments and at a price not much in excess of that anticipated when it was ordered. The aircraft must be able to cope adequately with its opposition. "Immature technology" can be unripe in many respects, including (and perhaps most important) being too costly; incautious efforts to exploit immature technology have routinely brought about the delayed delivery of operationally unready systems in numbers smaller than planned (because unit costs increase more often than program budgets, and quantities are reduced as prices go up). The problems begin when planners or engineers or makers of doctrine or requirements are obliged to decide whether some technology is indeed suitable for application to military needs and then to act on that decision. In recent years, the tendency has been to insist that such decisions be made very early; indeed, retrospective judgment suggests that many are made prematurely.[2]

Finally, I propose that the premise underlying both strategic and tactical doctrine in this country since World War II—that quality has an inevitable advantage over quantity—may well be overdue for revision. There are many reasons for questioning the prevailing judgment about quality versus quantity, but the most pressing is that many of the performance attributes traditionally credited with ensuring qualitative su-

periority in, for example, aircraft have become irrelevant to combat outcomes. Marginal advantages in speed, range, and altitude head that list. One is entitled to ask, in a similar vein, if a "50-percent better" CEP (circular error probable, or accuracy probability) makes one ballistic or cruise missile "better" than another when both carry nuclear warheads and the "poorer" performer has a CEP of 100 feet or less! Like excellence in close order drill as a measure of soldierly qualities, many widely acclaimed achievements of military enterprise and some assumed advantages of "advanced" technology have outlived their usefulness.

The Application of Technology to Military Ends: Hazards and Limitations

Even the most determined, brilliantly managed, well-funded effort to develop and apply technology to military ends will not in every instance prove successful. First, technology can be stubbornly intractable: in thirty years of trying, no operationally superior aircraft or missile system dependent on ramjet propulsion has emerged. The autogyro and the flying wing were extremely ingenious but flawed conceptions; they were militarily redundant because whatever promise they had was overtaken by alternative, cheaper, and better technology.

Second, the incorporation of marvelous improvements at frequent intervals has not guaranteed the continuing usefulness of some fundamental system that has outlived its time. Adding jet engines to the B–36 and B–50 extended their operational lives by several years and probably did no grave harm to the national interest; but, like adding a swept wing and an all-jet propulsion package to the B–36 fuselage—as was done to create the prototype B–60—such expedients mostly demonstrated that 1940-style airframe concepts ill satisfied the needs of the Strategic Air Command in the 1960s. Nor, in the judgment of most specialists in strategic theory, did the development and production of the B–47 and B–58 contribute greatly to the achievement of strategic superiority. Although both incorporated the very latest in aerodynamics, propulsion, and avionics, they were generally regarded as poor strategic bombers.

Third, not even the most attractive experimental development, however soundly based and well proven, can find operational employment if a matching requirement does not appear: the liquid-air-cycle engine has been languishing "on the shelf" in search of an application since its laboratory demonstration nearly two decades ago.

Fourth, a capability developed skillfully and effectively, against great odds and at enormous expense, can be wholly negated by the appearance of a superior (or cheaper) means of performing a function: heat-sink and transpiration-cooled reentry bodies became museum curiosities with the development of ablative coating for missile warheads; and the attractive

qualities of the Navy's XF-10F, a variable sweep fighter of the early 1950s, became irrelevant once the Royal Navy demonstrated that steam catapults could satisfactorily launch jet fighters from carriers. And there are areas where technological improvement effort is wasted because no need for the improvement ever develops: Wright Field engineers of the 1950s demonstrated that a supersonic turboprop powered fighter aircraft probably could be built, and there was great applause for the development of a "steerable" nose gun for fighters in 1948—but where was the need?[3]

The moral of all this is that marvelously impressive technology that contributes nothing to the solution of a critical national problem is worth no more, and no less, than a persuasively worded requirement that calls for some technological achievement scientists and engineers cannot provide.

Faith in Future Technology

Traditionally, the armed forces of the United States have been committed to the use of large numbers of conservatively designed, highly dependable weapons that could be capably operated by quickly trained soldiers, sailors, and airmen. About 1945, American military planners became excessively enamored of the promise of threshold technology. Why? The question is one to which—sadly—historians of military technology have not yet turned their full attention, though it deserves as much. At the least it is worth notice that by 1945 soldiers and sailors and (particularly) airmen (and most of all American airmen) had been very much impressed by the effectiveness of such, to them, revolutionary devices as radar, jet propulsion, and rocketry, and, most of all, nuclear energy. Without those and a very few similar military innovations, World War II could have been very much like a quick-march World War I. Note that these innovations had truly revolutionary military implications, although most informed scientists and engineers were surprised that the military had waited so long to exploit their known (but not always fully demonstrated) potential. Also frequently overlooked was the circumstance that where new technology could provide only marginal advances, and in situations where marginal advantage in (for instance) flight performance could have a much less pronounced effect than better training, or superior tactics, or great numerical advantage, the benefits of new technology became uncertifiable. Such wry calculations came less readily to mind than the injunction that "Guided Missiles Could Have Won"[4] or other military memories of the many technical and scientific advances that affected the course of World War II.[5]

Like most of their countrymen and contemporaries, American military leaders of the late 1940s concluded that almost any conceivable weapon could be built if one were willing to make a sufficient investment

of ingenuity, resources, and time. To the failure of their late adversaries to put sufficient faith in that credo was widely attributed the outcome of the war.

That is how faith was born. But to understand how it was that technology and doctrine became so interdependent and pending technology such a dominating influence, it is necessary to turn to the perceived lessons of World War II, to review some relevant events of the 1945–1957 period (the pre-Sputnik era where American technological supremacy was virtually unquestioned), and then to consider what doctrinal consequences have befallen the Air Force by reason of the recent introduction of new weapons. To keep that process to reasonable lengths, it will be necessary to discuss a few representative cases and to extrapolate from them.

To many observers looking back from the perspective of 1945, the state of doctrine and weaponry in 1939 must have seemed as hopelessly confused as before Bull Run. Notwithstanding some holdover of older aircraft, the United States Army Air Corps had by 1939 mostly completed the conversion to monoplane fighters and bombers with retractable landing gear and fully enclosed cockpits. That transition seems remarkable only if one recalls that of all the world's major air forces only those of Germany and Japan had done as much. The Royal Air Force, the Russian and Italian air forces, the Poles and the French—and the United States Navy—still were producing and operating various aircraft with fixed landing gear or open cockpits—or both. The RAF, the Russians, the Italians, and the USN *still were buying wire-braced, fabric-skinned,* wood-framed biplane fighters. In August 1939, when every operational shipboard fighter in the inventory of the U.S. Navy was a biplane, the Germans began testing the world's first turbojet-powered airplane.

Six years later, as World War II ended, three nations had substantial stocks of operational jet fighters, electronic warfare was a reality, cruise missiles and comparatively long range rocket missiles were commonplace, nuclear weapons had destroyed two cities, and virtually every military aircraft in the world was both new and technologically obsolete.

What were the prospects for the future? On design boards or in test stations, but either untried or available only in imperfect prototypes, were aircraft with swept and delta wings, turbojet engines with two to five times the output and efficiency of their two-year-old prodecessors, air-launched radar-guided and heat seeking missiles, rocket engines that if clustered could propel warheads over distances of two or three thousand miles or put satellites in orbit, automatic navigation devices that could accurately direct winged vehicles over courses of several thousand miles, sophisticated airborne radar for both fire control and bombing, and aircraft that could exceed the speed of sound. A bomber capable of flying

8,000 miles with 10,000 pounds of bombs was ready for test; virtually every new bomber in development in the United States in early 1946 was faster than the highest performance propeller-driven fighter of World War II.

It is not a great oversimplification to suggest that the new United States Air Force sensibly concluded—*en masse*—that new technology, shaped and applied as rapidly as circumstances (most budgetary) would permit, could dominate military capabilities for the forseeable future. The difficulty was that there seemed to be too many promising opportunities—and they all promised to be costly. In a sense, the first flurry of post-demobilization activity consisted of attempting concurrently to explore an infinity of opportunities: to develop fighters and bombers, and cruise and ballistic and air-to-air missiles; simultaneously, to exploit the promise of unexplored frequency bands and rocket propulsion and turbojet propulsion and rocket-assisted takeoff; indeed, to make everything in the Air Force inventory perform "better.' "

But how would all this marvelous new technology affect Air Force tactics and strategy?

The usual early USAF response to that question was to propose modest variations on the concepts and doctrines developed during World War II. Evolution of doctrine through the gradual application of revolutionary new technology was preferred, but that sometimes created difficulties. For example, without much regard for the probability that air defense missiles would diminish the primacy of strategic bombardment as it had developed by 1946, analysts concluded that the greatest threat to long range bombers in the 1950s would be—as in 1945—the fast, heavily armed, air defense fighter. Thus, one development sidelight of 1945–1955 was an effort to perfect escort fighters for B–36s and B–52s that could extend the role of the P–51s over Germany and Japan in 1944–1945. Because designers could not provide jet fighters with cruise ranges of several thousand miles, they turned to such alternatives as parasite aircraft to fit the bomb bays of B–52s and B–36s, and fighters towed behind bombers or coupled to their wing tips. Aerial refueling was seriously considered for escort fighters well into the 1950s.[6]

The menu of promising opportunities seemed endless and irresistable. How was one to know in 1948 if he were overlooking an opportunity that could lead to the 1960s equivalent of BTO (bombing through overcast), or radar gunlaying, or jet propulsion? The legend of the secret weapon that might have won, and the bomb that did, persisted as both threat and goal. The Manhattan Project was proof that if sufficient manpower and brainpower and money were wisely invested in a well managed undertaking, however difficult, it could be successfully concluded. To ask "How difficult?" was to display an unseemly lack of faith. "How much?"

was heard more often, but "this will be worth any price, we can't afford not to have it" was the usual response. If the Manhattan Project seemed too grand an example to be emulated every few years, the Air Force had its own model: the development of the B–29 during the war. If the Hiroshima bomb represented a triumph of scientific will, the B–29 was certainly the most remarkable instance of integrative engineering successfully brought off by any air force and perhaps the best instance of how money and manpower could humble virtually any intransigent technology. Or so it seemed.

Technology and Doctrine: The Case of the Ballistic Missile

It was in that environment, with those perceptions, that the new United States Air Force set out in 1948 to develop and put into its squadrons the weapons that would make the nation secure for generations to come. Possessed of a nuclear monopoly that had yet to experience challenge, with its native scientific talent reinforced by the German creators of the V–1, the V–2, the Me–163 and Me–262, the United States seemed capable of nearly anything. And although the principal architects of Air Force doctrine foresaw several decades during which bombers, and then bombers complemented by long range cruise missiles, would continue to dominate strategic forces, they recognized that the intercontinental ballistic missile had eventually to be reckoned with.

Early U.S. work on ballistic missiles was stimulated by German example—the V–2—but was to some extent constrained by the premise that an intercontinental missile was at least a decade away and by the virtually unchallenged conclusion of American airmen that the long range bomber was by a considerable margin a more effective weapon. Indeed, until June 1944 all Allied intelligence authorities (if not all analysts) were agreed that no German rocket would ever be fired at England. The British assumed that no warhead smaller than five tons could be militarily effective (which ignored British and American experiences with half-ton and one-ton bombs) and that a missile large enough to deliver such a payload could not be developed in time to affect the course of the war.[7] The second assumption was reasonably sound, although it was dependent on the length of the war. But the first expressed a preference rather than a valid conclusion; as it happened, the Germans had different perceptions. Although the notion of an "invulnerable" delivery system underlay the German decision to build large quantities of V–2s, it was true that to the Germans a ballistic missile carrying one ton of explosive and costing about $45,000 was quite as sensible an investment as a $50,000 bomber that was likely to be shot down—together with several skilled airmen who could be put to better use elsewhere.

In any event, although the Americans were attracted to the concept of a ballistic missile, they felt no particular sense of urgency about it.

Initially, they settled for a slightly funded research project that had as its goal the somewhat unrealistic combination of 5,000-mile range and 5,000-pound payload, although all concerned were privately willing to concede that what was immediately sought was a means of exploring and demonstrating various aspects of technology. Actually, the vital ingredients of a medium-range ballistic missile were mostly within reach by 1947, excepting a nuclear warhead and proven means of warhead reentry, but few realized it. In any case, the delayed consequences of the postwar budget cutbacks caused the Air Force to drop all plans for ballistic missile development in July 1947. Of the twenty-eight missile projects established a year earlier, the two chief survivors with nominal application to the strategic mission were what later became Snark and Navaho. Both were cruise missiles also expected to carry 5,000-pound warheads 5,000 miles, although most other specifications were vague. (At various times Snark was to be subsonic or supersonic, air launched or ground launched, and was to rely on any of several different guidance schemes.)

The logic of the decision to drop ballistic missile development has been derided in later years, but mostly for the wrong reasons. American decision makers chose what they thought to be the safe assumption that evolutionary development along familiar lines would surely lead to the availability of a strategic missile. What were the "safer" lines? Application of turbine engine improvements, aerodynamic advances, and perfected autopilots to early cruise missiles, with ramjet propulsion and stellar-inertial guidance following along at some later date, was a preferred policy. The appreciation that a highly accurate 5,000-mile ramjet-powered cruise missile—and particularly one that was boosted to 70,000 feet by a rocket and thereafter flew at sustained supersonic speeds—was a more ambitious undertaking than the atomic bomb, much less the B-29, was seldom to be heard. Fifteen years and several hundreds of millions of dollars later, that appreciation still was not widespread.

Nor were the scientists on whom the American services relied for advice in the late 1940s notably enthusiastic about the future of a ballistic missile. Indeed, their most vocal spokesman—and the individual whose advice was most eagerly sought by the Air Force—openly ridiculed advocates of the long range rocket. Vannevar Bush told Congress, "I say technically I don't think anybody in the world knows how to do such a thing [make an accurate, nuclear armed intercontinental ballistic missile] and I feel confident it will not be done for a long period of time to come."[8]

Technical uncertainty, then, was a prime reason for discounting both the need for and the probability of obtaining ballistic missiles. The chief obstacles were still assumed to be guidance accuracy, rocket engine adequacy, and means of warhead re-entry. None of these difficulties and

nothing comparably unfamiliar troubled the perceptions of the cruise missile developers. They had no reason to doubt that they could perfect their chosen instruments of strategic warfare. For that matter, bomber program managers had only lately conceded that many of their casually accepted performance, schedule, and cost goals were unachievable.[9]

In 1950, the Atomic Energy Commission demonstrated experimentally what many nuclear scientists had contended earlier, that both lightweight fission weapons and eventual fusion weapons were feasible. The era of nuclear scarcity ended. At the same time, some members of the Air Force began to question whether manned bombers could successfully operate in an environment that included both sophisticated radar and high performance missiles. Finally, continuing work on rocket engines, principally in support of the rocket-boosted Navaho, made the ICBM propulsion problem seem manageable, although most military experts thought that completing development would take another ten years. Striking optimism about guidance technology was also evident, but the implications of stable-platform research and of miniaturized electronic components were not widely recognized.

Early in 1950, Air Force planners began to reassess their long-term missile requirements, and by the end of that year the Air Council had recommended establishment of a relatively slow-paced ballistic missile development project—the Atlas—to extend over nearly fifteen years. Underlying that recommendation was the assumption—expressed as strategic doctrine—that manned bombers would remain the backbone of strategic air power until at least 1965 and that increasingly more effective long-range missiles (Snark, followed by Navaho) would gradually be inserted into the inventory in the mid and late 1950s. The first operational intercontinental ballistic missiles were slated for deployment toward the middle or end of the 1960s.

Even though by that time progress had been considerable, there was mounting evidence that expectations of a smooth transition from increasingly proficient manned bombers to "unmanned aircraft" (as cruise missiles were officially called) had been unrealistically optimistic. And any sensible military engineer expected ballistic missiles to be even more difficult to perfect. Moreover, to those concerned with the effectiveness of the strategic forces in the early 1950s, the uncertain accuracy of the ballistic missile made it unattractive as compared to a manned bomber. Consequently, the Air Staff felt no particular urgency about accelerating the slow-tempo program initially approved. Indeed, had it not been for the sudden increase in military appropriations that attended the start of fighting in Korea, it is unlikely that the Atlas program would have obtained even the slight funding needed to get it into preliminary development.

In 1953, after disengaging from the Korean affair, the Eisenhower administration announced a new doctrine of national defense policy, subsequently dubbed "Massive Retaliation." It expressed a pronounced national aversion to any future commitment of American ground troops to large-scale fighting anywhere on the periphery of the Asian Communist world and the intention of using nuclear weapons delivered by the Air Force as the primary instrument of national force.

Almost concurrently, but for different reasons, the Department of Defense began to give serious consideration to accelerating the undernourished ballistic missile program. Although no great technical advances had been demonstrated since 1951, a number of respected experts now believed that an ICBM could be developed in no more than four or five years. The "Strategic Missiles Evaluating Committee," established in late 1953 to identify and cancel the less promising of several Air Force missile programs, endorsed an Atlas program acceleration and expressed grave doubts about the probability that several of the more "conservative" aerodynamic missiles would ever see active service.

That judgment certainly was not equally welcome in all areas of the Pentagon. Senior air officers remained convinced that cruise missiles were better prospects and, that if more money were to be spent anywhere, it should be on the new bombers (B–52 and B–58) due for delivery during the next three years. The Strategic Missiles Evaluating Committee, chaired by John von Neumann, had the ear of the Secretary of the Air Force, however. They concluded that the existing accuracy requirements for ballistic missiles (expressed in hundreds of feet) were preposterous; in the absence of good targeting information, any missile exchange would involve the Americans in "city busting" whatever their inclinations, so extreme target accuracy was an illogical requirement. The von Neumann group and its supporters agreed on the need to develop a ballistic missile quite different in many respects from those hitherto sponsored by the Air Force. Recognizing the institutional obstacles to rapid development of ballistic missiles, the group also urged that the development effort be separated, in all respects, from those being conducted by the regular air establishment, thus insulating it from prospectively hostile treatment.

