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USN-USAF INTERACTION FOR OCEAN SURFACE SURVEILLANCE USING LAND-BASED AIRCRAFT

BY

JOHN R. THOMPSON

LIEUTENANT COMMANDER, U.S. NAVY

JUNE 1979

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A study of USN-USAF interaction for the ocean surveillance role is conducted to consolidate fact and opinion concerning coordination issues. Selected USAF aircraft (B-52, FB-111, F-111, RC-135, C-130) are compared with the USN P-3 and are found to be capable of certain surveillance functions and likely to be available for the surveillance role through a range of world situations. Recommendations for methods to overcome restrictive organizational conditions include creation of a small joint Navy-Air Force agency to translate established policy into effective operational procedures.

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EXECUTIVE SUMMARY

Interaction between the Navy and Air Force is implied in the concept of mutual reinforcement. Gathering intelligence information regarding naval and commercial traffic on the surface of the world's oceans is a role within the capability of many long-range aircraft. Guidelines, programs, and legislation to coordinate Air Force and Navy efforts in the ocean surveillance task are relatively well-established as is sensitivity to the issue of Air Force participation in any maritime role.

The purpose of this study is to consolidate information on the interaction issue, with particular focus on the ocean surface surveillance role. Research was oriented toward a historical review of service interaction--including a review of recent related studies--and, toward a present-day analysis of programs, capabilities, and perspectives.

The evolution of land-based aircraft participation in maritime roles since WWI has been one of mixed controversy and cooperation. With the 1947 National Security Act, the 1958 Defense Reorganization Act, and DoD Directive 5100.1, the roles-and-missions responsibilities of the services have been reasonably well-defined. The 1975 USN-USAF Collateral Functions Training Agreement has further refined service interaction policies and facilitated increased mutual effort in exercise and training programs.

In order to analyze the relative inherent capabilities of Air Force and Navy aircraft in the surveillance role, four basic sources of information were exploited for this study. First a review of the literature, including pertinent studies and service instructions, was conducted. Next a questionnaire was distributed at the Naval War College to Navy patrol squadron pilots and flight officers, including former department heads and commanding officers. Then the author, a P-3 pilot, accompanied a B-52G ocean surveillance training flight, including pre-flight preparation and post-flight wrap-up. Finally, key offices in the Defense organization were visited for interviews with "operator level" action officers; visits included points of contact at OUSDR&E, OPNAV, HQUSAF, HQTAC, CINCLANTFLT, NISC and NOSIC.

Six aircraft types were specifically compared for the surveillance role; they include the P-3, B-52, FB-111, F-111, RC-135, and C-130. Factors such as aircraft range and endurance, equipment, cost, and availability were addressed. In addition, organizational issues and resources related to implementation of service interaction programs were discussed.

Conclusions of the study include:

- Post WWII legislation has resolved many roles-and-missions issues, but the concepts of collateral functions and mutual reinforcement require continued emphasis on Air Force participation in maritime roles.

- A number of currently operational USAF aircraft are well-suited for some aspects of the ocean surface surveillance role. Major attributes include range, endurance, speed and electronic countermeasures capabilities. Drawbacks include some equipment limitations as well as poor relative fuel economy for some aircraft.

- In conceptual world situations ranging from peace to general war, Air Force aircraft will be available to varying degrees. In more demanding conflict scenarios, availability will be severely restricted, but the relative value of each aircraft will be proportionately greater.

- As a result of inter- and intra-organizational factors, present USAF ocean surveillance crews are not performing to the limit of their potential.

- Historical rivalries and conflicting budgetary interests have resulted in dysfunctional organizational conditions.

- Inexpensive and potentially effective resources are available to enhance service interaction programs.

The study ends with several recommendations for improving interaction for ocean surveillance. These include a recommendation for creation of a small Air-Naval Force Application (ANFA) Directorate which would be analagous to an already existent, successful, Air-Land Force Application (ALFA) Directorate. This task-oriented, economical organization

would serve as an on-going vehicle by which established policies might be more effectively translated into operational practice.

Other recommendations include increased emphasis on operator-level information exchange and feedback, and on refinement of in-house training programs.

ACKNOWLEDGEMENTS

The encouraging academic environment of the Naval War College and its Center for Advanced Research is particularly helpful to the "operator-turned-analyst" who is fortunate enough to have worked here. The added advantage of as experienced an advisor as Dr. George F. Brown, Jr. enhanced the author's positive experience as did support from War College faculty members, CDR Paul Frazer and LCOL Paul Goree.

Particularly useful assistance was received from those outside the War College who were interviewed for this study; RADM W. A. Myers, CAPT N. E. Koehler, III, and LCDR D. Riffle of CINCLANTFLT; CDRs L. Blasch and J. Castano of OPNAV; LCOL R. Neal of HQUSAF; MAJ S. Czech and CAPT M. McNeal of HQSAC; Mr. J. Jedrlinic of NISC; MAJ S. Barneyback of HQTAC: MAJ D. Vogel of ALFA; CAPT P. Rogers and 1LT W. Ross of the 416th Bombardment Wing were particularly helpful.

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Responsibility for errors of perception or interpretation and for the views presented herein rest solely with the author.

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CHAPTER I

INTRODUCTION

USAF participation in maritime roles has been discussed and debated for a number of years. According to present law, the Air Force is assigned a number of collateral maritime functions including antisubmarine warfare (ASW), mining, surface ship interdiction, and surveillance. The subject area is a relatively volatile one in that it involves questions of traditional roles and missions.

This study addresses interaction for ocean surface surveillance using land-based aircraft, within the context of the overall interservice coordination issue. "Ocean surveillance" was singled out for the study for several reasons. (1) It placed a realistic limit on the scope of the study, considering time and resource limitations. (2) It has been an area of considerable USN-USAF interaction since the 1975 Holloway-Jones Collateral Functions Agreement. (3) Ocean surveillance has been an area in which inherent Air Force capability has seemed strong. (4) Consideration of only one aspect of the joint maritime functions area does not seem to limit discussion of more general interaction issues.

Study Objectives

This study consolidates available information dealing with Navy-Air Force interaction for ocean surface surveillance

using land-based aircraft. Although specific quantitative data pertaining to aircraft performance was considered, emphasis was placed on the "interaction" of forces, rather than on respective force capabilities. The study presents an assessment of current USN-USAF ocean surveillance interaction issues and highlights areas for potential improvements.

The central question addressed by the study is whether the current level of service interaction is adequate to fulfill the need for ocean surface surveillance using land-based aircraft. In addressing the question, only selected, current inventory USN and USAF long-range aircraft systems were considered. Besides the USN P-3 patrol aircraft USAF B-52, FB-111, F-111, RC-135, and C-130 aircraft were addressed because of their apparent inherent surveillance capabilities. Systems such as SR-71, U-2, F-4, E-3, F-5, etc., were not included because of mission, number, range, or other limitations.

Measures of effectiveness, cost, and the criteria for comparing the respective aircraft systems are developed in Chapter III. Generally speaking, to be effective, the aircraft must be available and it must have certain range, endurance, and equipment capabilities. Costs of operating the aircraft in the ocean surveillance role include fiscal as well as opportunity costs. The level of effectiveness required is dependent on the world situation in which the system is employed.

Alternatives

The principle alternatives considered in this study focus on the status quo and departures from it. With regard to status quo, SAC has generally assumed responsibility for the major USAF effort in the land-based aircraft ocean surface surveillance arena. The present "Busy Observer" training program has resulted in approximately 30 to 60 B-52 flights each year since 1975. The typical bombardment squadron assigned surveillance duties conducted about one or two surveillance training flights per year, per crew.

USAF TAC aircraft participate in similar surveillance training missions, but to a lesser extent. In addition, land-based USAF tactical aircraft participate in reconnaissance roles in some joint exercises. Tactical aircraft are conceptually susceptible to tasking in ocean reconnaissance roles according to Allied Tactical Publication 34 (ATP-34, Tactical Air Support of Maritime Operations).