By January 1955, a new ballistic missile program had been shaped. Although obstacles were numerous and varied, within a year parallel development of alternative rocket engines, guidance systems, airframes, re-entry bodies, launch techniques, and staging methods was in train. By 1956, when Army Chief of Staff General Maxwell Taylor first urged that a strategy of flexible response be substituted for massive retaliation, Atlas, Thor, Titan, and Jupiter were impending; and work had begun on what would become Minuteman. In 1957, Henry Kissinger argued the likelihood of and the prudence of preparing for limited nuclear war rather

than for expanded conventional war responses to peripheral threats. Sputnik and the "missile gap" allegations followed, not much ahead of the first salvos in the presidential campaign of 1960.

When the Kennedy administration came to power in January 1961, it enunciated a new set of strategic principles embodying graduated response and a counterforce strategy. All were fundamentally predicted on the use of the Atlas-Titan-Minuteman force plus the nearly ready Polaris missiles. Thor and Jupiter were to be retired from their European emplacements, having outlived their usefulness in only three years. The subsequent decision to abandon the costly emplacements because their vulnerability made them attractive targets represented a further application of the same logic. None of the withdrawn missiles had real second-strike capability and their existence represented a temptation to a missile-armed opponent to strike first, perhaps touching off the sort of spasm war the graduated response policy was intended to offset. Technology had proceeded so rapidly during the first five years of the ballistic missile era that by 1963 the missiles of 1960 were as obsolete as B–17s, and, unlike old bombers, nuclear tipped missiles were not suited to fighting brushfire wars.[10]

Perhaps the most striking indication of evolutionary change in technology and weapons concepts over the years from 1945 to 1963 is that by the later date ballistic missiles were the nation's chief instruments of strategic warfare, entrenched so securely in both doctrine and force structure that proposals for alternative or supplemental strategic weapons encountered impressive objections. That was precisely the reverse of the situation before 1957, when the ballistic missile was the handicapped competitor in a contest with cruise missiles and manned bombers, the chosen instruments of those earlier years.

For nearly a decade, objections to American reliance on ballistic missiles began with the contention that they were technologically incapable of doing what was required of them. Whether they could be developed at all was argued into the mid-1950s; their military qualities were widely discounted for another five years. These were not academic exchanges, confined to the isolation of staff offices and briefing rooms. They concerned important issues, both doctrinal and institutional, although the advocates of extensive reliance on ballistic missiles accepted with uncharacteristic indifference the evidence of a perpetuation of the bomber concept enunciated in the mixed force concept of 1957. In the event, the deployment of substantial numbers of missiles permanently affected the composition and structure of the strategic forces, working to the ultimate disadvantage of the manned bomber. Between 1951 and 1962, nearly 3,000 jet-powered strategic bombers entered the inventory; by the end of the latter year, it was plain that relatively few would be

replaced as age and wear had their effect. Ballistic missiles had become the dominant weapons of the United States. Yet until the certainty of that event had become apparent, there was relatively little discussion of its consequences.

Technology and Doctrine: Efforts to Ignore the Ballistic Missile

The analysis that underlay the 1954 decision to proceed with ballistic missile development was characterized by technical astuteness and scientific insight far above the ordinary, but doctrinal consideration was narrow and tightly hedged. For the next decade, many of the wide-ranging consequences of that decision were ignored; institutional infighting was frequent, as though the most important national issue was whether the airplane drivers or the missile sitters should rule the Air Force.

Most critics who had misgivings about the eventual effects of heavy reliance on ballistic missiles had a mistaken instinct for the sorts of arguments that best supported their case. They ignored significant factors that might have buttressed their case until missiles had expropriated many of the functions of the bomber. Early suggestions that it would be advisable to create an alternative to massive deterrence—a "graduated response," or "limited nuclear option"—were initially spurned by "the airplane drivers" until they found it expedient to argue for preserving bomber aircraft capabilities on remarkably similar grounds. It was paradoxical that a strategy and doctrine based on the creation and preservation of response options was opposed by its ultimate beneficiaries until the most attractive option had all but lapsed.

Cultural and institutional resistance to the innovation represented by ballistic missiles was only one reason for their relatively slow acceptance by strategic planners. Failure to take appropriate account of the unpredictability of technology was another. The notion that ballistic missiles would eventually come along in the evolutionary wake of increasingly complex cruise missiles dominated strategic planning from 1946 to 1954. Indeed, it was not until 1957, when it became all too obvious that an operational Navaho could not possibly precede an operational Atlas, that the "orderly evolution" misconception finally decayed.

Where strategic doctrine was realistically coupled to capability—which meant in the near term only—it remained relevant. The expectation that intercontinental cruise missiles would be developed quickly and at modest cost, however, reinforced the tendency of planners to extrapolate doctrine from existing capabilities; and the restatement of bomber-plus-cruise missiles concepts in long range planning documents reinforced the tendency to fund cruise missile development first and ballistic missiles least. The consequences of a different sequence of events from that postulated were not much explored.

Were there other instances in which fuzzy doctrinal assumptions interacted with immature technology to lead planners astray? Single cases do not adequately prove broad theses; yet multiple instances are not much more likely to convince when conventional wisdom is being challenged. Indeed, even if all the evidence points to conclusions that contradict ingrained belief, the evidence is likely to be ignored. Nevertheless, there is abundant support for the proposition that planning preferences expressed as requirements have little influence on the course and rate of advancing technology.

Engineering logic suggested (even insisted) that a turboprop variant of turbine propulsion would be the first successful application of jet propulsion to long range aircraft. Russian designers were so committed to that assumption that they made no serious efforts to develop long range turbojet bombers or transports during the years when American and British designers were creating the B–47, KC–135, Comet, B–52, and V-series bombers. That was one reason why Soviet progress in the development of long range aircraft lagged well behind that of several Western states, notwithstanding a considerably larger Soviet investment and a starting point that was not greatly different. In the United States, the turboprop-powered bomber never appeared (the only promising candidate was expeditiously redesigned to become the B–52!); only one American civil transport designed for that power plant was widely used (Lockheed's Electra); and, except for re-engined passenger aircraft, the turboprop was mostly applied to a few specialized military transports which had slight commercial attractiveness. (The C–130 was the only important exception.) Notwithstanding all that, until the late 1950s many military planners both persisted in the conviction that turbojet engines would ultimately give way to turboprops in many applications and invested substantial development resources in the effort to bring that about. It never happened."

Similar circumstances surrounded the recurrent assumption that air-to-air missiles would entirely supplant conventional (or slightly unconventional) rapid-firing guns as fighter armament, a thesis that on two occasions in two different decades led to the production of missile-only USAF fighters, and twice had to be abandoned. However compelling the anticipation than an operationally adequate IFF (Identification Friend or Foe) device would appear, and however attractive the doctrine that prospect induced, the "adequate IFF device" has eluded designers and engineers for the three decades since 1944, when R. V. Jones first convinced the British Bomber Command that German night fighters were using IFF as a target indicator. Finally, nuclear propulsion for aircraft remained so attractive that the United States continued to support its

development well after its economic and technical infeasibility had been convincingly demonstrated.

The Gap Between Invention and Application

These and similar cases share a common trait. It is not the laboratory-scale demonstration of some technical capability that proves difficult, but the eventual transition to operational utility. Science is not the obstacle; it is engineering. All of the devices mentioned above demonstrated nominal feasibility; every major feature of Navaho and Snark worked modestly well—in isolation; marvelously ingenious IFF devices were successfully tested; the turboprop was a more efficient user of turbine power than a turbojet; variable-sweep aircraft were safely flown by 1950; flight-capable nuclear heat sources were both designed and constructed, several times; ramjets have powered many flight vehicles, and so on. What was lacking, in all of these cases, was an application that engineers could cope with at reasonable cost and in reasonable time, and a level of operability that did not demand greatly more in precision or reliability or effectiveness than had actually been demonstrated. In the genre of ballistic missiles, the Thor is a marvelously useful example of the successful application of the art of the feasible: it represented the packaging of available propulsion, guidance, and warhead reentry technology in a relatively conventional airframe, and hence proceeded from project definition to initial demonstration in little more than a year and to full-scale operational test in precisely three years. In that same period, the Navaho program schedule slipped one year for each year the missile remained in development. The contrast is instructive.

In the end, ballistic missiles were rather quickly carried through advanced development and, in their employment, significantly altered earlier doctrinal concepts and national policy. Intercontinental cruise missiles became quaint themes for military historians because guidance, propulsion, and reliability elements refused to conform to the expectations of those who prepared strategic doctrine. Bombers, whether manned or unmanned, did not remain the dominant elements of strategic force in the 1960s and 1970s, as planners had anticipated. Indeed, the effort to upgrade the bomber, to make it the technological equivalent of the ballistic missile, and thus to extend its dominance, failed in the 1960s and 1970s, perhaps because it paralleled the course of cruise missile development in the 1950s: costly and demanding efforts to achieve high but not necessarily relevant performance when more direct, less expensive, and politically more attractive courses remained available.

Similar consequences have followed efforts to subordinate technology to doctrine in areas other than strategic warfare. Interdiction and close air support are important responsibilities of the Air Force; their

performance, in future battle areas, has been imperiled by effective anti-war air weapons against which conventional defense suppression techniques, however enriched by improved technology, have been less than fully effective. Suggestions that air doctrine be altered to conform to such "realities" has not been wholly welcomed.

Quality versus Quantity

The quality versus quantity issue is not an obvious candidate for treatment in such terms. But to the extent that qualitative advantage is honored much more highly than quantitative in U.S. air doctrine, there is a connection. Some areas of technology are much more likely to promote rapid changes in operational concepts and applications than others. Thus the introduction of a novel device with great effectiveness—an omnidirectional air-to-air missile, for instance—would presumably have a pronounced effect on the outcome of air battles. It would impart to its possessors a very substantial advantage, perhaps making conventional air-to-air tactics and the fighters designed for them obsolete.

The addition of a marginal improvement that gave one nation's fighter aircraft a 10 percent edge over others (however that was calculated) would have a much less marked effect. Indeed, if the air force with the "inferior" technology had superior pilots, or better tactics, the difference might well go unnoticed. That was more or less what happened in the Winter War between Finland and the Soviet Union, in initial engagements between F–80s and Mig-15s in Korea, and in some other well known cases. There appears to be little doubt that superior numbers and roughly equal quality give one a clear advantage: American and British fighter pilots benefited from that circumstance in the closing months of the war with Germany. It is generally conceded that the German introduction of Me-163 rocket fighters in significant numbers could have made Allied bomber losses unbearable, and the Me-262 fighters were completely superior to all operational Allied fighters of 1945. But there is no real evidence that slight performance advantages can be decisive or that they cannot be readily countered by either modest infusions of new technology or intelligent changes in tactics or doctrine. Certainly the experience of the United States Air Force in Southeast Asia between 1965 and 1972 would bear out that premise, confirming the relevance of air combat outcomes over Korea nearly two decades earlier![12]

These broad statements are but slightly supported by careful historical analysis. It is an area in which historians have traditionally deferred to statisticians and operations analysts. But there is much to be said for exposing such issues to historical research techniques—which, to the dismay of some and the glee of others, have been appreciably altered by the widespread availability of devices that comfortably can process enor-

mous quantities of data. It is prospectively as risky to trust in the "quality beats quantity" premise as it was to repose faith in the notion that evolutionary development would insure the ultimate appearance of intercontinental cruise missiles, or that the bomber always gets through. The assumption that technology and doctrine will alike change in traditional, evolutionary ways is comfortable, but it is not necessarily true; and, as some of the instances noted above suggest, it may also be an invitation to disaster.

Has all this been an abstract exercise in historical research? Or does a better understanding of the interaction of technology and doctrine and the derivation of requirements have current relevance for the Air Force and for the nation? Part of today's history, and tomorrow's, is a complex of doctrinal and technological issues that includes an aging bomber force, parity in ballistic missiles, a risky basing policy for U.S. strategic missiles, cruise missiles of a new sort, enlargement of an old arms limitation agreement, and a host of issues having to do with modernization of the equipment base for NATO. The century may afford few years in which it still will be possible to bring changing doctrine and emerging technology into concert with one another or to choose among technologies on grounds other than their seeming budgetary advantages.

The history of the past thirty years suggests that Air Force doctrinal planners may again find themselves compelled to alter operational concepts, basing options, and force structure to be consistent with the attributes of a set of technologies favored because of their nominal cost effectiveness, political attractiveness, or apparent availability. In the past, the consequences of such compromises have not often been advantageous to the Air Force—or the nation. There is much to be said for promptly acknowledging and realistically dealing with the influence of technology on the formation of doctrine.

Notes

1. Dr. Horst Boog (in a companion paper) has observed that the inability of Luftwaffe leaders to appreciate that technology does not obey military commands, however smartly voiced, was a substantial contributor to the 1943–1945 decline of that air force; and Dr. K. R. Whiting has remarked (in another paper for this symposium) that a delayed but sufficient Soviet appreciation of the relevance of air technology to tactical air doctrine had much to do with the revival of Soviet air power between 1943 and 1945. So many and so blatant are similar examples that the historian of technology is bewildered by the persistent assumptions (of those who compose "requirements") that the pace and direction of technology can be forced into channels arbitrarily selected by the armed services.

2. A. J. Harmon, *et al., A Methodology for Cost Factor Comparison and Prediction,* The Rand Corporation, RM-6269-ARPA, August 1970; R. L. Perry, *et al., System Acquisition Strategies,* The Rand Corporation, R-733-PR/ARPA, June 1971; R. J. Art, "Why We Overspend and Underaccomplish," *Foreign Policy,* No. 6, 1972.

3. See J. Jewkes, D. Sawers, R. Stillerman, *The Sources of Invention,* Macmillan, London, 1958; M. M. Postan, O. Hay, J. D. Scott, *Design and Development of Weapons (HMSO, London, 1964);* by far the most fascinating discussion of the interaction between innovation and requirements is E. E. Morison's classic *Men, Machines, and Modern Times,* MIT Press, Cambridge, 1966; a more limited but relevant piece is Robert Perry, *Innovation and Military Requirements: A Comparative Study,* The Rand Corporation, RM-5182-PR, 1967.

4. J. W. Angel, "Guided Missiles Could Have Won," *Atlantic Monthly,* December 1951.

5. The effects of that remarkable set of years are well represented by such as R. V. Jones, *The Wizard War,* Coward, McCann and Geoghegan, New York, 1978; and R. S. Macrae, *Winston Churchill's Toyshop,* Walker and Company, New York, 1971. There are many others in the "gee whiz" category, of course, most notably the accounts of German weapons development and its almost realized (!) potential. See, in particular the 14 *Toward New Horizons* reports prepared by the Army Air Forces Scientific Advisory Board under Theodore von Kármán, Chairman, 1945.

6. See M. S. Knaack, *Encyclopedia of U.S. Air Force Aircraft and Missile Systems,* (Volume 1, Post-World War II Fighters), GPO, Washington, 1977, pp. 312–313; G. Swanborough and P. M. Bowers, *United States Military Aircraft Since 1908,* Putnam, London, 1963, pp. 466–769.

7. David Irving, *The Mare's Nest,* Kimber, London, 1964, pp. 44–45.

8. Vannevar Bush, who had been chairman of a special committee on new weapons for the JCS, in testimony before the Special Senate Committee on Atomic Energy, December 1945; also see *Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services, Part 1,* November 1957 (85th Cong., 1st sess.).

9. See R. L. Perry, *The Mythography of Military R&D,* The Rand Corporation, P-3356, May 1966; and Perry, *et al., System Acquisition Strategies.*

10. For the early history of ballistic missile development, see E. M. Emme, editor, *The History of Rocket Technology,* Wayne University Press, Detroit, 1964. Other near-contemporary accounts of interest include J. L. Chapman, *Atlas, The Story of A Missile,* Harper and Brothers, New York, 1960; and J. Hart, *Mighty Thor,* Dvell, Sloan and Pearcel, 1961. The "missile gap" issue, and pre-1957 concepts and doctrine, are addressed in *Hearings Before the Preparedness Investigating Subcommittee . . . ,* U.S. Senate, 85th Congress, 1st and 2nd Sessions, November 1957 and January 1958.

11. It sometimes is forgotten that the turboprop variant of the B-47 actually was built—for test purposes—and that a similar modification was scheduled for B-52s at one point. The curious history of military interest in turboprop propulsion has yet to be completed, although it clamors for attention.

12. See R. F. Tolliver and T. Constable, *Fighter Aces,* Macmillan, New York, 1965; J. N. Merrit and P. M. Sprey, "Quality, Quantity, and Training," in *USAF Fighter Weapons Review,* Summer 1974, pp. 7–14; R. F. Futrell, *The United States Air Force in Korea, 1950–1953,* Duell, Sloan and Pearce, New York, 1961.

COMMENTARY BY A SCHOLAR

I. B. HOLLEY, JR.

My marching orders for this session were twofold: (1) to comment on the two papers presented, and (2) to suggest issues and areas as yet inadequately treated by historians of air power. The underlying objectives of the symposium as a whole, of course, have been to stimulate historical research on air power, a remarkably undeveloped study in view of the importance of the subject, and, secondly, to foster historical mindedness among Air Force officers. One only has to look at the scanty treatment Air Force history receives in the curricula of our centers for professional military education, the Air War College and Air Command and Staff College, to appreciate the need for such encouragement.

I comprehend the history of air power as embracing two elements, an inner and outer face, as it were. The outer face is obvious: it discusses operations, the strategic and tactical application of air power. The inner face deals with the means, the means which make air and space operations possible. In this session on technology and warfare we are largely concerned with the means.

Before taking up the two papers, I want to offer a couple of observations arising out of more than thirty years spent considering the means and the problems encountered in providing suitable weapon systems.

My first observation has to do with my fellow commentator, General Bryce Poe. At a conference in the Pentagon several weeks ago he recalled how upset he was when he learned of his assignment to head the Air Force Logistics Command. As he put it, "they dragged me out of the cockpit, kicking, and I left my fingernail scratches on the runway protesting every inch of the way." This is an entirely understandable reaction; traditionally the materiel field has *not* been the road to high command. The Navy has her EDO or Engineering Duty Only officers, specialists and technicians rather than commanders. The Air Force hasn't made this distinction so clearly, but the problem remains nonetheless. Officers who have specialized in such fields as research and development, acquisition, supply, maintenance, etc., do not normally rise to the very top. Occasionally, the Air Force takes a promising leader from a career in operations and puts him in Logistics Command to groom him for higher responsibilities. But a *career* in logistics, or on the materiel side, seldom leads to four stars.

The consequences of this prevailing practice are many and profound. For our purposes here, the most important consequence has been the relative lack of interest in serious historical studies across the whole logistical spectrum. And lack of interest leads to lack of support.

My second observation concerns the Air War College. It must be obvious to any observer that electronic warfare is a subject of vital concern to the Air Force. One would assume that at the Air War College, the professional school for bright, able colonels with their eyes set on flag rank, electronic warfare would constitute a significant bloc in the curriculum. But this year, when an effort was made to organize a research seminar on electronic warfare to engage some of our best minds on the multitude of unsolved doctrinal problems, only *one* student officer expressed any interest. The others all shied away from it.

Why is this so? Because it's not the perceived road up; it's specialist territory, or so they think. One must confess, there is evidence to support their perceptions. For example, how many Air Force general officers are there who have come up from careers specializing in electronics? I keep asking this question, but never get an answer.

If aspiring colonels have shied away from careers in such technical specialties as electronics, have the historians done any better? We desperately need historical studies of Air Force experience in electronic warfare as a basis in the formulation of doctrine, but so far there have been almost no takers. For officers and historians alike, the drama of military operations, of battle, fuels intense interest in this direction. There are problems just as challenging in the logistical sphere, on the materiel side, and they are just as vital to national survival. But few write about them.

So the great challenge before us comes down to these two questions: (1) How can we induce more of our able young historical scholars to enter the materiel field, and (2) how can we provoke greater interest in such studies on the part of those in positions of influence and command?

Let us turn now to the first of the papers, Alex Roland's "The Impact of War Upon Aeronautical Progress." Unless one has worked in the history of technology, it would be easy not to appreciate just how valuable Alex's introductory essay on the literature of the field really is. Truly objective and informed appraisals are exceedingly hard to come by. This feature in itself makes the paper well worth reading. But there is much more besides.

More significantly, in my opinion, Alex makes a highly important contribution to the history of technology when he calls for an "intellectual history of aeronautics." What we get, all too often, are descriptions of

hardware; what we most need is a great deal more attention to the creative process behind the hardware. How are the goals, the performance specifications, defined, and by whom? What are the assumptions, conscious and unconscious, of the formulators? What are the prevailing constraints, and why do these constraints act as they do? In this connection one would do well to consider the broader implications of unwitting psychological restraints. For example, how long did we put off going to the moon because the idea was preposterous, unthinkable? As Stephen King-Hall, the English MP and news analyst, used to say, "What is thinkable is doable," a thought which recalls Lewis Mumford's perceptions on the high utility of science fiction in unlocking our preconceptions and prejudices about what is do-able and what is not.

Admittedly, the kind of intellectual history of technology, or air power, which Alex Roland calls for is exceedingly difficult to write. What is more, the necessary primary sources are hard to root out. But this *can* be done by resourceful historians.

To recapitulate Alex Roland's pivotal ideas, then: What we need is a history of the ideas behind aeronautical innovation and how those ideas evolve. This in turn will require a far deeper and more subtle penetration of the primary sources than most of us have previously made, asking new and difficult questions, as Alex has done, of the evidence. If we do this, and do it well, perhaps even the decision makers will start reading and benefiting from what we have to say about the technological side of the history of air power.

Now let me turn to nit-picking with regard to Alex Roland's paper. One is surprised to find no mention of the Guggenheim grants of the mid-1920s, especially the cash which endowed aeronautical engineering schools in six or seven universities. Dick Hallion of the Smithsonian Air and Space Museum has written an interesting book on how these schools eventually sent a flow of aeronautical scientists and research engineers into the aircraft industry of the United States. Surely this broadening base of talent had much to do with the post-World War II decline of NACA which Alex laments in his paper.

Further, Alex presents the increasing role of industry in deciding what research NACA would undertake in terms of a "power alliance" between the military and industry, a kind of forerunner of the "military-industrial complex." That phrase has become a cliché rising readily to our lips in recent years, but must we interpret the relationship as a sinister plot of the big interests engaged in subverting the public good intended by the Progressives when they enacted NACA in 1915?

How could NACA ever hope to retain her prewar role as "arbiter"? The situation had changed radically since the prewar years. In that period,

scientific talent was decidedly lacking in the armed forces. Even in industry really top-drawer scientific talent was spread thin. What is more, so-called R&D money was invested almost entirely in development or applied research and not in fundamental or scientific research. Funds for fundamental research were either nonexistent or doled out with an eyedropper. In the post-World War II era, however, all this had changed; Guggenheim-backed schools and others had turned out a flood of talent. The Air Force was now spending millions on R&D, much of it in fundamental research, awarding such contracts not only to the universities but to the aircraft manufacturers as well. The latter now had elaborately equipped research labs and qualified staffs to a degree unknown before the war.

Under these circumstances, how could a few individuals under NACA auspices, no matter how talented, claim to enjoy a perspective and detachment necessarily superior to that of industry and the military?[2] One may well ask, are market-oriented decisions on research inherently inferior to bureaucratic decisions? Further, " industry," as epitomized in a word by Alex Roland, can't really be treated as a monolithic entity. Surely the *intra*-industry clash of competitive interest, competition for tunnel time, and other calls on NACA facilities, serve to check or balance out the more egregiously self-serving amongst the competing claims of individual manufacturers.

One might further observe that it was not "industry" as a coherent, unified, managerial entity which pushed for a large role in making decisions on NACA research but individual scientists and engineers *within* industry who did so. These scientists and engineers cannot uniformly be identified as synonymous with management. Indeed, they are often at odds with management. Their collective behavior is sometimes far more akin to that of university scientists than to the conduct of businessmen. Their bosses not infrequently complain that they are more interested in pursuing scientific knowledge for its own sake then in perfecting practical end products which bring profits.

Alex may also have overlooked the ever-important factor of human personality. Did air arm officers and industry representatives veer away from NACA in the post-World War II era when opportunity offered because they found NACA official John Victory a difficult man with whom to deal?

The foregoing criticisms of Alex's paper only serve to highlight the important clues he gives us, clues providing helpful directions toward further research on the "inner" history of air power. Hardware studies oriented around individual weapon systems, such as the F–15 or the A–10, will continue to be written—and will be useful if well done. But the really important frontier for materiel studies cuts across individual hard-

ware items. The most rewarding studies will look to relationships between creative designers and decision makers and the institutional matrix in which they appear—the armed services, the individual manufacturers, the aeronautical industry in its collective or associational garb, NASA, Congress, the universities, and the like. In sum, the most rewarding historical studies will be those written around the significant ideas and concepts which lie behind the weapon systems and related equipment which constitute the cutting edge of air power.

Perhaps I can clarify somewhat the distinction I'm trying to make between histories of hardware and histories of ideas by contrasting two different types of professional journals. If you read *Technology and Culture,* the journal of the Society for the History of Technology (SHOT), you will find that most of the articles deal with underlying concepts, ideas. By contrast, if you pick up almost any one of the aviation journals, you will find that virtually all the articles are descriptive and institutional, seldom analytical, and infrequently offer serious treatments of their underlying concepts.

Turning now to Bob Perry's paper, "The Interaction of Technology and Doctrine in the USAF," it seems to me that essentially the same kind of message that we found in Alex Roland's paper emerges here, even though the two authors are working in different media, and even though Bob Perry certainly never put the label of intellectual history on his pitch.

To begin with, Bob is telling us historians that it will do little to advance our understanding of air power if, for example, we write a history of Project SNARK. Such a project might be interesting and useful, but it will do little to enlarge our grasp of what really fuels technological advance—and what retards that advance—if we fail to get at the story behind such individual weapon systems. For that matter, it will do little good to look at whole programs unless we probe more fully into the assumptions and preconceptions of the planners and their commanders.

What Bob calls for, along with Alex Roland, is intellectual history of the most sophisticated sort. What were the unspoken assumptions of the planners? Did they in fact put too much faith in the "inevitable advantages" of technological superiority? Did they, in consequence, place undue trust in over-the-horizon, yet to be developed technologies? Did this excessive faith in hither edge of the art quality in fact cost the taxpayers excessively in outlays of defense dollars and in delayed deliveries? Has doctrine "pulled" technology more often than technology has "pushed" doctrine? These are all excellent questions which Bob raises.

Bob Perry's central thrust adds up to a damning indictment of the procedures used by the Air Force over the past thirty years for concocting

doctrine and the substance of that doctrine itself. Few of us who have studied that doctrinal process will be inclined to take issue with his criticisms. Even the officer who heads up the Air Force Systems Command, General Alton D. Slay, admits that the services have "all too often" leaped into what he calls a "premature hardware choice" without adequate prior scrutiny and in-depth study of the requirement for a given weapon system and its doctrinal implications.* As a matter of fact one may detect in Bob Perry's contentions faint overtones of Office Management and Budget Circular A–109 and Department of Defense directives 5000.1 and 5000.2, which have recently forced the services to demonstrate formally and precisely how a proposed acquisition will meet mission needs. Under such a regime, if actually enforced, there should be no more instances of heavy outlays on pie-in-the-sky unproven technology.

On the other hand, while the directives from OMB and DOD may give a needed corrective along the line of Bob's criticisms, there is always, as he suggests in his conclusions, a danger that the pendulum may swing too far. There's always the possibility that too much insistence upon full justification in advance will end up by stifling innovation. This danger is especially acute where the stifling or slowing of pace holds out the promise of high dollar savings and can therefore be presented to the voters in appealing garb.

Fortunately, there is a built-in corrective in the form of zealous manufacturers whose imaginative designers and resourceful engineers, no less than the scent of profits, keep tempting the services with the lure of ever more spectacular performance. This leads me to a final observation about the subject matter of the two papers presented here.

For every weapon system there are two crucial elements, although they are not always recognized as such. These are: hardware and doctrine, which is to say, the weapon itself and guidance on the best way to employ it.

For hardware, we have a built-in incentive for progressive improvement; this is the profit motive of the manufacturer and the intellectual involvement of his designers who often pursue perfection as an end in itself in much the same way as the scientist does. But whether the motive is gain or sheer joy in the game itself, their enterprise drives on the pace of innovation.

On the other side of the equation, the doctrinal side, there is no such powerful actuator. No profit motive inspires a continual and relentless

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*"Managing Modern Electronics," *Air Force Magazine* (July 1978). p. 43.

search for the perfection of doctrine. No competitive entrepreneural drive goads the perpetual scrutiny of doctrine in search of improvement. As a consequence, the evolution of doctrine has tended to lag dangerously. Only in war, when the motive is survival itself and the test of adequacy is daily evident, does doctrine experience an inexorable pressure to improve.

There are other reasons, perhaps, for the lag in doctrine. Hardware is tangible; doctrine is intangible. We are a nation given to material solutions. In the past we have sought to out-produce our enemies as the road to victory. But what happens when, as Bob Perry points out, budgetary limitations prevent us from pursuing every promising technological innovation in the quest for qualitative as well as quantitative superiority? Then, if ever, there is a premium on better doctrine, better employment.

Our tendency as a nation to scant the intangible, to exalt hardware over ideas, now arises to haunt us. We are Romans rather than Greeks. Can we find some way to improve our formulation of doctrine within this context? Can we find some Hamiltonian solution which will provide internal, intrinsic incentives which will encourage sounder thinking and more searching scrutiny, more reflection on this vital doctrinal process throughout the military services?

Let me conclude this commentary by offering a response to Colonel Hurley's request for suggestions as to future research on technology and air power. I'm not going to give you a shopping list of suitable subjects. Instead, I want to share with you some sailing directions on what constitutes the desired character in historical studies which deal with the ideas behind the hardware. What follow are some sentences quoted from the foreword written by Professor Tom Hughes for R. Cargill Hall's study entitled *Lunar Impact: A History of Project Ranger,* published by NASA in 1977. Professor Hughes is chairman of the Department of History and Sociology of Science at the University of Pennsylvania. What he has written could almost be said to constitute an ideal specification for the kind of history which must be written if the inner history of air power is ever to be meaningfully probed:

> R. Cargill Hall has written a history. Readers not familiar with the state of writing about twentieth century technology and science may not realize his achievement. Accounts—so called histories—of recent technology and science are often little more than simplistic narratives focusing almost entirely upon sequences in hardware development or upon scientific idea explication. In commendable contrast, Hall organized a coherent narrative and analysis of complex institutions, people, ideas, and machines changing in character and in relationship one to another over time.
>
> His history of the Ranger Project is also critical and mature. He avoided neither complexity and contradiction nor reasoned analysis and judgments about episodes and people. He allowed for accident, unintended consequences, shifting priorities, budgetary adjustments, and over-determined events. This is evidenced by a frank account of six superficially ignominious Ranger failures, an analysis of the effects

of NASA management by committee, an appraisal of the impact of high-priority Project Apollo upon Ranger, and consideration of the consequences of Ranger's being done at the Jet Propulsion Laboratory, a university rather than an industrial laboratory. He comprehended how these and other factors generally influenced the project and shaped the automatic machine, the exploring spacecraft, at its hard core.

Lunar Impact transforms the records of a technological project into history by applying the canons of historical scholarship. The techniques and modes of interpretation are the general historian's. Because of this, Ranger emerges from the study not simply as a machine designed and operated by technical specialists but, more complexly and convincingly, as the focus of activities resulting from the conflicting interests, the power struggles, and the contrasting objectives of individuals, groups, and institutions. Viewed in this way, the writing of the history of the Ranger project becomes a challenge similar to the writing of the history of political campaigns and business enterprises.

The reader will recognize elements common to many kinds of history; he or she may also note the development of themes often encountered in large-scale technological and scientific projects. Most obvious is the tension between the values and goals of science and engineering. Throughout Hall's history one encounters scientists striving to shape Ranger so that it could perform a number of complex scientific experiments; the reader also meets engineers endeavoring to design a machine realistically contrived to perform one or two priority tasks like photographing the surface of the moon. Another significant theme concerns the tension permeating the Jet Propulsion Laboratory between the academic spirit of free inquiry and loose disciplinary structure, and the industrial laboratory style of project-oriented organization and highly directed problem-solving. These tensions were severe, sometimes constructive and at other times frustrating. Hall succeeds in seeing the situations in the perspectives of the various principals and principles.

Hall's book is also unusual and interesting because it reckons, as noted, with failure, the frequently ignominious inadequacy of the early machines, launches, and operations. Hall absorbed enough of the wisdom of experienced managers and engineers not to be startled or shocked into rash pronouncements and value judgments about failure. He learned that early Ranger was a high-risk endeavor, venturing into treacherous waters in which a number of careers foundered. In writing of failure, Hall had an advantage over his counterparts doing political histories: he did not have to contend with the host of simplistic myths that accumulate about the sites of political disasters. As yet, technology and science are not easily enough comprehended to attract the sensation seeker and the simplifier.

On the other hand, Hall, unlike the political historian, did have the formidable problem of making complex technology comprehensible to the generally informed reader. Wisely and considerately, he wrote about technical and scientific matters with his professed audience in mind—historians, interested laymen, and managers; he resisted the temptation to write for the highly sensitive, deeply involved, and specialized readers of the NASA "comment cycle." Also his technical and scientific information is related by him to general themes. The personalities of salient scientists, engineers, and managers are delineated insofar as these influenced the character of the technological artifacts and the scientific ideas.

Finally, the agency sponsoring this study should be commended. A large publicly funded administrative enterprise such as NASA understandably gravitates toward sustaining public relations and strives for favorable public opinion. Hall's book emerged from the NASA matrix surprisingly free of the constraining influences. The engineers, scientists, and managers at NASA and at the Jet Propulsion Laboratory do not appear in this book as cutouts; they do emerge as believable three-dimensional men involved in an extremely interesting and significant episode in recent history.

COMMENT BY A SERVING AIRMAN

GENERAL BRYCE POE II, USAF

I am happy to be here. I'm obviously not here as a historian. Rather, I've been asked to give a participant's view of the "other side of technology." I feel rather strongly about that—probably because, and I'm very proud of the fact, in my thirty-plus years I have been a commander at every rank except Second Lieutenant and Brigadier General. This experience gives one a different look at technology than one might have in other circumstances. When we discuss technology and its role in the evolution of air power, we should remember that technology is the *application* of science—not the knowledge itself so much as the use to which we can apply it. To somebody who has the kind of responsibilities most of us in the Air Force have, technological improvements have little charm until they're shaken down into reliable, maintainable, and, most of all, available systems that will put bombs on the target.