Land-based ASW patrol aircraft perform a sizeable portion of the Navy's ocean surface surveillance. The present level of deployed squadron surface surveillance operations is from 15 to 30 sorties per squadron, per month--or from 1000-2000 total operational flights per year. While an individual crew may fly only 10-15 dedicated surveillance flights per year, it

may fly 15-20 additional ASW or exercise sorties whose tasks are directly related to surface surveillance skills.

Service interaction for ocean surveillance involves a system of USN and USAF officers from the Pentagon to the aircraft wing level which acts to coordinate the training of USAF crews and to incorporate USAF assets into joint maritime exercises. With few exceptions, the action officers deal with USN-USAF interaction as an additional, or secondary duty. CINCPACFLT, CINCLANTFLT, SAC and TAC have designated officers who coordinate interaction in their respective areas of responsibility, but there is little routine dialogue among all the components.

Two general departures from the status quo were viewed as alternatives for the purpose of this study. One involved a decrease in the present level of interaction, and the other, an increase. All three alternatives -- status quo, decrease, and increase, were treated conceptually, rather than quantitatively.

In addressing these alternatives, two very basic, general assumptions were made. The first was that USN anti-submarine patrol aircraft will continue to be exploited for surface surveillance regardless of the level of Air Force participation in that function. This assumption is based

on the fact that an aircraft optimized for ocean subsurface surveillance can be expected to have surface surveillance capabilities, as well.

The other general assumption was that, if USAF aircraft are capable and available for ocean surveillance, organizational obstacles restricting effective USN-USAF interaction can be overcome in the interest of national security.

Methodolody

This study emphasized interaction, rather than a comparison of capabilities of the respective services to perform ocean surveillance roles. A review of applicable literature was made to consolidate thoughts germane to the topic. Visits and phone conversations with persons in key offices of both services were conducted to sample the current level of attention and the problems related to the interaction issue. A questionnaire was sent to representatives of the Navy's fixed-wing patrol (VP) community at the Naval War College to elicit responses concerning present peacetime Navy ocean surveillance practices. The author (a USN patrol plane pilot) accompanied and observed a USAF B-52 ocean surveillance training mission. An analysis was made of the potential of various USN and USAF aircraft to perform the ocean surveillance task.

Several strategic situations were considered to provide a forum for discussing aspects of the interaction issue.

Chapter II provides a historical background of USN-USAF interaction issues as recorded in news media, books, and various studies. Appendix II-A is the text of the current USN-USAF Collateral Functions Training Memorandum of Agreement.

Chapter III is an analysis of the requirements for ocean surface surveillance and the relative surveillance capabilities of selected land-based aircraft. Appendix III-A summarizes the "VP Questionnaire"; Appendix III-B is a report of the author's B-52 OSST flight; and Appendix III-C summarizes the surveillance-related equipment of selected land-based aircraft.

Chapter IV discusses aspects of the "availability" question in the context of several general world situtions.

The first part of Chapter V is a treatment of current organizational concerns related to the USN-USAF interface; the second part addresses potential resources for maximizing the effectiveness of Air Force participation in the maritime surveillance role.

Chapter VI contains the author's conclusions and recommendations.

DEFINITIONS AND ACRONYMS

ALFA - Air-Land Force Application (Directorate)

ANFA - Air-Naval Force Application (Directorate)

ASW - Anti-Submarine Warfare

ECM - Electronic Countermeasures

ESM - Electronic Support Measures

FLIR - Forward Looking Infra-red

LLTV - Low-Light Level Television

Ocean Surveillance - Quote from CNO Report on the FY 79 Budget by Admiral J.L. Holloway; March 1978, p. 19:

> "Ocean surveillance is the systematic observation of ocean areas to detect, locate, and classify selected high interest aerospace, surface, and subsurface targets and provide this information in a timely manner. A target may be any hostile, neutral, or friendly platform of interest. Ocean surveillance provides the current operational setting in which Navy commanders deploy forces to do battle. Ocean surveillance both supports and depends upon C^3 and intelligence, and, therefore must be integrated with both."

For the purposes of this study, the definition of ocean surface surveillance is adapted from CNO's definition.

OSST - Ocean Surface Surveillance Training; refers to a joint USN-USAF collateral functions training program involving B-52s.

RIG - Recognition Identification Group or Recognition and Intelligence Groups; normally refers to the act of aircraft maneuvering near a surface vessel for the purpose of gathering intelligence.

TAS - True Airspeed

TSST - TAC Sea Surveillance Training; Analagous to SAC's OSST.

VP - "Fixed Wing Patrol"; designation of USN land-based ASW patrol aircraft squadrons.

CHAPTER II

BACKGROUND

A number of studies since World War II have considered the question of USAF participation in the traditionally naval tasks of sea surveillance, antisubmarine warfare, and aerial mining. Various conclusions have been reached, ranging from the pessimistic to bold proposals for extensive peacetime USAF involvement.

A reader can quickly infer from some of the studies that service rivalries have been underlying motives in discussions of the subject (e.g., "The Air Force is mission-hunting," or "The Navy is trying to protect its empire.")

The roots of service rivalry concerning land-based aviation in maritime roles penetrate to the 1920s and the outspoken advocate of air warfare -- General W.L. "Billy" Mitchell. His dramatic warship-sinking demonstrations of 1921 and 1923, and his testimony critical of the Navy Department policies in 1925[1] were not conducive to cordial Army-Navy relations. The United States Naval Institute Proceedings during the 1924-26 time frame are replete with articles discussing the pros and cons of airplanes versus battleships and of the question of control of aviation assets in maritime roles.[2]

Of course, the controversy carried into World War II, and it has been asserted that resultant poor planning degraded the effectiveness of the Air Force in sea control tasking.[3] A notable example was the controversy between the Army and Navy Chiefs of Staff over the antisubmarine warfare (ASW) mission. The Army wanted a coastal command organization of land-based aircraft analagous to that of the Royal Air Force. The Navy wanted 1300 B-24s and B-25s transferred from the Army to the Navy for use in the maritime role. While that argument was going on, ship sinkings by submarines continued.[4]

The author of the U.S. Naval Institute 1946 Prize Essay stated the situation this way:

> ...this nation found itself on December 7, 1941, with totally inadequate coordination among its armed forces....
>
> It would be difficult at best to point out where the fault lay. However the defect was happily seen and corrected, with time again our most potent ally.[5]

Under the demands of war, interservice controversies were resolved at least well enough to accomplish national objectives. By 1944 the Navy had acquired almost a thousand land-based B-24s for use in ASW.[6] In the 1941-45 war reports of the Joint Chiefs,there are a number of anecdotal examples of service cooperation in maritime tasks. General Arnold, Commanding General of the Army Air Forces,pointed

with pride to the March, 1943 Battle of the Bismarck Sea: in that battle, AAF light and heavy bombers decimated a Japanese convoy and 12,700 troops at a cost of only five U.S. airplanes and 13 crew members.[7] In another example of integrated warfare, General Arnold pointed out that B-29 mining operations in Japan in 1945 were so effective that they elicited the following remarks in a telegram from Admiral Nimitz to General LeMay: "The planning, operational and technical operation of aircraft mining on a scale never before attained has accomplished phenomenal results...."[8]

There are other examples of Army Air Force accomplishments in maritime roles during WWII, but as General Arnold's third report to the Secretary of War in 1945 points out:

> Perhaps the main point about all our air operations in the war against Japan is that they were part of a vast, complex, and coordinated whole. The role of air power was recognized and its potentialities were brilliantly exploited by the theater commanders...."[9]

And, in discussing the future of the Air Force, General Arnold wrote that:

> ...it is the team of the Army, Navy, and Air Forces working in close cooperation that gives strength to our armed services in peace or war.[10]

Following WWII, the inevitable cutback in defense spending helped to rekindle service rivalries. Difficult-to-resolve issues included the fate of land-based aircraft.