A stereotype persists that military professionals have usually been conservative about change. Sometimes this stereotype has worked to the great advantage of those military forces willing to press on with new technology and thereby gain an edge over their opponents. Often, however, the real worth of a new technical system has had to wait on improvements that have brought it to a practical, useful state. You can go back as far as you want. I'm sure there were iron weapons around for a thousand years before Scipio Africanus gave his legions that short sword of Spanish iron; but, as Carthage found out, that sword made an awful lot of difference to the legionnaire as he went to war and had something he could sharpen, a weapon that wouldn't bend and wouldn't twist. Perhaps the flintlock should have replaced immediately its clumsy predecessors; but, if one goes through the museums of Europe, you will find that some of those flintlocks also had an old matchlock on the same barrel because some soldier, perhaps the logistics commander of the day, said, "I want to be sure the thing works because it's not yet weatherproof." Before the Marlboroughs get to use the Brown Bess, there are people in between who try to see that it works.

When you look at technological change influencing warfare, you can go as far back as the introduction of the stirrup in 600 AD or as far forward as today. The laser is a scientific achievement. To me, responsible

for logistics, laser communications and laser-guided bombs are technical applications that have evolved from that scientific achievement, and I want to see to it that they work. I am irresponsible if I don't see to it that they work. The problem we participants face, in other words, is not so much one of advancing technology as one of keeping abreast of that technology with weapons that will accomplish the mission.

I would like to look for a few minutes at technology from other perspectives: our dependence on it, the problems it creates, how the public who pays for both the technology and the problems reacts to it, and a few examples of some of the lessons we've learned in dealing with technology. Clearly, we can't afford Alvin Toffler's symptoms of maladaptation to changing technology—be they denial, specialization, reversion, or over-simplification. We in the Air Force or, for that matter, anybody in the military, not only have to search for and develop the latest technologies, but we must be open to all aspects of their workings—open to new ways of dealing with them—and we must be aware that they represent a complex and not easily assimilated progression.

The other day, a friend sent me a 1927 aircraft yearbook for the Air Force Museum. Before I passed it to the Director of the Museum, Colonel Uppstrom, I looked through it; and I noticed with some jealousy that a pursuit plane, of which the Air Corps bought fifty in 1927, cost just over $33,000. The F–15, an integral part of our force both here and in Europe, has a current price tag of about eleven million dollars. By the time we get it ready to be more than a static display, the price is about seventeen million dollars. Even when you take into account the tremendous inflation over those fifty years, the F–15 costs some seventy times the pursuit plane of the 1920s. The point is that those 1927 aircraft were technologically simpler, easier to build, and easier to maintain than anything we fly today, and, consequently, much cheaper.

A similar example comes from the notes of General Benjamin Foulois, Chief of the Army Air Corps from 1931 to 1935. In 1909, Lieutenant Foulois prepared for flying training with Orville and Wilbur Wright by reading the few published works on aeronautical theory. With this "limited" knowledge, he began pestering the Wrights with theoretical questions. One day, while the airplane—the only one they had—was undergoing minor repairs, and after Wilbur Wright's patience has worn thin, the inventor pointed to the airplane and spoke one sentence to Foulois: "Throw your books away and go and get your hands dirty on that machine." Foulois ended up with a suit of overalls, a pair of pliers, a screwdriver, a handful of cotton waste, and a bar of soap; and he was probably a better pilot as a result. The technology of the Wrights was such that one could understand it by getting one's hands dirty, and Foulois certainly did that.

Today, we are far beyond "dirty hands"—although not so far as some think. Even during the days in 1946 and 1947 when I was on the air show circuit with the "new" F–80, I could keep that airplane's engine going for a week or ten days and a dozen sorties with a six-inch crescent wrench with which I took out the top spark plug to clean it. There were two spark plugs: the bottom one was too hard to get to, but I didn't mind the rumble in the engine caused by starting just with the top one.

What can an F–15 pilot do today if we sent him on a similar series of flights? He certainly cannot be expected to know in any real detail the workings of those black boxes and delicately-tuned instruments he uses to perform his mission. The hand-held bomb once dropped from biplanes is now a "smart" bomb, guided by television or laser to a target several miles away. With cruise missiles, those miles become many miles.

We've also come a long way from the staple of the 1927 Air Corps, the Liberty engine. The F–100 engine (which confuses some people because it is what we put in the F–15 and F–16) is designed in five parts or modules; we can remove, service, and replace each module without disassembling the entire engine. We use one F–100 engine on the F–16, two in the F–15. They have ninety-two components which permit us to maintain the engine without having to break it down for maintenance overhauls as often as in the past.

You don't get something for nothing with this technological improvement, however. To give you an example of the scale of management we are dealing with: United, the largest airline in the free world, manages 1,600 engines; we manage 44,000 jet engines. Now, instead of managing one engine, we're managing five modules per engine; and we really should, if we could get the automatic data processing (ADP) equipment to do it, manage all twenty-two life-limited components. Speaking of modules, incidentally, the F–16 aircraft itself is built the same way. Its five air frame modules make it an easier aircraft to get into and to fix. Most of its technology is current state of the art.

An area that perhaps overlaps all the technology of modern air power is automatic data processing, ADP. In a world that some say contains 200,000 digital computers, we are in the middle of a data processing revolution. The progress has been astounding. Dr. Carl Sagan has pointed out that the first large electronic digital computer, ENIAC, constructed in 1946, had 18,000 vacuum tubes and occupied a large room. The same computational ability resides today in a silicon chip microcomputer the size of one's small finger joint. Today we have microprocessors costing about $20.00 that can compute as much as a large computer that cost one million dollars twenty years ago. In my command alone, we have over 330 computer systems at work; when you include the work we do with the other services and the Defense Logistics Agency, the number grows

to about 430. We got those first computers in 1954, and by the mid-sixties we had some 375 data systems processing on about one hundred second-generation computers. Today we are down to around eighty-three, but it is impossible really to count the computers embedded in the equipment we support.

We could not have kept going without that technology, because we went from about 181,000 people in my command in 1961, the year we began to get IBM 7080 computers, to 91,000 today—cut in half in a period when we've gotten much more complex and difficult weapons systems to operate. The ADP took up a lot of technological slack, but those 90,000 people we lost represent technological expertise that is gone forever. Now we are running into a situation in which the 7080 computer is so old that IBM tells me that in a year they will no longer support it. It is so old that I have difficulty finding people who know the AUTOCODER language on it and who can move it to the high-order language of today. We have to look into the retired community to find people to come back and help us make that transfer into the higher-order language.

Testing is another function by and large dominated by technology. We have about 3,300 automatic testing equipment systems, with 400 more coming in the next two years—the cost: about a billion dollars. And, of course, we have automatic testing equipment that tests automatic testing equipment.

If the surge in ADP has been a technological escalation, the growth in embedded computers has been even more phenomenal. Today, when the pilot pulls the trigger on his F–16, the impulse runs through about six computers before the missile comes off the wing. By the early sixties, we had miniaturized the computer and made it tough enough to use in airborne and spaceborne systems. Today, most aircraft carry little black boxes that help navigate, locate targets, fire missile and gun systems, and detect enemy fire and radar. Consequently, we have shifted our approach in aircraft design. Where once one central computer controlled action, we now use a federated computer with each major sensor controlled by its own computer, which must communicate with all the rest of them to perform the mission. One good message I can bring you is that this month for the first time, and I think this would interest General Weyland and General LeMay, the cost and time to repair avionics is going down. We have a radio that does a thousand hours without repair and a TACAN system that goes 1,800 hours. At the same time, however, the cost of software is going up like a rocket.

What all this technological surge has caused for us, the participants, is the problem of how to maintain it, how to keep it running within reasonable costs—in terms of both money and manpower. The single most pressing problem we face as a result of the shift from quantitative

to qualitative emphasis is in our aircraft. Back in 1964, when the B-52s were relatively new and the F-4 was the pride of the TAC fleet, only about 34 percent of our total inventory was nine years old or older. In fact, the age of the active inventory then was seven and three-quarters years. Today, over two-thirds of the airplanes I support are nine years old or older. The average age is just over eleven years. The problem with that statistic, as with technology in general, is the basic rule of mechanics that the older mechanical things get the more liable they are to break and the more expensive they are to fix. We face an added problem. When an airplane comes in for an update of its avionics systems, we can't treat it as routine maintenance. Technology has decreed that the package for that fighter or bomber must be removed and reprogrammed; our maintenance time for software, consequently, is governed by how long we must take to reprogram the black boxes. And the problem is going to get more complicated. I am told that the cost of software development will likely run ten times more than hardware in the years ahead.

In other areas, we sometimes let technology confuse our sense of priorities, and here I shift back into the commander role. It is difficult to swallow the argument that money is not available for mundane things like hardening avionics buildings in the forward area or providing absolutely reliable command and control, when somebody comes up with an exotic system to provide a warm fog dispersal system that will not recover a single strike aircraft, because it is intended to support airlift in the forward area, and that will use in one hour enough fuel for a hundred A-7 sorties. Once in awhile we have got to get away from the charm of doing something technical because we can do it and pay attention to the fundamentals. We killed that fog thing temporarily, in USAFE (United States Air Forces in Europe) at least; I'm sure we broke some people's hearts, but we put the money in the kind of things we can use to put the bombs down. The Air Force, incidently, is still studying the concept.

Another side of technological innovation has been to lure us with the promise of things to come to the point that, as my Soviet counterpart sometimes says, "the better is the enemy of the good." In Europe, in 1974, we had to pound the table and fight and make trips to Washington to get laser pods for the F-4s. General Vogt, CINCUSAFE, and I, as Vice CINC, felt we needed them desperately. The reason we had to fight so hard to get them was that we were continually told that the Precision Emitter Location Strike System (PELSS) was "just around the corner." The tantalizing technological promise of PELSS is that it can pinpoint a guided strike force to an emitting target even if transmission stops after you launch the strike force. Now, don't get me wrong, I still support PELSS. I've got my command behind PELSS, but it is not here. And the pods that we wanted, crude as they were, had done the job in North

Vietnam. We eventually got the pods in Europe, and maybe we did so because I told some people the story about the Frenchman. I said I'm sort of like the Frenchman who lost his mistress and is weeping and waiting at the churchyard, and his friends at the funeral say: "Look, my friend, we know it's a sad time for you; but you're a young man, you'll meet another girl." And he says: "Yes, but what about tonight?" That's my responsibility: tonight. And I can't forget it. If I do, I am not responsible.

Perhaps the most challenging test of technology is at the very core of technology itself, and that is what is used to power it—energy. We in the Air Force use about half of the Department of Defense's 2 percent of the nation's energy. Seventy-seven percent of Air Force energy is in the form of petroleum, of which we use 66 percent to fly. In the last ten years, the cost has gone from $100 a flying hour to $490 a flying hour; as a result, we're flying much less. So we call upon technology to do the mundane again: to save us ten million gallons by reducing drag through putting vertical winglets on KC-135s or by putting on or removing vortex generators, depending on the kind of aircraft. This is not the exciting kind of work some of the technology people are interested in, but it will keep us over the target with the forces we need to accomplish the mission.

The task of coping with technological change in the employment of air power, of course, always revolves around money, and thus, since we're taxfunded, the public. Although public support has varied, it has been traditionally conservative. Remember the famous quote of 1911: "Why all this fuss about airplanes for the Army; I thought we already had one." Of course, five years later public support was completely behind Army aviation on the eve of war. That sine wave of support has been consistent: World War I, World War II, Korea, Sputnik, Vietnam. Even if the military explains that the consequences of inadequate support might be a decline in our technological parity with prospective enemies and we're given the money, an essential truth remains: you cannot confuse money and lead time. Whatever we do in the Air Force, whatever technological advances we order with that money, we must plan for lead time or we may get only a pretty static display. In most instances, the support equipment takes much longer to turn out than the airframe or the missile. Let me cite some examples to prove my point.

In 1970, Air Force planners asked industry to examine the possibilities of a highly maneuverable lightweight fighter. In 1971, we began to seek interested contractors. In April 1972, after we chose two of the five companies that offered proposals, General Dynamics and Northrop began to build two YF-16s and YF-17s, respectively. In January 1975, we selected the YF-16 as our air combat fighter. The first models were completed in 1976, and the first production aircraft will be delivered to

a United States Air Force combat organization at Hill Air Force Base in January of 1979. *Eight years* from technological idea to the actual system. Now I can't be too hard on the people involved with the technology in this case because some of that delay was due to "stretch-out" of the money, a factor our budgetary system always requires us to take into account. Eight years are what it took for that fighter; and it will take more than that, probably, for the next one.

Another example: electronic countermeasure pods are particularly susceptible to the problem of lead time. For two years now, we have realized that the ALQ-119 does not cover all the threats it must, and we have begun a program to improve its capability. The ALQ-131 pod is our latest system. It was conceived in 1972, and now, in late 1978, we have received less than three dozen, all of which are in testing. We designed this pod with a reprogramable software system, and yet we will probably encounter still another threat outside its ability. This doesn't mean we cannot get to the target, but it means that we have to look closely at the promises of technology.

One of the ways we in Logistics Command try to counter both the rising surge of technology-related problems and their rising cost is through a new outfit called the Air Force Acquisition Logistics Division. Its objective is to make sure lessons learned from operational units are written into production contracts, the only places we can ever improve performance. We walk the flight line, and we talk to the mechanic; and we take that knowledge back to the design engineer and say, for example, "Don't put another radio under the seat like in the F-4." We have spent $250,000 a month to remove and replace ejection seats in the F-4 when there is nothing wrong with the ejection seat, but rather with the radio. We do learn. I flew into a rage awhile back when I found several things under the seat of the F-16, but the contract had been written this time to require General Dynamics to figure out a way to lean the seat forward to allow us to get under it to change those items.

A third example: after World War II, the Air Force used mostly lightweight, light-gauge, aluminum alloy skins. It was highly corrosion-resistant and required minimum protection. In the early sixties, technology made rapid advances in developing higher strength aluminum alloys used primarily for structural applications because of their strength-to-weight ratio. They were tough, relatively cheap, easy to work with, and the engineers loved them. What we did not suspect was that the heavy gauge aluminum might be less resistant to corrosion than the light. That neglect turned out to be a costly mistake. Catastrophic stress corrosion failures occurred. We were forced to put the entire F-4 fleet on restricted flight after the Navy determined an F-4J crashed because of a stress-corrosion crack. The potential for failure of the nose landing gear

outer cylinder on the F-111 was so great that we replaced every one of them at a cost of 3.5 million dollars. But the cost is not the point. The point is we had a whole fleet of inoperable F-111s which could deter no one and could not carry out their mission.

Finally, a lesson learned that may have significant technological impact on the way we design and build aircraft: Fuel leaks have always been a major problem for us. For example, on the C-130 the major cost of keeping the aircraft flying is fixing fuel leaks—about $5.00 a flying hour. The situation is the same for many other aircraft, except two. When we surveyed the inventory, we found two old airplanes (the F-102 and F-106) that just didn't leak. We looked a little further and found that, instead of using sealant, they used a thermosetting film adhesive sealing process commonly referred to as "scotch-weld bonding." In November 1977, we completed fabricating a C-130 with the process and began testing it last December. So far it has completed 384 flight hours with no leaks related to that process.

So, you see, technology for me and my people in Logistics Command is a bit more involved than merely a new development in flight dynamics or an increase in look-down capability in a radar. Each technological development must bring with it some equivalent advance in logistic technology, or the advances in air power capabilities are meaningless. They're only good as long as we can use them in combat. Secretary of Defense Brown summed up the problem of technology and warfare when he called for us to be

> more modest in performance goals, recognizing that a system with less advanced technology that works, is far more militarily useful than a system with more advanced technology that doesn't work.

People tell me that this year we will go over fourteen billion dollars in the money we manage. If those were sales, that would replace ITT as number 11 on the *Fortune* 500. We take that responsibility very seriously, and the cost is not going to decrease. But the money can be more sensibly spent through equal emphasis on the "other side of technology." This "other side" may be mundane, dull, and unglamorous; but I hope that you historians will now understand my reactions to the developers who, in the past, may have kept aircrews alive by always giving us an extra ten knots, an extra thousand feet of altitude, and an extra thousand pounds of payload. When those developers come in as happy as they can be with a new advance, I may say, "Why don't we go with with what we planned; and let me turn down the wick on the engine a little bit, so as to use fewer maintenance people and, above all, so that we can give the commander more aircraft to put more bombs on the target?"

IX

THE EIGHTH MILITARY HISTORY SYMPOSIUM IN PERSPECTIVE

In his closing commentary on the symposium, Theodore Ropp reaffirmed the themes which had arisen during the course of the sessions; challenged historians to get on with the business not only of writing air power history but of doing so in an interesting and readable manner; and offered guidance to those who would take up his challenge.

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CLOSING COMMENTARY

THEODORE ROPP

How "squarely" are we historians facing the issues of air power history? My answer has four historiographical propositions:

1. Air power is a major theme in modern military history. Icarus came before Polybius, but the latter's case for the study of Roman history fits air power quite nicely. "Can anyone be so ignorant or lazy as not to want to know how, and because of what qualities in Roman government, practically the whole inhabited world fell under the dominion of that single city, and in not quite fifty-three years [1903–1958]?" The best modern analogy is that equally epic story of Magnificent Men and Sailing Machines, with equally revolutionary effects on international politics and warfare, of the sixteenth century.

This symposium has not neglected aviation's pioneers. We will have few more chances to hear them; our cadets are almost as far from their lives as Polybius was from that of Scipio. But in concentrating on the great events, decisions, and turning points, we should not neglect those other early airmen who "kept 'em flying." Fortunately, we need not wait for 400 years. Our ordinary airmen are literate, and we have ways of recording their memories which were not available to a Bernal Diaz.

The story of flying machines is far more dramatic than those of Carlo Cippola's *Guns, Sails, and Empires*, so early air historians felt compelled to concentrate on aircraft. But they are no longer focusing solely on "inventions." That doctrine, logistics, and manufacture are essential parts of air power is the greatest contribution of my colleague I. B. Holley to this field and a major sign of historiographical "maturity." Here again the story has moved from the personalities of such pioneer figures as Trenchard and Mitchell to the institutions by which men use and control this means of transportation.

2. As our Festival's organizers noted, the story of air power's "maturity" is in large part American. And this afternoon's program "Air Power Limits in Limited War" also shows that the danger of making the eagles scream too loudly may be less than that of an apologetic mood in which we assume that the destructiveness of air power is, somehow, peculiarly American.

3. The attempt to learn the lessons of a cold war—in which the standards of success or failure are so much harder to establish than in a hot war—has led recent air power historians to concentrate on military problems. They have not examined the military basis of our world lead in civil aviation or tried to assess its general influence in the world, except by reference to gross aircraft sales, air traffic, or tourist figures. Yet the links of military and civil aviation were those which pioneer airmen—consciously or unconsciously basing their arguments on those of Mahan—all stressed in the interwar era.

4. For this and other reasons, we may have to think a bit more of those people whose work, patronage, and taxes have kept them flying. And we must pay particular attention to the psychological states of those critics who led the shift in social attitudes by which those Magnificent Men in their Flying Machines became computerized Genghis Khans.

On balance, this has been an extraordinarily successful Festival for air power's 75th birthday. It began with one of the most remarkable lectures I have ever heard, one which so mixed erudition, wit, personal experience, and insight that, as is common with such lectures, some of us missed the point the lecturer was making. The Symposium continued with precisely that mixture of personal reminiscence, experience, and scholarship that one hopes to get in a *Festschrift*.

I, too, have spent years reading Mahan and have tried to follow his pedagogical principle of "Hammer your principles home!" For me this means that (1) Air Power history is a genuinely epic subject; that (2) owing to the historical circumstances of the Second World War, it became widely regarded as American; that (3) air power's destructiveness in that war was so great that its managers embarked on the experiment—unique in history, except perhaps for the British policing of the sea in the nineteenth century—of using their vast military and economic power to create a peaceful and prosperous world; and that (4) because this was an experiment, not all of their efforts were successful.

The psychological caution exercised in the nonuse of the most powerful military machine known to man did not please every soldier charged with executing these policies or every taxpayer and conscript who paid for them. The result was a series of controversies regarding every element of American political, economic, and military power, the most acute of which revolved around the use of the most dangerous, most publicized, and perhaps most decisive weapon in history. Unfortunately, in their efforts to chronicle and analyze these "military" controversies, air power historians have forgotten the civil aspects of air history and ignored the fact that the use or nonuse of ground, naval, economic, and diplomatic weapons was almost as experimental and controversial.

My final question is this. In the course of working our way to "maturity," have air historians, like historians of technology—where Mickey Rooney as young Tom Edison is our equivalent of John Wayne as Benny Foulois—forgotten our audience? We can hope, with General Parrish, to discuss air power issues in such a way as to have the same impact on opinion that Mahan's works had after 1890. But waiting for a new Douhet may be like waiting for a New Mahan on his ninetieth anniversary: if there was ever a slow selling military classic, it is that assembled by the widow Clausewitz nearly 150 years ago.

Actually, as General Parrish noted of one of the best attended AHA sessions of the last few years, we military historians occasionally *do* think of our audience and how to interest and to educate it. Our audience begins at eighteen. It likes a good story (Herodotus drew huge crowds to his Athenian history recitations) and is already a buff of some sort: rock records, T-shirts, or Nazi insignia. But it is also the alumnus, taxpayer, congressman, or USAF general of the future. That we have already lost many of its parents was one of General Parrish's main themes. That some of our scholarly papers read since his lecture might be equally hard for the young to read is equally apparent. This problem of catching the reader is especially acute for air power historians precisely because we are following the genuinely epic stories of those Magnificent Men in their Flying Machines by the detailed examination of peacetime technological and military decisions within complex bureaucratic structures. Who wants to read about the genesis of AFM 1-1, two weeks before the Gulf of Tonkin incident, when the story of the great Air Races of the 1920s is still untold?

Here, one part of Parrish's lecture gives us some hope. It is his emphasis on people, coping step by step with every one of the complex technological and human problems of flying and then with the equally complex human, technological, and bureaucratic problems of the world's most powerful weapon. Can one expect an undergraduate to understand AFM 1-1, the TFX experiment, or the lead article in this month's *Scientific American*? The answer is yes—*if* one presents these as discrete problems in terms of the people who faced them and transfer to them the same principles which make the biographies of the great pioneers of the statistical method—I. S. Bloch and F. W. Lanchester—so exciting.

If this is one of our basic problems as air history matures, I can clinch my argument by citing two key works by new historians. Why is *Time on the Cross* suitable only for scholarly debate and *Roll Jordan Roll* compulsive reading? The first treats black people as objects for statistical manipulation, the second treats them as people. To face that age of anxiety which air power had done so much to create, our historians have to teach our readers "to learn," in Polybius's words, "to bear the vicissitudes of Fortune with Courage."

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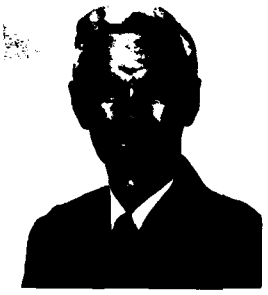
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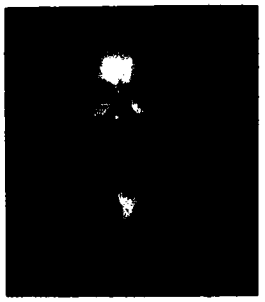


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INDEX

A–1 aircraft: 314, 317, 323
A3D aircraft: 269
A4D aircraft: 269
A–10 aircraft: 405
A–20 aircraft: 75
A–26 aircraft: 318
A–37 aircraft: 323–24
AC–47 aircraft: 314
AC–119 aircraft: 319
AC–130 aircraft: 317, 319
AD–4 aircraft: 266
Ader, Clément: 364
ADR–42 aircraft: 253
Aero Club: 23
Aeronautical Journal: 23
Aeroplane, The: 23, 69
Aichi designs: 91
Air accidents: 66
Air bases
  construction program: 75
  overseas: 225–26, 229, 258, 307
Air Board (British): 27, 31
Air Commerce Act (1926): 371, 374
Air Corps. *See* United States Air Force
Air Corps Tactical School: 190–91, 351
Air Council: 28, 393
Air Force Acquisition Logistics Division: 416–17
Air Force Department, activated: 248
Air Force Plans for Peace (Smith): 217
Air Forces
  Seventh: 339
  Eighth: 230, 356
  Twentieth: 223, 279
Air Mail Act (1925): 371
Air mail services: 9, 71, 375
Air power
  expansion of limits: 13–14
  ground commanders, attitude toward: 189–90
  history of. *See* Military history
Air Power in Three Wars (Momyer): 287–88, 342
Air Service. *See* United States Air Force
Air supremacy concept: 22–23, 27–39, 191, 218
Air Transport Command: 175
Airborne assaults: 314, 317
Airborne Warning and Control System: 307
Aircraft
  antisubmarine role. *See* Antisubmarine warfare
  Army aircraft. *See* Army aviation
  bomber aircraft. *See* Bomber aircraft; also by designation
  development and procurement: 56–60, 62–63, 72–75, 77–79, 91, 160, 293, 349, 362–80, 389, 395
  first acquired: 293
  inventory, periodic: 66, 194, 255, 348, 351
  losses, periodic: 311–14, 322
  missions visualized for: 37, 293
  monoplane, transition to: 389
  nuclear propulsion development: 397–98
  observation role: 294
  obsolescence problem: 414
  reconnaissance role: 5, 25, 37–38, 40, 50, 56, 59
  technological developments: 47, 71–72
Aircraft carriers

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Essex class: 263
Midway class: 255, 263, 265
United States (CVA–58): 227, 252–55, 258–60, 262–63
world's first: 88
Airships. *See* Balloons and dirigibles
AJ–1 aircraft: 253, 255, 264–65
Akagi, HIMS: 89
Akeno: 86
Akron, USS: 69
Alexander, Grand Duke: 36
Alexander, Harold L. R.: 190
Alksnin, Ya. I.: 105
ALQ electronic countermeasure pods: 416
Alsace, RAF strikes in: 30
Altitude flights: 58, 169
American Historical Association: 6
Ames, Joseph S.: 75
An Loc, operations around: 317–18
Anabuki, Master Sergeant: 92
Anderson, Frederick L.: 217
Anderson, Orvil A.: 286
Andrews, Frank M.: 17–18, 71, 73, 188, 190, 351
Annapolis, Md.: 60
Anthony, Victor B.: 324
Antisubmarine warfare
detection devices: 60, 62
Navy role in: 250, 257, 262
need for study on: 65, 163–64
Antoinette designs: 42
Arab nations: 308
Ardant du Picq, Charles: 17
Argentia Conference: 173
Argentina, goodwill flight to: 76, 351
Armed Forces Special Weapons Project: 234, 255
Armed and services inter-relations, need for study: 162
Army Air Forces. *See* United States Air Force
Army aviation
centralization versus decentralization: 291–93
beginnings: 294
expansion program: 264
growth potential: 295–96
helicopter integration into: 295, 314, 316–18
mission and organization: 291, 294
Army War College: 7
Arnold, Henry H:
as administrator-manager: 174–76, 187, 352
as Air Corps Chief: 74, 170–71, 173
on air forces autonomy: 171–72, 179
and air mail experience: 170
air power proponent: 17–18, 58–59, 169, 178, 202
on air strength reduction: 224
and aircraft development and procurement: 76–78, 173
Alaska flight: 71, 170
altitude record: 169
as Army Air Forces head: 172
on atomic bomb: 10, 220
biography needed: 15, 168, 203
British, relations with: 178–79
civilian authority, subordination to: 199
early service: 169–70
French, relations with: 179
on German replacement system: 141
on global strategy: 176–77
Hopkins, relations with: 173, 178, 352
Kenney, relations with: 176–77
leadership qualities: 171, 187, 198–99
LeMay, relations with: 175
Lovett assessment of: 181
Marshall, relations with: 171–72, 202

Mitchell supporter: 68, 170–71
on national defense safeguarding: 217
Navy, relations with: 174, 215–16
news media, relations with: 181–82, 203, 352
nickname origin: 179
on night operations: 77
Norstad, relations with: 175
offensive, stress on: 219
on roles and missions: 215–16
Roosevelt, relations with: 171, 173
self-assessment: 179
sense of humor: 179–80
Slessor assessment of: 179
Soviet Union, views on: 178
Staff, relations with: 174–75
Stimson assessment of: 178
on strategic bombing: 178, 215–16
technology, concern for future: 181, 203, 219
wager on war's end: 203
Arnold, Samuel G.: 5
Arnold Engineering Development Center: 377
Around-the-world flight: 349
Ashworth, Frederick: 249
Assistant Secretary of War for Air: 67, 351
Atlantic, battle of: 165
Atlantic Charter: 77
Atlantic Ocean area, defense of: 76, 262
Atomic bomb. *See* Nuclear weapons
Atomic Energy Act (1946): 230
Atomic Energy Commission: 230, 234, 264–65, 284, 393
Augusta, Ga.: 58
Austria, air operations against: 65
AUTOCODER computer: 413
Aviation
centralization versus decentralization: 66–67, 291–94
government policy on: 368–80
technological progress, peacetime-wartime: 362–67, 403–406
Aviation Act (1926): 351

B–10 aircraft: 71, 170
B–17 aircraft: 58, 72–73, 75–76, 351, 367
B–18 aircraft: 72, 75
B–24 aircraft: 75, 117
B–25 aircraft: 75
B–26 aircraft: 75, 314
B–29 aircraft: 6–7, 9, 12, 216, 218, 221, 224–25, 228, 230, 234, 236–37, 255, 279, 304, 391
B–36 aircraft: 72, 225, 227, 234–36, 260, 387, 390
B–47 aircraft: 225, 236, 387, 397
B–50 aircraft: 225, 234, 387
B–52 aircraft: 225, 238, 309, 315–23, 341, 390, 394, 397
B–57 aircraft: 318
B–58 aircraft: 387, 394
B–60 aircraft: 387
Baker (Newton D.) Board: 71, 350
Baku: 113
Balbo, Italo: 44
Baldwin, Hanson W.: 352
Baldwin, Stanley: 70–71
Baldwin, Thomas S.: 57
Balfour, Arthur: 26
Balkans area: 117
Ballard, Jack S.: 324
Balloons and dirigibles: 50, 56
Baltic Sea area: 117
Ban Me Thuot, battle of: 323
Baranov: 105
BARBAROSSA, Operation: 107–108, 120
Barksdale Field, La.: 71
Barrier defense plan: 318
Basic National Security Policy: 267
Baucom, Donald: 287
Bay of Pigs incident: 10
Becker, John W.: 366
Belgorod: 116

Bell, Alexander Graham: 57
Bell, J. Franklin: 208
Benson, William S.: 68
Bering Sea area: 265
Berlin: 58
  blockade and airlift: 234, 237, 302–303, 307
  raids on: 77
Bertram Collection: 153
Bertrand, Gustave: 165
Bien Hoa: 314, 337
Bikini Atoll tests: 221–22, 249–50, 252
Bikini Evaluation Report: 252
Biographies
  need for: 14–15, 164, 286
  Pogue on compiling: 204–209
Birmingham, USS: 60
Black Sea area: 109
Blanchard, William H.: 221–22, 236
Blandy, William H. P.: 261
Bleriot, Louis: 53, 169
Bloch, I. S.: 422
Blumenson, Martin: 206
Blyukher, Vasili K.: 101, 103
Board of Ordnance and Fortifications: 56–57
Bock, Feodor von: 109
BODENPLATTE Operation: 146
Boeing designs: 71, 89
Boelcke, Oswald: 40
Bogan, Gerald: 193
Bolling (Raynal C.) Mission: 64
Bomb Group, 509th: 220–22, 228, 230
Bomb loads: 315
Bomb Sights: 59
Bomb Wing, 58th: 221, 228
Bomber aircraft
  armament: 37–38, 40
  bomber–versus–fighter debate: 76
  development: 37–38, 42–43, 71–72, 389–90
  in tactical role: 315
Bombing operations. *See* Strategic operations
Bombs, guided: 312, 321
Boog, Horst: 128–56, 159, 161–62, 164
Borowski, Harry: 287
Bowers, Ray L.: 309–25, 330, 333–34, 338
Bradley, Omar N.
  air power, attitude toward: 190
  and carrier program: 258
  on roles and missions: 233, 235
Brereton, Lewis H.: 222
Brewster Buffalo: 73
Bridges, strikes against: 321–
Bristol designs: 100
Britain, battle of: 26–27, 47, 77, 148–49, 165, 300
Brodie, Bernard: 246, 251–52
BROILER Plan: 232, 234
Brooks, Peter: 364–65
Broughton, Jacksel M.: 312
Brown, Harold: 418
Buckingham, William: 324
Budget Advisory Committee: 234
Budkov: 107
Bundy, McGeorge: 311, 337–38
Bureau of the Budget: 231
Burgess & Curtiss factory: 61
Burke, Arleigh A.: 196, 256, 259, 261, 269, 284
Burke, C. J.: 23–24
Burns, James M.: 171, 174
Busemann, Adolf: 365
Bush, Vannevar: 78, 392

C–47 aircraft: 315
C–124 aircraft: 314, 318
C–130 aircraft: 316, 318, 323, 397, 417
Cambodia, operations in: 309, 319–20
Capper, Colonel: 51
Caproni, Gianni: 67
Caproni designs: 65
Caribbean neutrality patrol: 76

Carney, Robert B.: 234–35, 268–69
Carolinas maneuvers: 352
Casablanca Conference: 173, 179, 353
Cate, James L.: 63, 172
Catton, Jack: 236
Cayley, Charles: 12
Central Highlands, operations in: 317, 323
Central Intelligence Agency: 359
Chaff, scattering: 321
Chamberlain, Neville: 74, 171
Chambers, W. I.: 60
Chandler, Charles D.: 58
Chang Hsueh-liang: 101
Changchun: 118
Changkufeng (Lake Khasan): 104
Chanute, Octave: 52
CHARIOTEER Plan: 252–53
CHECO Project: 324
Chiang Kai-shek: 205
China
  air power priority in: 308
  Communist seizure: 237, 263–64
  Japanese invasion: 70, 87, 89–90
China incident (1937): 86
Chinese Eastern Railway: 101
Chuikov, V. I.: 113
Chungking: 87
Churchill, Winston: 25
  on air offensive against Germany: 355
  air power, attitude toward: 190
  Joint Chiefs of Staff, comment on: 205
  Roosevelt, communication with: 77
  tribute to Royal Air Force: 77
Cippola, Carlo: 420
Civilian authority, subordination to: 199
Clark, J. J.: 193
Claude designs: 89
Clausewitz, Karl von: 150–51, 422
Coakley, Robert W.: 161
Coast defenses, in defense scheme: 56
Cody, S. F.: 53
Coffey, Thomas M.: 13
College Park, Md.: 58, 60, 169
Collier Trophy: 364
Collins, James L.: 297
Combined Chiefs of Staff: 78
Comet bomber: 397
Command of the air. *See* Air supremacy
Commander in Chief, Far East: 265
Commander in Chief, Pacific: 305, 339
COMMANDO HUNT campaigns: 318–20, 324
Commerce, Department of: 374
Commercial aviation, government policy on: 369–79
Committee of Imperial Defence: 24
Con Thien, battle of: 315
Concentration of force, principle of: 30
Concorde Militaire: 52–53
Condor Legion: 72, 102
Congress
  appropriations by: 58, 60, 62, 69
  aviation, policy on: 371–79
  hearings on B–26 and B–36: 260–6
  relations with air officers: 35
Coningham, Arthur:
Conner, Fox: 207
Conolly, Richard L.: 262
Consolidated designs: 75, 225
Continental Air Command: 303
CONTROL Project: 301
Converse, Elliot: 287
Coolidge, Calvin: 67, 350
Cooling, Benjamin F.: 7, 15–16
Coox, Alvin D.: 84–95, 159, 161–62
CORONA HARVEST Project: 14, 32