The Navy feared that all land-based aircraft would come under the jurisdiction of the Army Air Force; thus transferring the airborne antisubmarine and reconnaissance functions away from the Navy.[11] However, such a transfer did not occur. In fact, the 1947 fiscal appropriations provided more money and aircraft to the Navy's air arm than to the Army Air Force.[12]

The land-based aircraft question was a key issue in the 1947 service unification discussion. Air Force officers believed that in addition to winning identity as a separate armed service, they could also gain control over the Navy's land-based air assets. This belief was based on an assumption that services should be organized according to weapon functions, i.e., Air Force for aircraft, Navy for ships, etc. The Navy, however, argued that the services should be organized and assigned missions based on stated functions; and that they should be equipped with weapons suitable for accomplishing the assigned functions. For example, given the function of sea lane protection, the Navy believed it should have control over whatever aircraft and ship systems that were necessary to do the job.[13]

The 1947 National Security Act which created the OSD and the JCS neither accomplished all the goals of its proponents, nor resulted in all the evils feared by its opponents. The Air Force became a separate service, and the Navy retained its land-based air power. However, clear delineation of

functions was not accomplished until the enactment of the Department of Defense Reorganization Act of 1958.

The 1958 Department of Defense Directive 5100.1 -- subject: "Functions of the Department of Defense and Its Major Components" -- supplemented the 1958 Act. It promulgated very specific primary and collateral functions of the services. The Navy's primary function included a charter to "...conduct such land and air operations as may be essential to the prosecution of a naval campaign."[14] DoD Directive 5100.1 also assigns the Air Force the following "collateral" functions:

> ...To train forces:
>
> a. To interdict enemy sea power through air operations.
>
> b. To conduct antisubmarine warfare and to protect shipping.
>
> c. To conduct aerial minelaying operations.[15]

The Joint Chiefs of Staff publication "2", titled "Unified Action Armed Forces" also addresses the primary and collateral functions. This October, 1974 publication reiterates DoD Directive 5100.1 function assignments. Article 20101 of the JCS document very specifically addresses the relationship between services with overlapping functions:

> 20101 Common Functions
>
> ...The forces developed and trained to perform the primary functions set forth hereinafter shall be employed to support and supplement the

> the other Services in carrying out their primary functions, where and whenever such participation will result in increased effectiveness and will contribute to the accomplishment of the overall military objectives. As for collateral functions, while the assignment of such functions may establish further justification for stated force requirements, such assignment shall not be used as the basis for establishing additional force requirements.[16]

In effect, the Air Force is therefore required to train for various maritime roles, but it is prohibited from using these collateral functions as a "basis" for funding requests. In other words, the Air Force can use ocean surveillance as an additional -- or "further" -- reason for spending money, but it cannot use such functions as a "primary" force requirement justification.

The 1947 and 1958 Acts, DoD Directive 5100.1, and JCS Publication 2 form the legal basis for USN-USAF interactions for maritime functions. Since their promulgation, additional guidelines have been published in the form of "Memoradums of Agreement" (MOA). In 1975, an MOA titled "USAF-USN Collateral Functions Agreement" was signed by the Chief of Naval Operations, Admiral J.L. Holloway, and the Chief of Staff of the Air Force, General D.C. Jones. It is such a frequently referenced document and it provides such explicit guidance germane to the topic, that it is included as Appendix A to this chapter. The Collateral Functions MOA is aimed at setting policy for Air Force training for applicable maritime roles. Concerning ocean surveillance, it states:

...Considering the scope of sea control operations and the degree of existing Air Force maritime capability, the following tasks are considered appropriate:

a. Performance of ocean surface surveillance/reconnaissance to include real-time location, identification, determination of movement and reporting of enemy or potential enemy surface combatants and merchant ships. Such tasking could conceivably be implemented in the following scenarios:

(1) Establishment of radar and visual barriers at specified choke points and key locations.

(2) Establishment of search sectors in oceans remote from naval task force operations for purposes of general strategic assessment or for deceptive operations.

(3) Establishment of search operations in support of naval task force operations....[17]

The MOA goes on to address liaison authority, reporting requirements, command relationships, training plan preparation, training rules of engagement, and areas of responsibility.

Besides providing policy guidance for the services, the 1975 Collateral Functions MOA has elicited comment from the press. L. Edgar Prina, the editor of Sea Power magazine was quick to comment on the pact. His January 1976 article on the subject summarized the "parochial" issues. He wrote that the MOA, which was drafted by RADM S.R. Foley, Jr., and MGEN R.L. Lawson, was a result of Secretary of Defense Schlesinger's emphasis on "mutual reinforcement."[18]

The years before and after the September 2, 1975 signing of the Collateral Functions MOA have been punctuated with

activity related to Air Force involvement in maritime roles. A brief summary of some of the highlights of that activity follows.

July 1971

The Boeing Company completed a classified feasibility study of the use of Harpoon missiles on B-52D aircraft. It discussed basings, targeting, and aircraft performance considerations.[19]

December 1974

USAF published its classified final report on its four "Busy Harbor" flights which were flown at the request of General D. C. Jones to test the capability of B-52G/H and FB-111 aircraft in sea surveillance and attack roles.[20]

May 1975

Air University classified student research study proposed the use of palletized avionics in USAF KC-135 aircraft to complement the Navy's ASW program.[21]

January 1976

Editor emeritus of *Sea Power* magazine addressed parochial nuances of the 1975 collateral functions MOA.[22]

March 1976

USAF published classified SAC Operations Plan 28-76 -- "Busy Observer." The publication is a direct result of the

1975 MOA. It was sent to all SAC B-52, FB-111, and KC/EC/RC-135 units for possible tasking. It requires certain B-52 squadrons to fly a minimum of 4 ocean reconnaissance training missions every six months. Procedures for mission conduct, communications, and reporting are addressed in detail.[23]

April 1976

An Air University student research paper discussed the use of TAC's F-111 in the sea surveillance role. The author concluded that the F-111 is the best USAF aircraft for sea surveillance and that TAC should implement an ongoing training program for that role.[24]

April 1976

"Air Force Times" newspaper discussed 1975 MOA in articles titled,"Pact expands AF role in backing Navy in war."[25]

April 1976

An ex-commander of a USN patrol plane squadron wrote a paper at the Air University titled, "Air Force Role in Maritime Operations." Among many considerations and conclusions,he makes the following observations:

> ...How available would USAF assets be in time of national crisis?
>
> ...How will lack of command and control between Air Force and Navy assets be addressed in coordinated operations?

...Since training for collateral missions is not a funded role, it is not apt to be adequate to maintain proficiency.[26]

June 1976

A Defense review panel ad hoc report on "Land-Based Air and the Sea Control Mission" made the following points:

- 60 percent of ships sunk by air attack in WWII were sunk by land-based aircraft.
- inattention to modest preparation for the use of land-based air during hostilities may result in not having the option to use them - or threaten to use them in sea control operations.
- land-based aircraft and bases are less flexible and more vulnerable, but aircraft carriers can be lost permanently.
- the use of land-based air presents the Soviet planner with a difficult and broad array of considerations.[27]

June 1976

Classified research study by USAF LtCol at the Naval War College investigated the use of the B-52 in ocean surveillance and interdiction roles. The paper recommends "stronger Navy effort in providing SAC with the information necessary for the B-52D to successfully execute its collateral mission."[28]

August 1976

Classified RAND study discussed potential Air Force contributions to sea control in limited war. The study concluded that there is substantial uncertainty about the need for, or utility of, USAF capabilities as a complement for USN sea control assets in limited regional conflicts. It stated that this

very uncertainty might be cause for further exploration. It also indicated that the Air Force might contribute indirectly to ASW by assuming non-ASW missions that would otherwise be flown by Navy P-3 aircraft.[29]

October 1976

USAF study by the tactical air command concluded that USAF long range tanker, cargo, and bomber aircraft have better capabilities than attack and fighter aircraft for ocean surveillance missions. The study also called for an evaluation of AWACS in the maritime surveillance role.[30]

Winter 1976

Article by retired USAF MGEN R.N. Ginsburgh titled "A New Look at Control of the Seas," in Strategic Review magazine suggested that Navy's need for help with sea control called for a review of Air Force resources fitted for that role. He suggested that the emphasis on mutual reinforcement might be a basis for revising the prohibition of funding requests for collateral missions.[31]