Council of People's Commissars (USSR): 110
Coventry, German raid on: 322
Cowdray Board: 26
Craven, Wesley F.: 172
Creasy, Edward S.: 5
Crimea, campaign in: 112
CROSSROADS Operation: 221–22, 249–50, 252
Cuba: 56, 60
Cuban missile crisis: 10, 310
Cuneo, John R.: 12
Cunningham, A. A.: 61
Currey, John C.: 335
Curtiss, Glenn H.: 57, 60, 65
Curtiss designs: 87, 91
Czechoslovakia crisis: 232

Da Nang: 323
DAISY CHAIN Operation: 265
Dak To, battle of: 315, 317
Dante Alighieri: 4
Davison, F. Trubee: 351
Davison, Ralph E.: 193
Dayton, Ohio: 58
DB–3F aircraft: 106
DC–3 aircraft: 367
Deane, John R.: 118, 353
Defense, Department of: 67, 292, 363, 394, 407–408
Defense Logistics Agency: 413
Defoliation program: 314, 316, 318
De Gaulle, Charles: 205
De Havilland designs: 62, 64–66
Demilitarized Zone (Vietnam): 317, 322
Denfeld, Louis E.: 233–35, 254, 259, 261, 263
Deutsch, Harold C.: 165–66
DI–2 aircraft: 99
Diaz, Bernal: 420
Dick: 17
Diem, Ngo Dinh: 313–15
Dien Bien Phu, battle of: 9, 306
Dill, John: 174
Dirigibles. *See* Balloons and dirigibles
Disarmament movements: 66, 69, 88
Dmiansk pocket: 121
Dnieper River: 116
Doctrine
  development of: 10–11, 30–32, 43–46, 71–72, 215–38, 250–58, 279–80, 284, 286–88, 292–93, 301–302, 386–400, 407–10
  interaction with technology: 386–400
Don Bend: 113, 115
Doolittle, James H.: 17–18
Dornier designs: 366
Douglas, Donald: 175
Douglas designs: 72–73
Douhet (Giulio) theory: 9, 23, 41–45, 67, 74, 134, 151, 178, 300, 300, 355, 422
Doumer bridge: 321
Dowding, Hugh: 165
Dresden, raid on: 9, 304
Dulles, John Foster: 3, 267, 335

Eaker, Ira C.: 16, 70, 175, 188, 190
  on air power future: 358–59
  on atomic bomb: 220–21
  biography: 346–47
  on chemical warfare: 357
  and Europe air strength: 224
  on Korea & Vietnam lessons: 357–58
  and Luftwaffe destruction: 353
  Spaatz, tribute to: 356–57
  staffs Air Corps expansion: 74
Early, Stephen T.: 181
EARSHOT Plan: 228–29, 286
EARSHOT JUNIOR Plan: 229
Eatherly, Claude: 9
EB–66 aircraft: 321
EC–121 aircraft: 318
Edinburgh, German raid on: 26
Eisenhower, Dwight D.

air power, attitude toward: 190–91
biography, Pogue on compiling: 205, 207–208
on defense policies and expenditures: 237, 267
and Europe defenses: 224, 265
and freedom of expression: 9
and massive retaliation doctrine: 394
on military-industrial complex: 377
OPEN SKIES Plan: 301
on psychological operations: 335
on roles and missions: 247
on unification: 285
on united service academy: 285
Electronic countermeasures: 318–19, 321, 334
Electronic warfare, disinterest in: 403
Eller, E. M.: 17
Ellyson, Theodore G.: 60
Ely, Eugene: 60
Embick, Stanley D.: 73
Emerson, Ralph Waldo: 15
Emme, Eugene M.: 12, 14, 21, 56–79
Emmons, Delos C.: 76
Endurance flights: 58
Engineering magazine: 24, 28
England. *See* United Kingdom
English Channel, first flight over: 53
ENHANCE PLUS Project: 321–22
ENIAC computer: 413
Enterprise, USS: 69
Esher, Lord: 53–54
Etzold, Tom: 287
Eurasia: 266
Europe, defense of: 224, 258, 265–66, 284
Everest, Frank F.: 226, 229

F2H–2 aircraft: 266
F–4 aircraft: 306, 312, 321, 415, 417
F4F aircraft: 73, 91
F4U aircraft: 91
F6F aircraft: 91
F–15 aircraft: 308, 405, 411–12
F–16 aircraft: 308, 412–14, 417
F–80 aircraft: 399, 412
F–86 aircraft: 304
F–100 aircraft: 412
F–102 aircraft: 417
F–106 aircraft: 417
F–111 aircraft: 306, 322, 417
Fairchild, Muir S.: 10, 74
Farman, Henri: 52
Farman designs: 85–87
Fat Man atomic bomb: 228
Faure, Colonel: 86
Fechet, James E.: 70
Federal Aviation Commission: 71
Ferson, Steve: 176
Fighter aircraft, postwar development: 390. *See also by designation*
Fighter operations, progress of: 39–40
Finland, Soviet invasion of: 104–106, 399
Finletter, Thomas K.: 9, 231
First Aero Squadron: 59, 62, 348
Fisher, William P.: 220
Flare ships: 314, 318
Fleet Marine Force: 70
Flexible response doctrine: 394
Flight magazine: 23, 54*n*
Flying schools established: 58
Foch, Ferdinand: 65
Fogleman, Ron: 286
Fokker, Anthony: 40
Ford, Gerald R.: 324
Ford Willow Run plant: 160
Forrestal, USS: 264, 266
Forrestal, James V.: 193, 204, 231–34, 249, 256, 258–59
Fort Leavenworth, Kan.: 57
Fort Myer, Va.: 57–58, 60

Fort Omaha, Neb.: 57
Fort Riley, Kan.: 169
Forward air controllers: 314–15, 317–18
Foulois, Benjamin D.: 9, 57
  and air mail assignment: 71
  as air pioneer: 70, 190, 412
  on aviation centralization: 66–67
  commands first squadron: 59, 62, 348
  heads AEF aviation: 64
Fox, Roger: 324
France
  air doctrine, development and practice: 38–40, 43–44
  air force autonomy: 42
  aircraft development and procurement: 36–37, 43–44, 48, 52, 75, 352
  balloons and dirigibles: 50
  Spanish civil war experience: 45
Frank, Walter H.: 70
Fredette, Raymond: 63
Freud, Sigmund: 213
Frey, General: 23
FROLIC Plan: 232, 234, 286
Fryklund, Richard: 16
Fullerton, J. D.: 22–24
Futrell, Robert F.: 14, 17, 67, 279, 324
FW–190 aircraft: 117
FW–200 aircraft: 115

Gaddis, John L.: 287
Gaither Report: 285
Galland, Adolf: 146
Gallery, Daniel V.: 253–55, 259, 265, 282, 284
Gamelin, Maurice G.: 44
Garros, Roland: 40
Gates, Artemus: 249
Gates, Horatio: 3
Gatling gun: 319
Genda, Minoru: 88, 93
General Dynamics designs: 416–17
General Headquarters Air Force: 71–73, 75–76, 293, 351
Geneva Disarmament Conference: 66
George, Harold L.: 72, 76, 78
Georgia maneuvers: 352
German Air Fleet League: 36
Germany
  air defenses system: 146
  air doctrine development and practice: 44–45, 47, 131–35, 147–50
  air offensive against: 117, 120, 122, 148, 165–66, 259, 353–57
  Air War Academy curriculum: 129–30, 134
  aircraft development and procurement: 36–37, 43, 48, 91, 119, 160
  aircraft and personnel losses: 110–11, 115–18
  aircraft and personnel strength: 118, 120
  assignments, policies on: 130, 132, 134–35, 144–45
  balloons and dirigibles: 57
  Britain, air offensive against: 26–27, 47, 77, 148–49
  command and leadership principles: 128–31, 153–56
  communications, deficiencies in: 142, 165
  conflict among high command: 136–39
  conscription revived: 66
  cross-training neglected: 130
  dive bomber, stress on: 121, 135, 149
  high command organization: 135–40
  intelligence, neglect of: 145
  inter-service relations: 162
  leader principle, effect of: 155–56
  logistics, treatment of: 151, 154, 160–63
  long-range aircraft, lack of: 114,

120, 122, 141
long-range flights: 42
Luftwaffe activated: 42, 66
military philosophy, traditional: 150–51
mission of Luftwaffe: 147
offensive overstressed: 133–34,145–47, 151
officers, backgrounds of: 151–53
pilots, training and efficiency: 122, 142–43, 354
Polish air force destroyed by: 105
replacements of aircraft & crews: 141
reserves, neglect of: 151
security, laxity in: 165
Soviet neutrality pact: 105
Soviet operations against: 107–18
Spanish civil war experience: 45, 72, 148–49, 151
specialization, stress on: 130–31
staff officers, training: 129–31, 150–51
strategic operations concept: 37, 39, 120, 134–35, 147–50
support services, neglect of: 13–32, 141
tactical air support doctrine: 135, 147–51
tactical organization and operations: 38, 40, 121–22
tactics and operations, stress on: 131–32, 140–43
technology, treatment of: 132–33, 143–45, 151–55
transport aircraft, lack of: 122, 141–42, 303
turbojet development: 389
V–2, logic behind: 391
World Wars experience: 47, 151
Giap, Vo Nguen: 306
Gibbs-Smith, Charles H.: 8, 15, 21, 50–55
Giffard, Henri: 50
Gigant transports: 166
Giles, Barney M.: 177
Gilster, Herman L.: 320, 334
GIRDER Project: 250, 257
Godfrey, Arthur: 200
Goering, Hermann: 114, 122
criticized: 130
and leader principles: 155–56
on Luftwaffe mission: 148
offensive, overemphasis on: 146
opposition to supreme command: 140–41, 162
relations with staff: 136–40, 143
staff experience: 151, 156
and Stalingrad airlift: 141–42
technology, neglect of: 133, 143–44
Goldberg, Alfred: 14, 159–64
Golovanov, A. Ye.: 113
Gorbunov: 107
Gorki: 116, 120
Grade designs: 85
Great Britain. *See* United Kingdom
Greater Khingan Mountains: 118
Greenwood, J. E.: 290
Greenwood, John T.: 215–38, 279–82, 284, 286–87
Gregory, Tom: 198
Grey, Charles G.: 23, 69
Gropman, Alan: 13
Grozny: 113
Grumman designs: 73, 91
Guderian, Heinz: 141
Guernica, battle of: 148
Guggenheim grants: 404–405
Gulf of Tonkin: 311, 337
Gumrak: 115
Gunships: 314, 319
Gurevich, Mikhail: 107

Hackett, John: 3
Hagood, Johnson: 208
Haig, Douglas: 25, 29, 50
Haiphong, strikes against: 305, 311–12, 320–21, 358

Halder, Franz: 132
HALFMOON Plan: 234, 286
Hall, R. Cargill: 409
Hallion, Richard: 404
Halsey, William F.: 193
Hamburg, raids on: 304
Hampton, Va : 370
Hampton Roads, Va.: 60
Hanoi, strikes against: 311–12, 321–22
Hansell, Haywood S.: 175, 191
Harding, Warren G.: 67
Harmon, Hubert R.: 175, 259, 266
Harris, Arthur: 356
HARROW Plan: 234
Hartsook, Elizabeth: 324
Hasdorff: 17
Haushofer, Karl: 134
Hawaii nonstop flight: 349
Hayward, John T.: 249
He–111 aircraft: 114–15, 120
He–162 aircraft: 143–44
He–177 aircraft: 115, 121, 143
Heinrich, Prince of Prussia: 36
Henderson, G. F. R.: 28
Herodotus: 422
Herzl, Theodor: 213
Hickam, Horace M.: 17–18, 190
Higham, Robin: 12, 21
Hill Air Force Base: 416
Hindenburg, Paul von: 63
Hino, Captain: 85
Hiroshima: 220, 222, 237, 248
Hiryu, HIMS: 89
Hispano—Suiza designs: 100
Historians. *See* Military history
Hitachi designs: 91
Hitler, Adolf
  aggression by: 73–74, 102, 134
  and air staff organization: 139
  and air threat: 45
  assassination attempt: 131
  bombing, policy on: 76–77
  faulty decisions by: 145
  and German rearmament: 66
  and leader principle: 155
  logistics, neglect of: 142
  on Luftwaffe mission: 147–49
  offensive, overemphasis on: 146, 150
  relations with subordinates: 136
  security, obsession with: 138, 144, 156
  and Soviet war directives: 107, 109, 112–16, 120, 122
  staffs, dislike of: 156, 162
  as supreme war lord: 130
  technology, neglect of: 144
  young commanders, demand for: 131
Ho Chi Minh: 330, 335–36
Holley, Irving B.: 14, 63, 372, 402–409, 420
Homze, Edward L.: 21, 36–47
Hoover, Herbert: 66
Hopkins, Harry L.: 74, 173, 178, 152
Hosho, HIMS: 88
Howell (Clark) Committee: 71–72, 171
HS flying boats: 65
Hughes, Thomas: 409
Hull, German raid on: 26
Hull, John E.: 190
Humphreys, Frederic E.: 58
Hurley, Alfred F.: 15, 22, 63, 67, 204
Hurricane fighter: 77
Huston, John W.: 168–82, 198–99, 202
Hydrogen bomb, implications of yield: 237

I–5 aircraft: 101
I–15 aircraft: 100, 102–103, 108
I–16 aircraft: 89, 100, 102–103, 108
Identification friend or foe device: 397–98
IGLOO WHITE system: 318–19, 334
Il–2 aircraft: 106–107, 112, 115, 121

Il–4 aircraft: 106, 109
Il'ya Muromets bomber: 40
Il'yushin (Sergei V.) designs: 89, 106
Immelmann, Max: 40
Imperial All-Russia Aero Club: 36
Industrial mobilization plans: 226, 228
Ingalls, David: 351
Intelligence systems, need for study on: 163
Inter-Allied Aviation Committee: 31
International Air Meet (1909): 58
International Brigades: 102
Iowa, USS: 179
Iron Hand (Wild Weasel) fighter: 312, 322
Irvine, Clarence: 236
Ismay, Hastings L.: 203
Israel: 308
Italy
  air doctrine development: 38, 40, 44–46
  air force autonomy: 38, 42
  aircraft development and procurement: 36–37, 43
  Ethiopia experience: 45
  long-range flights: 42
  Spanish civil war experience: 45
  strategic operations by: 37, 39
IVY Operation: 237

Japan
  air force development: 85–87
  air offensive against: 223, 279, 300
  aircraft development and procurement: 86, 88, 91–92, 94
  aircraft and personnel losses: 91–92, 95
  aircraft and personnel strength: 90–91, 118
  carrier operations against: 279
  carrier program: 88–90
  China experience: 70, 87, 89–90
  first air combat: 86
  interservice relations: 162
  kamikaze attacks: 92–93
  Manchuria–Mongolia experience: 90
  naval aviation development: 87–90
  pilot training and efficiency: 87, 90–91, 93
  provocations by: 73
  reasons for defeat: 93–95
  Soviet, confrontations with: 101, 103–104
  Soviet neutrality pact: 118
  Soviet operations against: 118–19
  surrender to USSR: 119
  underestimated by West: 84–85
Jeschonnek, Hans: 122, 131, 133, 137, 142, 151
Jet propulsion, U.S. development: 376–77, 397
Jewkes, John: 363
JN aircraft: 59, 66
Johnson, Kelly: 365, 367
Johnson, Louis A.: 227, 258–59, 264
Johnson, Lyndon B.: 199–200, 310–11, 337–38, 341, 357–58
Joint Army-Navy Board: 68
Joint Chiefs of Staff: 187, 222, 226–27, 231, 247, 255, 264–66, 268, 312, 337–38, 340
Joint Outline of the Long Range War Plan: 252
Joint Staff Planners: 250
Joint Strategic Plans Group: 252
Joint Strategic Survey Committee: 247
Joint Strategic Target Planning Staff: 280
Joint War Plans Committee: 250
Jomini, Henri: 5–6
Jones, R. V.: 397
Ju–52 aircraft: 114–15, 122, 142
Ju–86 aircraft: 114–15

Ju–87 aircraft: 76, 102, 121
Ju–88 aircraft: 120
Ju–290 aircraft: 115
Juin, Alphonse: 205
JUNGLE JIM Project: 313–14
Junkers designs: 366