January 1977

Sea Power magazine article entitled "Terra Firma: The Largest Aircraft Carrier" discussed W.D. O'Neil's (DDR&E) concept for an ASW/ASUW/AAW land-based multi-purpose naval aircraft (LMNA). Emphasis of the article is on the maritime capabilities of land-based aircraft and on alternative platforms to accomplish maritime objectives.[32]

December 1977

A professional paper titled "Protecting the Fleet" was published at the Center for Naval Analyses (CNA). In a discussion on future developments, the author included the statement, "Protection of the fleet will require coordinated action by land and sea-based systems, including some outside the Navy's control. To maintain coordination in the face of enemy countermeasures will require responsive systems of command and control."[33]

April 1978

USAF General Ahman testified before the Senate Armed Services Committee that the Air Force is training strategic assets on a regular basis to prepare to perform many types of maritime operations. He reported that SAC and the naval Ocean Surveillance Information Center (NOSIC) had established a direct communications link to improve command and control techniques.[34]

May 1978

Writing in Armed Forces Journal, author Bridget Gail discussed conflicting proposals for the Navy's shipbuilding program and related issues. A controversial quote from that article is significant if for no other reason that the fact that it represents one perspective of public opinion:

> Consider, for example , what is missing in recent testimony, speeches, studies, and leaks...Explicit discussion of the common capabilities of U.S. sea and air forces...Sea power is discussed in terms of ship or seaborne air power. While land-based Soviet Naval Air and missile forces grow steadily in capability, the U.S. Navy still wants to ignore the Air Force, and OSD tacitly permits the oversight rather than take on two services at once.[35]

June 1978

Science magazine published an article which discussed an Institute for Defense Analyses (IDA) study on land and sea-based protection of the North Atlantic Sea lines of communication (SLOC). The article quotes Secretary of Defense Brown as saying that he sees "the opportunity for land-based air to make a significant contribution as a supplement to the sea-based air..." The author of the article also asks a very pointed question, whether sea control with land-based aircraft "should be carried out by the Air Force instead of the Navy."[36]

December 1978

A Congressional Budget Office paper, titled U.S. Naval Forces: The Peacetime Presence Mission, discussed as one alternative to carrier basing in the Indian Ocean, employment of USAF F-111 aircraft flying surface surveillance missions from Diego Garcia.[37]

Summary

Since General Mitchell's post-WWI advocacy for aircraft in maritime roles, there has been considerable debate about who should control the land-based aircraft assets. Experience in WWII demonstrated the utility of coordinated shore-based aircraft employment in sea-control tasks; however, post-war service unification attempts re-opened Air Force-Navy roles-and-missions arguments. The 1947 National Security Act and the 1958 Defense Reorganization Act helped to resolve the policy issue of principle service functions.

With respect to Air Force collateral sea control functions, the 1975 Holloway-Jones Memorandum of Agreement helped to translate broad policy into operational practice. Various studies and media comments during the 1970s have served to further develop the details of the Air Force-Navy interaction problem. However, these studies have also reached conclusions and raised issues which can bear further analysis. One facet of the roles-and-missions question which has been actively addressed is that of ocean surface surveillance. The Air Force is presently actively engaged in a program of training with its inherent assets to ensure a capability in this collateral mission area.

The remainder of this study will assess aspects of the present state of Air Force/Navy interaction in the ocean surveillance role. Organizational issues, inherent Air Force capabilities, and concepts of operations will be addressed.

APPENDIX A

to CHAPTER II

THE 1975 COLLATERAL FUNCTIONS MOA

APPENDIX A

TO CHAPTER II

THE 1975 COLLATERAL FUNCTIONS MOA

Because it is the central document upon which current USN-USAF interaction for ocean surface surveillance is based, the September 1975 CNO/CSAF collateral functions memorandum of agreement is included here in its entirety:

MEMORANDUM OF AGREEMENT
ON
THE CONCEPT OF OPERATIONS FOR USAF
FORCES COLLATERAL FUNCTIONS TRAINING

References:
a. CNO Memorandum to CSAF of 6 February 1975, Subj: Employment of USAF Augmentation Forces in Collateral Functions.
b. CSAF Memorandum to CNO of 19 February 1975, Subj: Employment of U.S. Forces in Collateral Functions.
c. DOD Directive 5100.1, Subj: Functions of the Department of Defense and its Major Components
d. JCS Pub 2, Unified Action Armed Forces (UNAAF).
e. JCS Pub 1, Dictionary of Military and Associated Terms.
f. Agreement between the Department of the Navy and the Department of the Air Force of 22 May 1974 governing B-52 aircraft aerial delivery of Navy sea mines.

PURPOSE

1. To set forth the joint USAF/USN agreement in accordance with references (a) and (b) concerning a general concept of operations of U.S. Air Force resources training to perform collateral functions.

BACKGROUND

2. The Department of Defense Reorganization Act of 1958, supported and implemented by references (c) and (d), states the collateral functions of the Air Force - "To train forces:

a. To interdict enemy sea power through air operations;

b. To conduct antisubmarine warfare and to protect shipping;

c. To conduct aerial minelaying operations."

3. One of the primary functions of the Navy listed in references (c) and (d) is to "organize, train, and equip naval forces for naval reconnaissance, antisubmarine warfare, protection of shipping, and minelaying, including the air aspects thereof, and controlled minefield operations."

4. JCS Pub 2 specifies that each Service has the responsibility for "planning for the utilization and exploitation of the intrinsic capabilities of forces of the other Services which may be made available." Training for unified and joint operations is to be conducted in accordance with Chapter III of JCS Pub 2. Specifically, joint exercises may be held on the initiative of one or more of the Service Chiefs and the initiating directive for exercises held by agreement between Service Chiefs or commanders acting directly under them will be issued jointly. This concept of operations, therefore, represents the broad guidance necessary for the development of plans for enhancing, through training, Air Force collateral functions capabilities to support naval operations at sea.

5. The definitions and functions outlined in references (c), (d), (e), and (f) remain unchanged by this agreement.

DISCUSSION

6. It is becoming increasingly more important for the Unified Commander to utilize effectively any resources that are made available to conduct sea control operations in accordance with the spirit and intent of mutual reinforcement.

7. Sea control operations involve a variety of surface, subsurface and aviation functions, most of which are beyond the scope of this agreement. This general concept of operations for training Air Force resources in collateral maritime functions is limited to those aspects of sea control which are within the intrinsic capabilities of those resources. That is, Air Force resources will be trained for tasks (a) which complement and supplement sea control operations, and (b) for which an inherent Air Force capability already exists. Further, since primary functions may necessarily preempt the availability of Air Force resources, it is recognized that a primary organic Navy capability must be maintained.

8. It is envisioned that Air Force capabilities might be employed to perform the following tasks:

a. Search and identification
b. Electronic warfare
c. Tactical deception
d. Attack against surface and air units
e. Aerial minelaying

9. Considering the scope of sea control operations and the degree of existing Air Force maritime capability, the following tasks are considered appropriate:

a. Performance of ocean surface surveillance/reconnaissance to include real-time location, identification, determination of movement and reporting of enemy or potential enemy surface combatants and merchant ships. Such tasking could conceivably be implemented in the following scenarios:

(1) Establishment of radar and visual barriers at specified choke points and key locations.

(2) Establishment of search sectors in oceans remote from naval task force operations for purposes of general strategic assessment or for deceptive operations.

(3) Establishment of search operations in support of naval task force operations.

b. Performance of attrition operations wherein the Unified Commander, or when authorized, the supported naval component commander could assign specifically designated and identified enemy surface combatant/merchant shipping as targets. This task could be performed by either an airborne or ground alert reaction force.

c. Aerial minelaying operations.

10. Training of Air Force resources in collateral functions will be based on the following agreed precepts.

a. Direct liaison is authorized between the Major Air Commanders and the Fleet Commanders-In-Chief to effect training programs for Air Force units which may be made available to perform collateral functions.

b. Training will be conducted to support maritime operational requirements set forth by the unified commanders.

c. Reports will be in accordance with joint, Navy, and Air Force requirements using inbeing communication nets and will be reported as near real time as possible.

d. Command arrangements for training normally shall be the same as those established for operational employment; i.e., Air Force forces remain under the operational control of the appropriate Air Force commander and operate in support of the naval commander.

e. Training plans will be prepared by Major Air Commanders or their designated subordinates in coordination with the appropriate Fleet Commanders-In-Chief or their designated subordinates.

f. Training rules of engagement (ROE) will be established by the Major Air Commanders and the Fleet Commanders-In-Chief or their designated subordinates.