Kaga, HIMS: 89
Kaganovich, M. M.: 106
Kahn, David: 163
Kahn, Herman: 5
Kamikaze attacks: 92–93
Kanbara, Lieutenant: 87
Kantor, MacKinlay: 15
Kármán, Theodore von: 170, 181, 224
Karsten, Peter: 17
Kawanishi designs: 91
Kawasaki designs: 91
KB–29 aircraft: 234
KC–135 aircraft: 238, 397
Keegan, George: 334
Kelley, Fred: 15
Kellogg–Briand Treaty: 66
Kennedy, George C.: 236
Kennedy, John F.: 305, 313, 395
Kenney, George C.: 74, 76, 176–77, 190
Kesselring, Albert: 109, 141–42, 155
Key West Agreements: 232–34, 255, 261, 280
Khalkhin-gol (Nomonhan) incident (1939): 87, 89, 104, 106
Kharkov, battles of: 112, 115
Khe Sanh, battle of: 306, 315
Khripin, V. V.: 105
Khrushchev, Nikita S.: 123
Kiev area: 109
Kilner Board: 75–76
King, Ernest J.: 174, 177, 193, 203, 247, 261
King-Hall, Stephen: 404
Kirkpatrick, Elmer E.: 226
Kissinger, Henry A.: 321, 394
Kissner, August W.: 236
Klein, Doyen: 249
Klimov, Vladimir: 124
Kluck, Alexander von: 59
KNICKEBEIN system: 165
Koller, General: 138, 146
Kontum, battle of: 317
Korea
  air experience in: 236, 283, 302–304, 307–308, 338, 357–58
  Air Force history project: 14
  air supremacy in: 303
  Communist invasion of South: 237
  Japanese forces in: 118
Korten, General: 138
Kozhevnikov, M.: 116
Krasovsky, General: 118
Krebs, Captain: 50
Kuban area: 113
Kuomintang: 205
Kurile Islands: 118
Kursk, battle of: 115–17
Kuter, Laurence S.: 72, 74, 174, 176, 191

L–4 (Piper Cub): 294
La–5 aircraft: 113
La–7 aircraft: 117, 119
La–9 aircraft: 119
LaGG–3 aircraft: 106–107, 113
Lahm, Frank P.: 58, 60, 190
Lake Baykal: 103
Lake Khasan (Changkufeng): 104
LAM SON 719 Operation: 319
Lanchester, F. W.: 23–24, 27–28, 422
Land power, historians' treatment of: 16
Langley, USS: 69–70
Langley, Samuel P.: 56–57, 60
Langley Field, Va.: 61, 71, 73, 76
Langley Laboratory: 375
Lansdale, Edward G.: 330–32, 335–36
Laos, operations in: 305–306, 309, 315–16, 318–20, 324

Lapchinskii,: 44
Laser systems: 319
Lassiter Board: 350
Lattre de Tassigny, Jean de: 205
Lavochkin designs: 107, 117
Leeb, Wilhelm von: 109
Leadership, discussions on: 186–209
Leahy, William D.: 177–78, 233
Leighton, Richard M.: 161
LeMay, Curtis E.
  Arnold, relations with: 175
  and atomic bomb: 222
  biography of: 15
  and JUNGLE JIM: 313–14
  on leadership: 186–89, 197–201, 203–204
  on national security: 199
  as R&D director: 219
  Rex interception: 73, 351
  on roles and missions: 280
  self-assessment: 179
  as SAC commander: 236
  on strategic operations and forces: 10–11, 200–201
  on training: 197–98
Lewis, George: 366, 370
Lewis, Isaac N.: 58
Lexington, USS: 69
Liberty engine: 64, 66
Liddell Hart, B. H.: 160–61
Lilienthal, Otto: 8
Limited wars, U.S. conduct: 330–32
Lincoln, George A.: 228
Lindbergh, Charles A.: 75–76, 180, 349
LINEBACKER campaigns: 10, 320–22, 341–42
Lippman, Walter: 182
Loc Ninh, battle of: 315
Lockheed Electra: 397
Logistics
  careers in, outlook for: 402–403
  need for study on: 159–63
Loktionov, A. D.: 105
London, German raids on: 27, 61, 63, 77
London naval agreement (1930): 88
Lorraine, British strikes in: 30
Lorzer, General: 138–39
Los Angeles, USS: 69
Louisiana maneuvers: 352
Lovesy, A. C.: 365
Lovett, Robert A.: 181
Lowe, Thaddeus S. C.: 50
Luce, Stephen B.: 4
Ludendorff, Erich: 150–51
Luke, Frank: 64
Lusitania, SS: 59
LYak–9 aircraft: 113
Lyman, Deke: 352

M–105 aircraft: 117
MacArthur, Douglas: 66, 190, 286
MacArthur—Pratt Agreement: 70
Machine guns: 58
MacIsaac, David: 14, 178, 283–89
Mackay Trophy: 169–70
Macon, USS: 69
Maginot, André: 43
Mahan, Alfred T.: 4–9, 13–15, 56, 421–22
MAKEFAST Plan: 228–29
Malta, German failure to occupy: 141
Man and Superman (Shaw): 47
Manchouli: 101
Manchuria, Japanese-Soviet actions in: 118–19
Manchurian incident (1931): 86
Manhattan Project: 219, 230, 284, 390–91
Manstein, Erich von: 115–16
Marblehead, Mass.: 61
March Field, Calif.: 71
Mariana Islands: 226
Marine Corps aviation
  doctrine development: 290
  first aviators: 61
  personnel and unit strength: 65, 70, 79

roles and missions. *See* Roles and missions
World War I experience: 65
Martin, William I.: 192–96, 198
Marne, battles of: 40, 59
Marshall, George C.: 169
on air forces autonomy: 202
air power, attitude toward: 190
on aircraft development and procurement: 75, 77–78
Arnold, relations with: 171–72, 202
biography, Pogue on compiling: 204–205
appointed Chief of Staff: 76, 208
on cross-Channel assault: 353
resignation rumor: 208–209
Roosevelt, relations with: 173
and Soviet attack on U.S.: 285
Stimson, relations with: 204, 206
on training: 352
on unification: 285
Marshall Islands: 90
Martin designs: 66, 71
Marx, Karl: 213–14
Mason, R. A.: 21–33
Massive retaliation doctrine: 267–69, 394
Maxim, Hiram: 54
Maxwell, Alfred R.: 220
May, Ernest A.: 213–14
Mayaguez incident: 283
MB designs: 66
McCain, John S.: 174, 193
McCone, John D.: 340
McConnell, John P.: 312
McCracken, William P.: 351
McDonald, George C.: 227, 279
McNamara, Robert S.: 11, 16, 311, 316, 334, 338
McNarney, Joseph T.: 74, 234–35
McPherson, John B.: 337–42
McSwain (John J.) Committee: 171, 180
Me–109 aircraft: 102–103, 107–108, 117
Me–163 aircraft: 391, 399
Me–210 aircraft: 143
Me–262 aircraft: 144, 391, 399
Mediterranean theater: 120, 166, 227, 257, 262, 265, 306–307
Metcalf, Arthur: 354
Mexican Punitive Expedition: 62, 348
Miami Beach, Fla.: 175
Middle East
oil resources in: 227
RAF operations in: 301
Midway, battle of: 73
MiG–3 aircraft: 106–107
MiG–15 aircraft: 399
Mikoyan, Artem: 107
Mikulin (Alexandr) designs: 100, 124
Milch, Erhard: 130, 136–39, 144, 148, 151, 155
Military Airlift Command: 292, 295, 303
Military aviators, first: 58, 169
Military history
areas needing more treatment: 7–8, 14, 161, 159–64, 388, 404–10
cautions in compiling: 288
conservatism in writing: 12
criticism of: 16–17
events, evaluating: 213–14
freedom of expression in: 9–10, 14
oral history, introduction into: 17
treatment by historians: 3–7, 13–18, 159, 300, 420–22
Military–industrial complex: 377–79, 404
Miller, Ronald: 363, 365–66
Millett, Allan R.: 5
Millikan, Robert: 62
Milling, Thomas D.: 59, 169
Milton, Theodore R.: 300–308, 330, 334–35, 338
Missile systems

air-to-air missiles development: 397–98
Atlas: 237, 393–96
development and procurement program: 391–96
doctrine for, developing: 396–99
ICBM and IRBM development: 237–38
Jupiter: 394–95
Minuteman: 238, 394–95
Navaho: 392–93, 396, 398
Polaris: 270, 395
Shrike rocket: 312
Snark: 392–93, 398
Soviet SA–7: 311–12, 317, 320, 322–23
submarine-launched: 269–70
Thor: 238, 394–95, 398
Titan: 238, 394–95
V–1 and V–2: 391
Mitchel Field, N.Y.: 303
Mitchell, William
on air forces autonomy: 66–67, 293, 349
as air planner: 17–18, 62–64
on air power mission: 67, 355
biography: 15
conflict with Navy and General Staff: 67–68
heads AEF aviation: 64
Mitscher, Marc A.: 193
Mitsubishi designs: 91
Moffett, William A.: 68–69, 193
Molotov, Vyacheslav M.: 105
Moltke, Helmuth von (1800–91): 150–51
Mommsen, Theodor: 5
Momyer, William W.: 16, 287–88, 341–42
Mongolia, Japanese in: 118
Mongolian People's Republic: 87
Montgomery, Alfred E.: 193
Montgomery, Bernard L.: 190–91
Moon, Lieutenant: 69
Morgan, Daniel: 3
Morgan, John Pierpont: 4
Morgenthau, Henry, Jr.: 173, 204
Morosovskaya: 114
Morrow (Dwight W.) Board: 67, 350
Moscow, German drive on: 109–11, 120
Mountbatten, Lord Louis: 190
Mukden, Soviet drive on: 118
Mulford, Lewis: 404
Munich crisis: 73–74, 171
Murphy, Charles J. V.: 302–303
Murphy, Joseph: 249
Mussolini, Benito: 44, 102

Nagasaki: 220, 222, 237, 248, 304
Naiden, Earl L.: 75
Nakajima designs: 91, 119
Nalty, Bernard: 324
Napoleon Bonaparte: 15, 50
Nate (Type 97) aircraft: 119
National Academy of Sciences: 61
National Advisory Committee for Aeronautics: 61, 68, 76, 362, 367–80, 404–405
National Aeronautical Association: 73
National Aeronautics and Space Administration: 363, 378, 406
National Bureau of Standards: 371, 374
National Liberation Front (North Vietnam): 313, 315
National Research Council: 62
National Security Act (1947): 248, 256, 260
National Security Council: 256, 264–65, 337–38
National Supersonic Research Center: 377
Naval Aeronautical Research Committee (Japan): 87
Naval War College: 56
Nayler, J. L.: 363
NC–4 seaplane: 69
Nef, John U.: 362, 380
Nelson, Horatio: 15

Neumann, Captain, 25
Neutrality Acts: 66, 73
New Look program: 267–69
Newhart, Bob: 213
Newport Agreement: 234, 256, 280
Nieuport designs: 86
Night-vision devices: 318
Nile Delta: 142
Nimitz, Chester W. (*see also* United States Navy)
  antisubmarine warfare, stress on: 250
  on carrier operations plans: 232
  on nuclear weapons plans: 226, 250–51, 284
  on roles and missions: 247, 253, 261
  on strategic operations: 253–55
Nippon Hikoki designs: 91
Nishizawa, Warrant Officer: 92
Nixon, Richard M.: 320–22, 341
Nomonhan (Khalkhin-Gol) incident (1939): 87, 89, 104, 106
Nomura, Commander: 94
Normandy campaign: 165
Norstad, Lauris
  Arnold, relations with: 175
  and atomic bomb: 219
  on national security: 216–17
  on roles and missions:232
  and Seventy-Group Plan: 218
  and SWARMER Exercises: 303
North Africa campaign: 166
North American Designs: 253
North Atlantic Treaty Organization: 307–308
North Carolina maneuvers: 303
North Island flying school: 58, 60
North Sea region: 265
Northrop designs: 366, 416
Norwegian Sea area: 265
Novikov, A. A.: 112–13, 115–16
Nuclear weapons
  Air Force position on: 10–11
  employment doctrine: 219–24, 230, 234, 237, 248–57, 261–62, 264–68, 284
  hydrogen bomb yields: 237
  Navy employment: 248–50, 261–62, 264–70, 284
  small-yield bombs: 266
  Soviet acquisition: 237, 263–64, 288

O–47 aircraft: 294
O–52 aircraft: 294
O'Brien, Larry: 287
O'Donnell, Emmett, Jr.: 236
Offensive, stress on: 304
Office of Management and Budget: 407–408
Office of Scientific Research and Development: 78
Officer candidate schools: 175
Ofstie, Ralph A.: 254, 259–61, 284
Okinawa, bases in: 258
Olds, Robert: 188
OPEN SKIES Plan: 301
Oppama: 87
Orel, battle of: 115–16
Oscar (Type 1) aircraft: 119
Osoaviakhim: 101, 123
Ostfriesland, HIMS: 67–68
Osur, Alan M.: 13
Ower, E.: 363

P2V aircraft: 254–55, 264–65
P–36 aircraft: 75
P–38 aircraft: 75, 367
P–39 aircraft: 75
P–40 aircraft: 75, 91
P–47 aircraft: 75
P–51 aircraft: 390
Pacific Fleet: 339
Panama Canal area: 56, 250
Pan American Goodwill Flight (1926–27): 70, 346, 349
Panay, USS: 73
Panmunjom: 304, 306
Paret, Peter: 5
Paris

German drive on: 59
Vietnam peace talks: 313, 320, 322, 341–42
Parrish, Noel F.: 3–18, 286, 422
Partridge, Earle E.: 10, 221
Patrick, Mason M.: 64, 69, 350
Patton, George S., Jr.: 190–92, 206
Paulus, Friedrich von: 114–15
PBY patrol boats: 76
Pe–2 aircraft: 106, 117, 119
Pe–8 aircraft: 100
Pearl Harbor: 69, 79, 88, 90, 129
Pearson, Drew: 253
Pennsylvania, USS: 60
Pensacola, Fla.: 60
Peripheral Basing Program (1946): 224
Perry, Robert: 386–400, 407–10
Pershing, John J.: 62–64
Pétain, Henry Philippe: 43
Petlyakov (Vladimir M.) designs: 100, 106
Philippines area: 56
Photography, aerial: 40, 59–60
Pilots, training and efficiency: 75, 308, 352, 355, 399
PINCHER studies: 226, 228, 250, 286
Piper Cub (L–4): 294
Pitomik: 114–15
Pleiku: 323, 337
Plocher, Herman: 109, 116
Poe, Bryce, II: 402, 410–18
Pogue, Forrest C.: 15, 202–209
Poland, German and Soviet invasion of: 105, 118
Polybius: 420, 422
Polikarpov designs: 99–100, 101*n*
Port Arthur: 85
Port Lyautey: 265
Portal, Charles: 177, 191, 202
Portugal, bases in: 307
Potsdam Conference: 178
Power, Thomas S.: 236
Pratt–MacArthur Agreement: 294
Precision Emitter Location Strike System (PELSS): 415
President's Air Policy Commission: 231, 253
Prince of Wales, HMS: 85
Problems of Air Navigation (Douhet): 23
Psychological operations: 314, 335
Pyle, Ernest T.: 352

Question Mark: 70, 349
Qui Nhon, enemy attack on: 338

R–5 aircraft: 99, 102
R–38 dirigible: 69
Radar systems: 307
Radford, Arthur W.: 193, 247–49, 261, 281
Radio communications: 59–60
RAINBOW 5 Plan: 78
Ramey, Roger M.: 236
RAND Corporation: 225
Ranger, USS: 69
Reconnaissance, aircraft role in: 5, 25, 37–38, 40, 50, 56, 59
Red River, Vietnam: 358
Reed, George: 60
Reeves, John W.: 193
Reeves, Joseph: 193
Refueling, aerial: 70, 225, 234, 306–307, 349, 390
Renard, Captain: 50
Repulse, HMS: 85
Research and development
Air Force effort: 61, 68, 76, 362, 267–80, 404–405
government investment in: 368–79, 405
Rex, SS: 73, 351
Rheims: 58
Rhineland air strikes in: 30, 72
Ribot, Alexandre: 64
Richardson, Holden C.: 60
Richthofen, von: 114, 129–30, 143
Rickenbacker, Edward V.: 64
Rickover, Hyman: 208–209
Rockets. *See* Missile systems

Rodgers, John: 60
Rogers, Turner C.: 222–23
Rohrbach designs: 366
Roland, Alex: 362–80, 403–406
Roles and missions: 70, 215–18, 227, 230, 232–35, 247–48, 253, 255–63, 266–67, 280–82, 288
ROLLING THUNDER Operation: 305, 310–13, 318, 321, 324, 338–40
Rolls, Charles S.: 54
Rommel, Erwin: 141, 151, 166
Roosevelt, Elliott: 173
Roosevelt, Franklin D.
and air mail assignment: 71
and aircraft development and procurement: 74–75, 77–78, 352
appeal against bombing: 76
Arnold, relations with: 171, 173
and atomic bomb development: 77–78
Churchill, communication with: 77
and commercial aviation: 374
defense policy: 72–73
Marshall, relations with: 173
Roosevelt, Theodore: 4, 8–9, 57, 76, 369
Ropp, Theodore: 420–22
Roscoe, Theodore: 13
Rosenberg, David A.: 245–79, 284–85, 287, 290
Roswell Army Airfield, N.M.: 221
Rowley, Ralph A.: 324
Royal Aircraft Factory: 24
Royal United Services Institution *Journal*: 22–24
Rudenko, General: 118
Rundstedt, Gerd von: 109
Ruppenthal, Roland G.: 161
Russia, Imperial (*see also* Soviet Union)
aircraft development and procurement: 36, 38, 43, 48
tactical organization and operations: 40–41
Ryan, John D.: 236
Ruchagov, P.: 104
Ryujo, HIMS: 89