11. Areas of Responsibility:

a. Air Force is responsible for training of its personnel in collateral functions as specified in JCS Pub 2.

b. Air Force is responsible for its portion of all costs associated with training, operations, material, logistic support, personnel support and any other funding aspects of these collateral functions.

b. Navy is responsible for providing the essential intelligence information to Air Force forces that are designated to train in collateral functions during the periods in which such training is underway.

d. Navy will make available training periods to Air Force taking into consideration such factors as Navy training and operational requirements, sensitivity of operations, and capabilities and limitations of available forces.

e. In the event that formal schooling of Air Force personnel is deemed necessary, such schooling will be provided by the Navy on a space-available basis. Funding of travel expenses for Air Force personnel associated with such schooling will be borne by the Air Force.

12. Effective Date. This agreement is effective immediately and shall remain in effect until amended by mutual written agreement between Navy and Air Force.

J. L. HOLLOWAY, III
Chief of Naval Operations

DAVID C. JONES
Chief of Staff, U.S. Air Force

CHAPTER III

INHERENT CAPABILITIES

The 1975 Holloway/Jones agreement concisely summarizes the general concept of Air Force participation in maritime roles. It says that:

> ...Air Force resources will be training for tasks (a) which complement and supplement sea control operations, and (b) for which an inherent Air Force capability already exists.[1]

As mentioned in Chapter II, a number of studies have been conducted in the last 5-10 years which address aspects of the Air Force's intrinsic capabilities in maritime roles. This chapter will address those capabilities of selected USAF and land-based USN aircraft which are directly related to the ocean surveillance role. The following topics will be addressed:

1. The Need for Surveillance Information
2. Requirements of an Ocean Surveillance Aircraft
3. Comparison of Selected Current Aircraft
   a. Aircraft performance on selected profiles
   b. Aircraft standard equipment evaluation
   c. Aircraft inventory and range comparison
   d. Operating cost comparison

1. The Need for Surveillance Information

Land-based aircraft are certainly not the most technologically sophisticated means of gathering intelligence from the ocean's surface. Although the SR71 represents near state-of-the

art in aircraft overhead reconnaissance, imaging and signal gathering satellites provide capability of an even greater scope. Disadvantages of the more sophisticated sensors are generally recognized. Responsiveness, susceptibility to meteorological interference, vulnerability to sophisticated countermeasures, dollar cost, and availability are perhaps the most frequently addressed shortcomings.

Despite their weaknesses, there is little question that high-technology surveillance systems such as satellites and over-the-horizon radars provide data not readily available from other sources. Through subsequent computer processing and correlation of information, much can be learned about surface traffic on the oceans. The place of land-based aircraft is not one of substitution for these sophisticated systems. Rather, aircraft occupy a complementary position which emphasizes their relative responsiveness, foul-weather capability, and flexibility. An additional, significant advantage of land-based aircraft is, of course, their ability to launch weapons against surveillance targets during hostilities.

In the recent Atlantic Council Policy Study, "Securing the Seas," the assessed importance of land-based aircraft can be inferred from the recommendation that "Alliance/Air Force assets be considered for a greater contribution in the ocean surveillance role."[2] This recommendation acknowledges the potential need for aircraft reconnaissance and surveillance in time of war.

The peacetime need for surveillance is evident in routine Navy tasking and intelligence procedures. Table III-1 is an estimate of surveillance and ASW employment percentages of deployed P-3 squadrons.

TABLE III-1

PEACETIME NAVY P-3 SURVEILLANCE EMPLOYMENT
(Percentages)

	ASW	SURFACE SURVEILLANCE	OTHER*
Atlantic/Med	63.0	23.9	13.
Pacific/Indian Ocean	34.7	49.8	15.6

* Logistic, maintenance, misc., and "Non ASW exercise" flights.

Source: VP Questionnaire -- (Appendix III-A)

Generally speaking, Pacific-based squadrons fly a higher percentage of surface surveillance missions than do Atlantic-based squadrons. The difference may be a result of the numerical imbalance of the Soviet submarine fleet in the two regions. Table III- 2 gives a representative comparison of these potential ASW objectives.

TABLE III-2

SOVIET SUBMARINE DISTRIBUTION
(Current and Obsolescent)

	NUMBER	PERCENT OF TOTAL
Atlantic & Mediterranean	272	74%
Pacific & Indian Ocean	96	26%
TOTAL	368	

Source: Atlantic Council Policy Study, Security the Seas, (Boulder, CO: 1979)

Just as submarines are potential objectives for sub-surface surveillance, naval and merchant ships are the principle objectives of surface surveillance missions. Table III-3 illustrates the magnitude of the surface intelligence problem.

TABLE III-3

WORLD-WIDE MERCHANT AND NAVAL SHIPPING

	TOTAL NUMBER	PERCENT OF TOTAL
Merchant Ships of the world*	67,945	84%
Active Naval Ships of the world**	12,789	16%
TOTAL	80,734	

*Steam and motorships 100 gross tons and larger; source: Lloyds Register of Shipping Statistical Tables 1977

**All categories except submarines; submarines represent an additional 842 possible surface contacts. Source: Janes Fighting Ships 1978-79, p. 760-761

It may be contested that Table III-3 is an overstatement of the military surveillance problem since it includes allied as well as potentially hostile assets, and merchant, as well as naval ships. However, it is frequently pointed out that "over-the-horizon" (OTH) targeting is a major problem with modern medium and long range missile systems. Discriminating friend from foe is, in turn, a major problem in OTH targeting. Within this context, all of the ships in Table III -- as well as the thousands of commercial ships smaller than 100 gross

tons -- must be considered potential surveillance objectives. As a supplement to other systems (including satellites and land-watches), land-based aircraft can contribute much to the fulfillment of wartime OTH identification and targeting requirements.

The 68,000 merchant ships of the world are also of considerable military interest during peacetime. Allied and hostile logistics potential, oil and cargo shipping patterns, and intelligence collection potential are examples of the military connotations of commercial shipping. The U.S. Naval Intelligence Support Center (NISC) includes an office whose primary responsibility is merchant shipping (mership) assessment.

Data used by NISC is supplied from many sources. Navy P-3 squadrons are the major contributors of mership photography. Analysis of the photography permits updating of files on ships of interest and reevaluation of logistic potential, etc. Given the number of merships in the world and the relatively small number of sorties flown by P-3 aircraft, it can be safely estimated that the demand for peacetime mership surveillance exceeds the supply.

The need for ocean surface surveillance is well-established in peacetime. Wartime requirements can also be expected to be high, particularly for over-the-horizon targeting purposes. Land-based aircraft are required to complement and supplement other more sophisticated surveillance systems.

2. Requirements of an Ocean-Surveillance Aircraft

Given the need for surface surveillance by land-based aircraft, one is left with choosing the aircraft characteristics which contribute to fulfillment of the need. The following criteria help to focus on the qualities desired in an ocean surveillance aircraft:

- Long range - permits investigation of ocean areas at great distances from friendly bases.
- High endurance - at a given range, gives aircraft the ability to remain on patrol for extended periods.
- Navigation equipment - provides ability to effectively conduct search patterns and to accurately report contact location. Internal systems (no outside assistance required) are most desired; e.g., inertial navigation system, computer assisted celestial navigation, and doppler assisted dead-reckoning computer. Systems such as LORAN, OMEGA, TACAN, or others using externally assisted navigation aides make the aircraft more vulnerable to deception during hostilities.
- Search equipment - systems used to locate a specific objective or to search a given area for unidentified shipping. Long range detection and passive identification systems are desirable. Representative equipment can be divided into two categories:

  a. Active sensors - radar

  b. Passive sensors - ESM (Electronic Support Measures); FLIR (Forward Looking Infrared); LLTV (Low Light

Level Television); visual (eye, binoculars, stabilized binoculars); acoustic (use of ASW equipment to detect surface ships).

- Communications equipment - provides "real-time" reporting of contacts-of-interest as well as a medium for command and control. Due to the nature of the mission, long range communications are usually required. An on-line encryption capability is useful for more timely secure data exchange. Communications options include:

  a. Long range - HF CW (telegraph); HF voice; HF teletype (plain or encrypted); HF computer data link; UHF satellite relay.

  b. Short range - UHF voice; UHF secure voice (on-line encryption); UHF teletype; VHF voice, UHF computer data-link

- Photographic equipment - provides capability for post-flight analysis (identification, photogrammetry, etc.) and assessment. Integral or hand-held cameras which can be used in variable lighting conditions to provide high-resolution photographs are useful in surveillance aircraft.

- Maintainability - the salt-laden atmosphere within 2000 feet of the ocean's surface can affect the life of airframe and engine components. Construction materials and design may affect the utility of aircraft for the surveillance mission.

- Economy - within the constraints of a limited budget, low operating costs are especially desirable in surveillance aircraft.

This menu of desirable aircraft ocean-surveillance capabilities is not all-inclusive. State-of-the-art technological developments have produced other devices for detecting surface units. Wave patterns analysis, laser detection and communication devices, radiological detection equipment, integrated land-sea-air intelligence processing systems, and others, all have potential implications for aircraft ocean surveillance employment. The characteristics listed above and compared in the next section were selected because they represent current, generally available capabilities.

3. Comparison of Selected Current Aircraft

Previous studies have independently analyzed the utility of various USAF aircraft in the surveillance role.[3] This section will discuss aspects of several present inventory aircraft in a simple comparison of ocean surveillance capabilities. Aircraft compared are from two categories of current inventory platforms:

- Long-range, land-based aircraft currently in use for ocean surveillance operations or training (P-3, B-52, F-111).
- Land-based, long-range aircraft which seem adaptable to the ocean surveillance role (FB-111, C-130 RC-135).

Other long-range and/or surveillance-capable aircraft are not considered because of their special use missions, limiting characteristics, or relative non-availability. A more

comprehensive analysis might investigate their potential contributions to the ocean-surveillance task. Such aircraft as the E-3 (AWACS), U-2, SR-71, C-141, C-5, and RF-4 are included in the latter category.

Comparisons in this section include:

a. Aircraft performance on selected profiles

b. Aircraft standard-equipment evaluation

c. Aircraft inventory and range comparison

d. Operating cost comparison

a. Aircraft performance on selected profiles. Two profiles were chosen for the aircraft performance comparison:

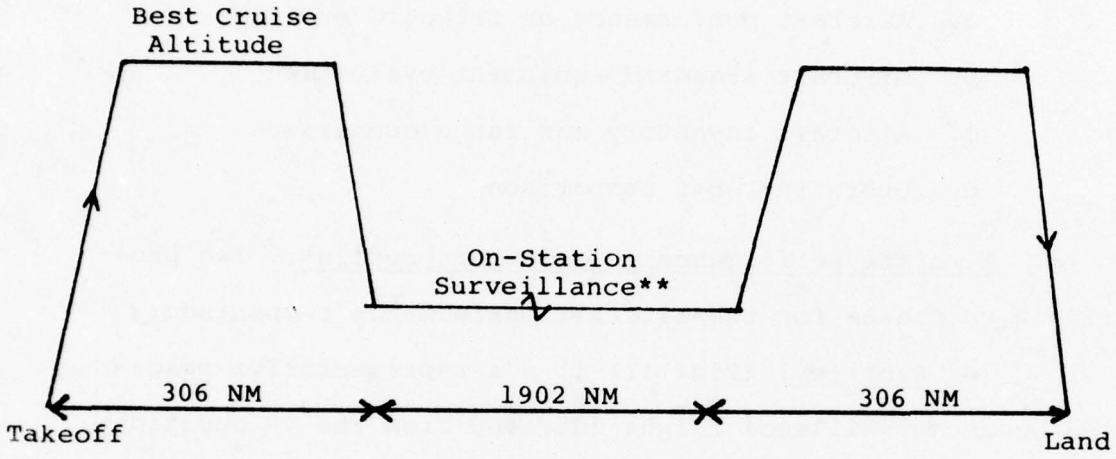
- Profile 1 (Fig. III-1) - a representative peacetime ocean surveillance flight (derived from the VP questionnaire in Appendix III-A.
- Profile 2 (Fig. III-2 - a notional maximum-radius, 4-hour-on-station flight.

Each of the profiles is somewhat artificial. Actual mission planning necessitates adaptation of specific aircraft characteristics to the required task (or vice-versa). However, the profiles do provide a common basis for comparing aircraft performance characteristics. Tables III-4 through III-6 provide a summary of computed performance data on each profile.

FIGURE III-1

PROFILE 1

REPRESENTATIVE PEACETIME P-3 SURVEILLANCE MISSION*

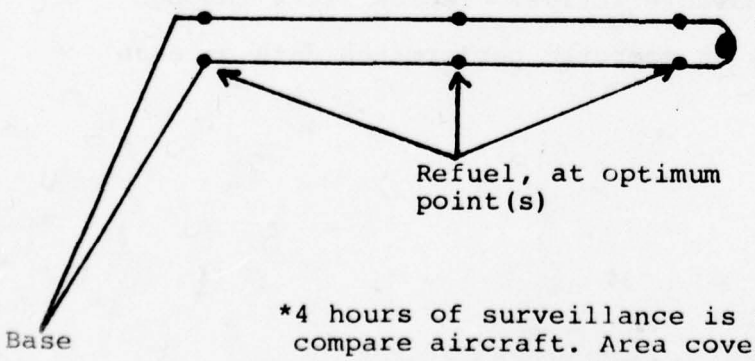


* Derived from P-3 Surveillance Questionnaire; Appendix III-A

**During ocean surveillance phase, aircraft is required to operate at 5000ft. and below, and to make 17 descents to 1000ft. or below to identify contacts. 30% of on-station time will be flown at max-endurance and 70% at max-range.

FIGURE III-2
PROFILE 2

MAXIMUM RADIUS FOR 4-HOUR SURVEILLANCE



*4 hours of surveillance is used arbitrarily to compare aircraft. Area coverage, search plans, etc. are not considered. Fuel on-station is computed at max endurance at 8000 ft.

TABLE III-4

PROFILE 1 (VP PROFILE) AIRCRAFT PERFORMANCE COMPARISON

	P-3A	P-3B	P-3C	B-52D	B-52G/H	FB-111	F-111	RC-135	C-130
Total time (hrs)	10.6	10.7	11.0	9.7	8.7	6.2	6.9	7.0	11.6
Total fuel (1000 lbs)	37.8	39.6	40.9	256	256	50.3	49.3	110	53.4
Enroute time	2.1	1.8	1.9	2.3[1]	1.3	1.4	1.5	1.3	2.2
Enroute fuel	9.9	9.9	10.4	40	40	9.5	14.4	22.3	10.5
On-station time	8.5	8.9	9.1	7.7	7.7	4.8	5.4	5.7	9.4
On-station fuel	27.9	29.7	30.5	196	196	40.8	34.9	88	42.9
Tankers/fuel reqd.	NA	NA	NA	1/40	Ø	1/20	2/27[2]	Ø	NA

[1] include 1.0 hours for refueling

[2] F111 using 2 external tanks; if clean configuration, an additional tanker is required.

Source: P-3 data: USN Patrol Squadron Thirty, NATOPS Office, Jacksonville, FL: March 1979; USAF data: U.S. Air Force Headquarters, XOOTS, Washington: March-April 1979.