Sagami Bay: 88
Sagan, Carl: 413
Saigon, enemy attacks on: 337
St-Mihiel, battle of: 64
Salmson designs: 86
Sal'sk: 115
San Diego flying school: 58, 60
San Juan, battle of: 56
SANDSTONE Operation: 234, 237
Santos-Dumont, Alberto: 52
Saratoga, USS: 69
Saratoga, battle of: 3
Saratov: 116, 120
Sasebo: 88
Sawers, David: 363, 365–66
SB-2 aircraft: 100, 102–103
SBD aircraft: 73
Schlaifer, Robert: 364
Schlieffen, Alfred von: 150–51
Schlight, John: 324
Schoenbaum, David: 197
Schweinfurt raid: 13
Science: Key to Air Supremacy: 181
Scipio Africanus: 411
Scriven, George P.: 61
SE designs: 66
Sea power, expansion of limits: 13–14
Seaplane designs: 60
Seattle-to-Wright Field flight: 71
Security, overmphasis on: 230
Seeckt, Hans von: 151
Selfridge, Thomas E.: 57
Sensor devices: 318–19, 333–34
Services inter-relations, need for study: 162
Seventh Fleet: 264
Sexton, Richard: 324
Shakurin, A. I.: 106–107
Shanghai incident (1932): 89

Sharp, U. S. Grant: 16, 334, 340–41
Shaw, George Bernard: 47
Shenandoah USS: 67, 69
Sherman, Forrest P.: 193, 235
  and atomic weapons employment: 249, 251–52
  as Chief of Naval Operations: 282
Shigemitsu, Mamotu: 103
Shimoshizu: 86
Shiner, Fred: 288–89
Shinohara, Lieutenant: 87
Ship-to-shore flight, first: 60
Shoho, HIMS: 89
Shokaku, HIMS: 89
Short, Oswald: 366
Showalter, Dennis: 333
Shvetsov, Arkadiy: 124
Signal Corps
  Aeronautics Section: 57
  Aviation Section: 59
  Science Research Division: 62
Sikorski, Igor I.: 40
Sims, William S.: 68
Sixth Fleet: 265
Skarstedt, Vance: 200
Slay, Alton D.: 407
Slessor, John C.: 179
Smith, Perry M.: 217
Smushkevich, Ya. I.: 105
Smuts, Jan C.: 27–28
Snow, Chet B.: 198
Society for History of Technology: 406
Sociology, need for study on: 162
Soissons, battle of: 39
Sombart, Werner: 362, 368, 380
Somme, battles of: 39
Sopwith designs: 86, 88
Soryu, HIMS: 89
South African War: 50
Southeast Asia. *See* Vietnam
Soviet Union (*see also* Russia, Imperial)
  advantages against Germany: 123
air doctrine, formulation and practice: 44, 102–103
aircraft development and procurement: 44, 99–100, 106–107, 112–15, 117, 119, 125, 160
aircraft and personnel losses: 108, 110, 116, 119, 125
aircraft and personnel strength: 98–99, 103, 117–18
Allied aircraft deliveries to: 119, 127
chemical warfare policy: 357
China, confrontation with: 101
China, military assistance to: 103–104
command unified: 111
dive bomber, enthusiasm for: 121
Finland, war with: 104–106, 399
first combat action: 101
Five-Year Plans: 98–99
Germany, operations against: 107–18
ICBM–IRBM development: 238
industry transplanted: 111–12
inter-service relations: 163
isolationism abandoned: 101–102
Japan, confrontations with: 101, 103–104
Japan, war against: 118–19
logistics, treatment of: 160–63
long-range flights: 42–43
neutrality pact with Germany: 105
neutrality pact with Japan: 118
New Economic Program: 99
North Vietnam, military aid to: 311
nuclear warfare threat: 359
nuclear weapons acquisition: 237, 263–64, 288
operations against, potential: 10–11, 224, 226–31, 234, 250, 253–59, 264–67, 279–80,

284–85
pilots, training and efficiency: 100–101, 106, 117
Poland, drive on: 118
purge of commanders: 105
Spanish civil war experience: 45, 102–103
strategic bombing by: 121
tactical air support role: 110–19, 121–22, 147, 308
turbine propulsion designs: 397
unpreparedness for war: 108
Spaatz, Carl: 175, 188
and air bases defense: 225
as air power champion: 18
and aircraft development and procurement: 75–76
and atomic bomb doctrine: 10, 219, 226, 228–29
biography lacking: 15
on carrier operations: 279, 281
Eaker assessment of: 356–57
on need for navy: 281
observes aircraft performance: 76–77
offensive, stress on: 218
on roles and missions: 233, 247
staffs Air Corps expansion: 74
Spaatz Board: 219–20, 223
Space, expanding operational limits: 11–12, 14, 17
Spad designs: 86
Spain
air bases in: 307
civil war, experiences from: 45, 72, 102–103, 148–49, 151
Spanish–American War: 9
Special Forces units: 314
Speer, Albert: 78, 139, 162, 353–54
Spitfire fighters: 77, 107
Sputnik launching: 11, 395
Squier, George O.: 23
Staffs and staff officers: 314–15
Stalin, Josef: 44, 101–102
aircraft, interest in: 122–23
and German attack: 105, 110–12
as supreme war lord: 163
and two-front war: 118
Stalingrad, battle of: 113–15, 117, 121–22, 141–42, 303
State Defense Committee (USSR): 110
Steward, Oliver: 364–66
Stillerman, Richard: 363
Stimson, Henry L.: 5, 177–78, 204, 206
Strategic Air Command: 197–98, 221, 225, 229–30, 234–35, 266, 280, 287–88, 292, 301, 387
Strategic operations
doctrine and policy development: 10–11, 30–32, 43–46, 71–72, 215–38, 250–58, 279–80, 284, 286–88, 293, 304–306, 310–13, 317, 320–24, 337–42
effectiveness: 215
first recorded raid: 50
Navy role in: 250–62, 268–70, 279–80
need for study on: 164
progress in: 39, 41–42
psychological effect sought: 39, 311, 313
Strategic Bombing Survey: 78, 178, 222, 247, 354–55
Strategic Missiles Evaluating Committee: 394
Strategy for Defeat (Sharp): 334, 341
Stuka dive-bomber: 76
Styer, William: 232
Submarines. *See* Antisubmarine warfare
Suez Canal area, bases in: 258
Sullivan, John L.: 249
Sunderland, Riley: 324
Sungari River: 101
Supreme Allied Commander, Europe: 265
Supreme War Council: 32
SWARMER Exercise: 303

Sweden, air force autonomy in: 42
Sweeney, Walter C.: 236
Sykes, Frederick: 24, 31
Symington, W. Stuart: 231, 235

T–28 aircraft: 314
TACAN system: 414
Tachikawa designs: 91
Tactical Air Command: 292
Tactical air support
  doctrine and policy development: 306–308, 310, 314, 317, 319, 321
  Navy role in: 266
Tactical Fighter Wing, 8th: 321
Taft, William Howard: 58
Taijeron, Anthony: 199
Tallman, Kenneth L.: 346–47
Tan Son Nhut: 324
Tanker aircraft: 306–307. *See also* Refueling, aerial
Targets, identifying and engaging: 30–31,318–19
Task Force 77, USN: 317
Taylor, John W. R.: 41
Taylor, Maxwell D.: 340, 94
Taylor–Rostow Mission: 304–305
Tazinskaya: 114
TB–3 aircraft: 99, 103, 109
TB–7 aircraft: 100
TBF aircraft: 73
Technology
  computers, role in: 413–14
  cost factors in: 411–12, 414, 416–18
  fuel conservation goals: 415
  interaction with doctrine: 386–400, 407–11
  lead time in: 416
  management required in: 412–13
  need for more study on: 7–8, 14, 161, 388, 404–10
  operation, transition to: 398–99
  peacetime-wartime progress: 362–67, 403–406
  quality versus quantity in: 386–87, 399–400
  priorities, fixing: 414–15
  risks and limitations in: 387–88
  testing in: 413
  World War I effect on: 37–41, 293
  World War II advances, lessons of: 388–91
Technology and Culture: 406
Tedder, Arthur W.: 191, 225
Teller, Edward: 11
Terzi, Francesco de Lana: 50
Tet offensive (1972): 317, 320, 334, 341
Texas maneuvers: 352
Thai Nguen, air strike against: 339
Thailand, air bases in: 306, 311, 317–18, 321, 323
Thanh Hoa, air strikes against: 321
Thieu, Nguyen Van: 321, 323–24
Thomas, Lowell J.: 181
Thompson, Robert: 322
Thud RidOge (Brouuhton): 312
Tilford, Earl: 324
Timoshenko, Semyen K.: 106
Tiverton, Lieutenant Commander: 30–31
Toffler, Alvin: 411
Tokorozawa: 86
Tokugawa, Captain: 85
Toward New Horizons: 181
Towers, John H.: 60, 76, 193
Toynbee, Arnold J.: 288
Trans-Atlantic flight: 69
Transport aircraft: 303–304, 314
Transportation, Department of: 363
Treasury, Department of the: 173
Trenchard, Hugh M.: 24, 29, 31–32, 63–65, 67, 191, 355
Truman, Harry S
  and air force priorities: 232
  atomic warning to Stalin: 237
  on atomic weapons employment and control: 249–50, 264–65

budget limitations by: 234, 258, 267, 281–82, 284–85
and carrier program: 258
and military forces reduction: 9
on roles and missions: 232, 280
on unification: 285
Tsingtao: 86, 88
Tu–2 aircraft: 119
Tukhachevsky, Mikhail N.: 105
Tumen River: 104
Tunisia campaign: 142, 166
Tupolev: 105
Tupolev designs: 43–44, 99–100
Turboprop-powered aircraft: 397–98
Twining, Nathan F.: 10, 15

U–2 aircraft (USSR): 101, 112
Udet, Ernst: 40, 136, 143, 155
Ugaki, General: 86
Ukraine, campaigns in: 109, 111, 117
ULTRA, effect on Allied operations: 165–66
Unification of services: 260–61, 285, 288
Unitary Wind Tunnel Plan: 377
United Airlines: 413
United Kingdom
air bases in: 226, 258, 307
air force autonomy: 23–26
air power, employment concept: 22–32, 301
aircraft development and procurement: 24–27, 44, 48, 53, 75, 160, 352
atomic aircraft dispatched to: 237, 302
balloons and airships, early use: 50
German air offensive against: 26–27, 47, 77, 148–49
inter-service relations: 163
naval air service: 25, 28–30, 65
Royal Flying Corps: 25, 29, 40
strategic operations by: 178
United States air forces
air forces autonomy movement: 42–43, 66–67, 71, 202, 215–17, 293, 349
budget cuts: 231
doctrine and organization development: 10–11,30–32, 43–46, 71–72, 215–38, 250–58, 279–80, 284, 286–88, 292–93, 301–302, 386–400, 407–10
expansion programs: 264
global responsibilities: 56
inter-service relations: 163, 314–15
offensive, stress on: 304
personnel and unit strength, periodic: 75, 78–79, 194, 217–18, 232, 236, 349, 351
pilots, training and efficiency: 75, 308, 352, 355, 399
postwar development: 215–19
research and development in: 61, 68, 76, 362, 267–80, 404–405
restraints on operations: 304–307, 312, 316, 333, 335, 337, 339–40
roles and missions. *See* Roles and missions
security, overemphasis on: 230
Seventy-Group Program: 217–18, 231
staffs and staff officers: 314–15
United States Army
Air Corps Act (1926): 67
Army Air Forces activated: 77, 294
aviation in. *See* Army aviation
general staff authorized: 56
Reorganization Act (1920): 66
research and development by: 374
technology, attitude toward: 7
transport aircraft, need for: 295–96
unpreparedness for war: 9

United States Navy
air doctrine formulation: 245–48, 262–63, 267–71, 281–82, 290
aircraft development and procurement: 60, 79
aircraft and personnel strength, periodic: 651, 68, 79, 194
antisubmarine role: 250, 257, 262
aviation expansion program: 69–70, 73
Bureau of Aeronautics activated: 68–69
carrier programs and employment: 68–69, 79, 227, 246–47, 252–53, 258–61, 264, 269, 279, 281
change, resistance to: 270–71, 281
expansion program: 264
first aviator: 60
as first line of defense: 56, 73, 216, 268
flexibility, stress on: 269–70
General Board: 256–57, 269, 284
industry, relations with: 194
Korea experience: 264
Mahan, attitude toward: 8
Missile submarines development: 269–70
Naval Expansion Act (1938): 73
nuclear weapons employment: 248–50, 261–62, 264–70, 284
officers, training and indoctrination: 246, 270
preparedness for war: 9
research and development by: 374
on roles and missions. *See* Roles and missions
and strategic operations: 250–62, 268–70, 279–80
tactical air support by: 266
technological innovations acceptance: 270
World War I experience: 65
Ural Mountains: 111
UT–1 aircraft: 101
UT–2 aircraft: 101

V–1 and V–2 missiles: 391
V series bombers: 397
Vagts, Alfred: 16
Van Staaveren, Jacob: 324
Vandenberg, Hoyt S.: 190
as air power champion: 18
and atomic bomb: 219–20
biography lacking: 15
and carrier program: 258
and Europe air strength: 224
on national security: 9
on roles and missions: 234–35
on strategic operations and forces: 10, 235–36, 259
on war plans status: 231
Vann, John P.: 317
Vasilevsky, A. M.: 116, 118–19
VC–5 Squadron: 264
Venice, Austrian raid on: 50
Verdun, battles of: 39
Versailles Treaty: 135
Victory, John F.: 370, 405
Viet Cong: 313
Vietnam
aggression in, failure to publicize: 331
air defenses, enemy: 319, 322
air experience in: 283–84, 304–25, 333, 335, 337, 339–40, 357–58
Air Force history project: 14–15
air forces, RVN: 305, 317, 323, 338–39
air units departure from: 323
cease-fire negotiations: 321–22, 341–42
civilian casualties: 322
civilians, interference by: 334–35
civilians, problem of: 316–17

defoliation program: 314, 316, 318
enemy build-up in South: 322–23
enemy reaction to air attacks: 311, 315–16
enemy supply system: 319–20, 340–41
final campaign: 324
insurgency in, suppressing: 313–18
intelligence failures in: 319–20, 334
mining operations: 320
psychological operations, failure to exploit: 330–32, 335–36
Soviet aid to North: 311
spring offensives, enemy: 317, 334
troop units commitment to: 315, 340
Vietnamization program: 324
Villa (Francisco), Pancho: 62, 348
Vogt, General: 415
Volga River: 111, 113, 115, 120
Von Neumann, John: 394
Voronez, battles of: 116
Voroshilov, Kliment E.: 106
Vought designs: 91
Vyazma–Bryansk pocket: 109

Wagner designs: 366
Wakamiya Maru, HIMS: 88
Wake Island: 90
Walker, Kenneth: 70, 72
Walleye bomb: 312
War in the Air (Wells): 58
War plans, indecision in: 231
Warning systems: 307
Warsaw, German bombardment of: 76
Washington Naval Conference (1921–22): 66, 69, 88
Washington Navy Yard: 60
Wasp, USS: 69
Weapon Systems Evaluation Group: 266–67
Webb, James E.: 231, 284–85
Weapons, effect on tactics: 411
Wedemeyer, Albert C.: 232
Wells, H. G.: 58
West, Rebecca: 47
Westover, Oscar: 71, 74, 170, 173, 190
Wever, General: 132–33, 148
Weyland, Otto P.: 189–92, 226, 231
Wheeler, Earle G.: 306
Whitcomb, Richard: 365
White, Thomas D.: 10, 15, 18, 301
Whitehead, Ennis C.: 190, 303
Whiting, Kenneth R.: 13, 98–123, 160
Wild Weasel (Iron Hand) fighter: 312, 322
Wilhelm I of Germany: 151
Wilhelm II of Germany: 57
Wilson, Donald: 72
Williams, Robert R.: 291–96
Wilson, Woodrow: 9, 59, 61
Wilson Center: 283, 288
Wind tunnels: 60, 377
Winterbotham, F. W.: 165
Wohlstetter, Albert: 229
Wolfe, K. B.: 175
Woodring, Harry H.: 73
World War I
as aviation turning point: 37–41, 62–66, 189, 293
statistics on U.S. effort: 65
World War II
air doctrine development and execution: 47, 189
air experience gains: 300, 330, 348–49, 352–57
Air Force history project: 14
casualties saved by air warfare: 11
Wright brothers: 8, 51–54, 56–58, 213, 364–65, 412
Wright designs: 100
Wuhan, battle of: 103

X–15/aircraft: 72
XB–17 aircraft: 71
XB–19 aircraft: 72
XF–10F aircraft: 388

Yak–1 aircraft: 106–107, 117
Yak–3 aircraft: 117
Yak–7 aircraft: 114
Yak–9 aircraft: 114, 117
Yakovlev, Aleksandr S.: 101*n*, 117, 121–22
Yalta Conference: 118, 173
Yalu River: 304, 357
Yamamoto, Isoroko: 88–90
Yaroslavl: 116, 120
YF–16 and YF–17 aircraft: 416
Yokosuka: 88
Yorktown, USS: 69

Zambeccari, Count: 8
Zeppelin, Ferdinand von: 57
Zero (Zeke) aircraft: 91
Zhigarev,: 112
Zhukov, Georgi K.: 87, 104–106, 111, 113, 116
ZITADELLE Operation: 116
Zuiho, HIMS: 89
Zuikaku, HIMS: 89

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