TABLE III-5

PROFILE 2 (RADIUS) AIRCRAFT PERFORMANCE COMPARISON - UNREFUELED

	P-3A	P-3B	P-3C	B-52D	B-52G	B-52H	FB111	F111	RC135	C130
Radius (NM)	1555	1670	1610	1335	2002	2550	445	200	1700	1032
Total Fuel Burned (1000 lbs)	51.8	49.9	51.8	225.5	273	273	31.4	36.5	124	51.9
Reserve Fuel (1000lbs)	8	8	8	30	30	30	5	3	20	10
Transit Speed (TAS)	333	340	342	445	445	445	450	420	450	240
Transit Time (hrs) (2-way)	9.8	9.6	9.1	6.0	9	11.5	1.9	1	7.5	8.6
Transit Fuel (1000lbs) (2-way)	39.4	37.1	38.6	137.5	183	198	13.4	10.2	80	37.5
On-station Speed	188	208	214	245	242	240	360	328	300	168
On-station Time	4	4	4	4	4	4	4	4	4	4
On-station Fuel	12.4	12.8	13.1	88	90	75	18	26.3	44	14.4

[1] P-3 on-station computed on 2-engine loiter

[2] FB111 and F111 computed with external tanks

Sources: P-3 data: USN Patrol Squadron Thirty, NATOPS Office, Jacksonville, Fla: March 1979; All others: USAF Headquarters, XOOTS, Washington: April 1979

TABLE III-6

PROFILE 2 (RADIUS PROFILE) AIRCRAFT
PERFORMANCE COMPARISON - REFUELED

	B-52D	B-52G	B-52H	F-111	FB-111	RC-135
Radius (NM)	5060	5060	5060	2288	3380	4500
Total Fuel Burned (1000lbs)	541.5	473	433	95	123.1	450
Reserve Fuel (1000 lbs)	30	30	30	12	5	27
Transit Speed (TAS)	440	440	440	420	450	450
Transit Time (Hrs)	23	23	23	10.9	15	10.1
Transit Fuel (1000 lbs)	453.5	383	362	68	105.1	134
On-Station Speed	240	240	240	321	360	300
On-Station Time	4.0	4.0	4.0	4.0	4.0	4.0
On-Station Fuel	88	90	71	27	18	54
Tankers Required	6	4	3	2	2	3

[1]P-3 and TAC C-130 aircraft not capable of in-flight refueling.

[2]B-52 radius constrained by 30-hour crew-duty-day limitation

[3]F-111 refueled only once, each way; additional range limited by crew endurance.

[4]F-111 and FB-111 computed with 2 external tanks.

Source: U.S. Air Force Headquarters, XOOTS, Washington: March, April 1979.

b. Aircraft standard equipment evaluation. Each of the aircraft selected for this comparison has a specifically assigned primary mission for which its inherent equipment is optimized. This subsection will briefly summarize and compare the major surveillance-related gear. A detailed technical analysis will not be made; the purpose of this subsection is to compare the apparent relative equipment capabilities among potential surveillance aircraft.

Table III-7 is a summary of the author's evaluation of the adaptability of current aircraft equipment to the ocean surveillance role. The list of characteristics in the "Requirements of an ocean surveillance aircraft" section of this chapter was used as a criterion. The aircraft equipment lists contained in Appendix III-C provided the basis for comparison.

Since P-3 aircraft are dedicated primarily to ASW and surface surveillance roles, it is not surprising that P-3 equipment characteristics seem well-suited for surveillance tasks. With some exceptions, Air Force aircraft equipment lists also appear suitable for surface surveillance.

All aircraft with precise inertial navigation systems and backup electronic and celestial aids are suitable for the "characterless" open-ocean navigation environment. The automated relative-plot ASW navigation aids of the P-3 make it especially adaptable to the surface surveillance task.

TABLE III-7

AIRCRAFT EQUIPMENT SUITABILITY FOR THE OCEAN SURVEILLANCE ROLE

	P3A/B	P-3C	B-52D	B-52 G/H	FB-111	F-111	RC-135	C-130
Navigation	+ +	+ +	+	+	+	+	+	+
Search								
Active sensors	+ +	+ +	+	+	+	+	+	+
Passive sensors	+	+ +	+	+	+	-	+	- -
Communications								
Encrypted	+ +	+ +	- -	- -	- -	- -		- -
Plain	+ +	+ +	+	+	+	+		+
Photography	+	+	- +	- +	- +	- +	- +	- +

+ + Well suited

\+ Adequate

\- Limited suitability

\- - Not suited

The range and angular coverage of the P3 radar give it greater capability for ocean surface search than alternative aircraft, but by using effective search pattern planning, the other aircraft can also accomplish the task. Passive search using ESM and ECM equipment is available to most aircraft, but the advantages of the P-3C ESM and acoustic equipment make it relatively better suited for the passive search role.

Long-range communications options for the P-3 make it most suited for surveillance, while the presence of HF radios in almost all long-range aircraft makes off-line encrypted voice transmission of information possible. The presence of secure teletype and computer data-link equipment speeds reporting, but informaiton may adequately be relayed in other ways.

Photographic capability is a part of the P-3 integral equipment and the cameras used permit reasonably good photography of surface ships in a non-threatening environment. (The P-3C Update II does not have an integral camera but the combination of a new hand-held camera system and a high-quality optical window in the cockpit is expected to help compensate for the loss of the externally mounted camera.) Given a proper choice of hand-held camera systems, all aircraft should be capable of useable intelligence photography.

It appears that all of the aircraft considered in the equipment comparison have useful ocean surveillance capabilities.

It also appears that some aircraft are better equipped than others for certain tasks. However, given a need for surveillance intelligence and an adequately trained crew, each of the aircraft should be suitable for employment in the surface surveillance role.

The importance of training should not be overlooked; the fact that equipment is suitable for the mission does not guarantee suitable mission performance. Aspects of training are discussed in Appendix III-B and in Chapter V.

c. Aircraft inventory and operational radius. Given aircraft and equipment characteristics which are suitable for the ocean surveillance role, the question of aircraft availability and distribution remains an important consideration. This subsection compares the number of selected aircraft and squadrons currently in the U.S. inventory, and then compares the geographic areas which might be surveyed by those aircraft. Questions of availability which are related to primary mission responsibilities and organizational issues are deferred to Chapters IV and V.

Table III-8 summarizes the approximate numbers of aircraft and squadrons currently in service.

Excluding tankers, the pool of selected Air Force aircraft totals about 1,300. As will be discussed in Chapter IV, many of these aircraft may be unavailable due to primary mission requirements. However, an availability as low as 5% would

TABLE III-8

POTENTIAL OCEAN SURVEILLANCE AIRCRAFT AND SQUADRONS

Model	Number of Aircraft	Number of Squadrons	Remarks
P-3A	117*	13	Naval Reserve
P-3B/C	280	24	
B-52D	75	5	
B-52G/H	241	15	
B-52 D/F	50	-	Training
FB-111	60	4	
F-111E/F	282	13	156 in Europe
C130	234	15	32 in Europe
C-130A/B/C	150	18	Air National Guard
C-130A/B	121	11	Air Force Reserve
HC-130	30	5	Search and Rescue
EC/RC-135	19	-	
WC-135/WC-130	29/14	3	Weather recon
KC-135	487	30	Refueling (non-surveillance)

* Author's estimate based on 9 aircraft per squadron (157 P-3As were produced for the Navy).

Source: International Institute for Strategic Studies, The Military Balance (London: 1978)

add 65 ocean surveillance aircraft to the Navy's total of 397 P-3s -- or an increase of about 17% in land-based surveillance platforms.

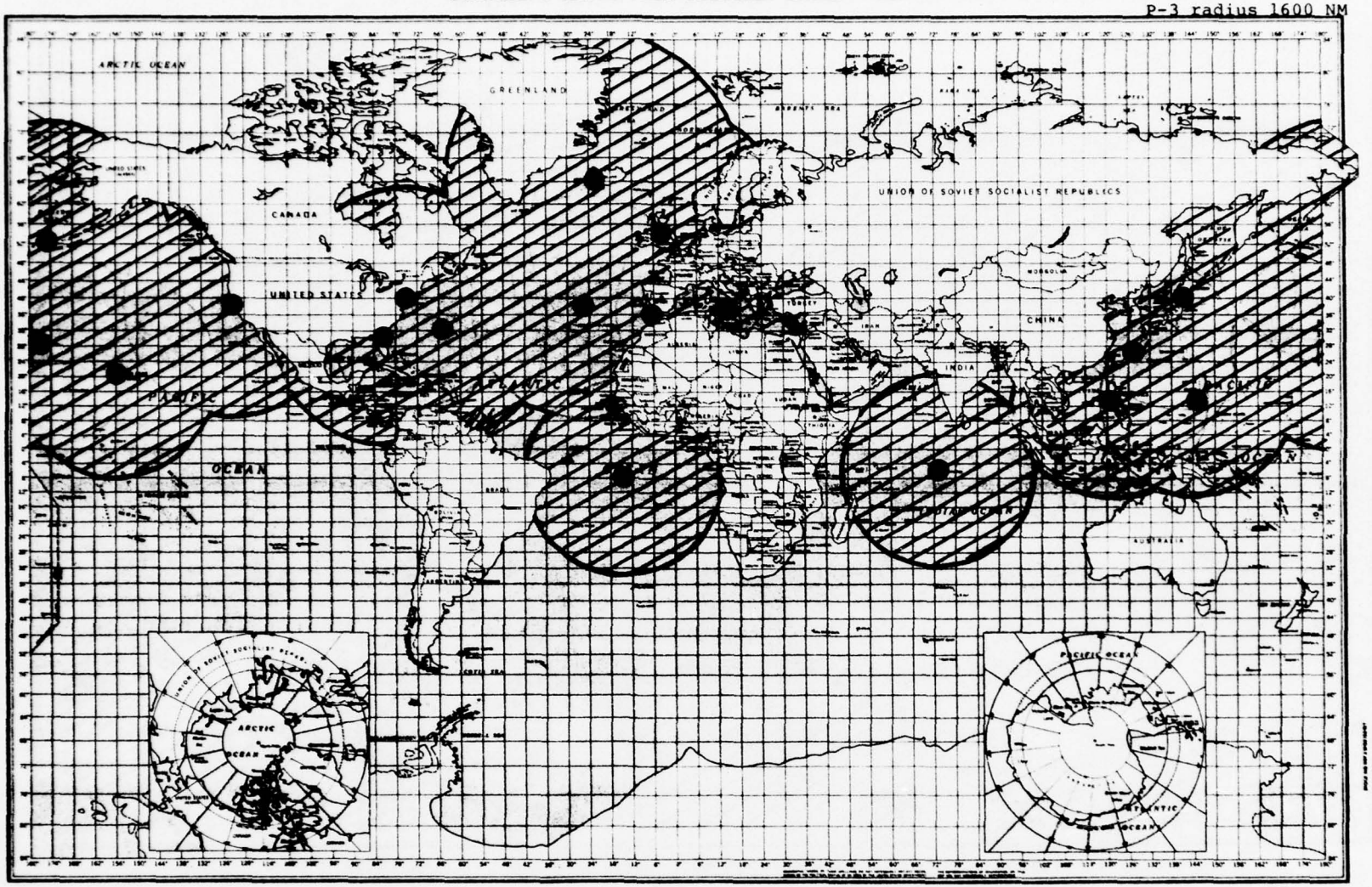
Given a limited number of additional aircraft with which to perform surveillance, the geographic distribution and range capabilities will greatly affect their utility. Figures III- 3 , 4, and 5 illustrate the distribution and coverage possible using presently available bases and using Profile 2 refueled radii calculations.

Most of the bases represented in Figures III-3-5 are current operating sites for the aircraft whose radius emanates from the site; however, several notional bases are included (P-3s from Ascension Island and the UK; F-111/FB-111s from Ascension, Keflavik and Diego Garcia, and RC 135s from Ascension and Diego Garcia). Factors which affect the actual area coverage include overflight rights, base support, destination fuel reserve requirements, and tanker availability. In addition, because of its 148.4 foot outrigger wheel footprint, the B-52 requires a 200 foot-wide runway under normal circumstances. These and other limitations will influence the area covered. However, as illustrated in Figure III-5 the relative range and basing potential of USAF aircraft provides an apparently significant opportunity for supplementing USN patrol aircraft.

FIGURE III-3

PROFILE 2 RADII FROM SELECTED BASES - USN

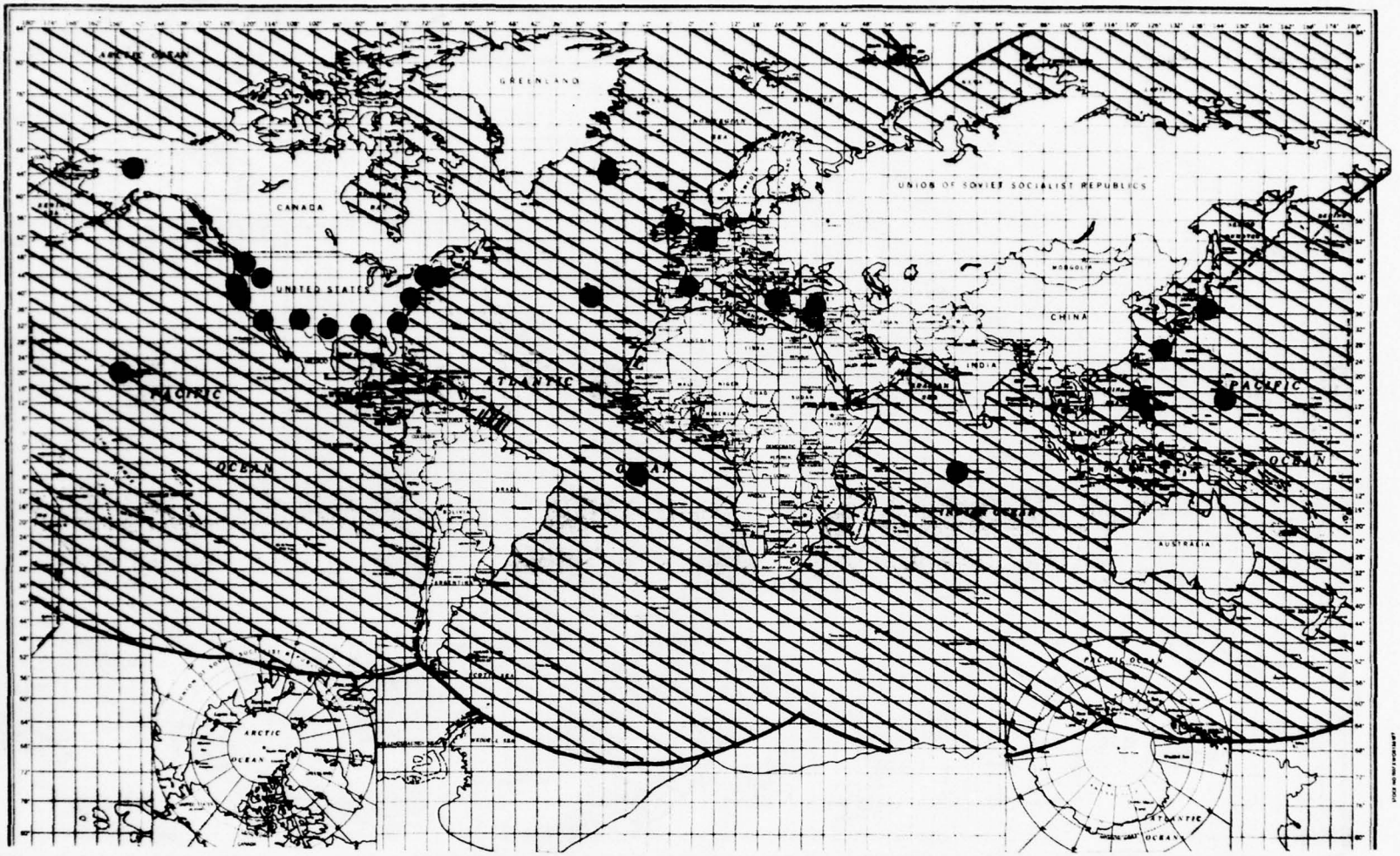
P-3 radius 1600 NM



Bases: Adak, AL; Moffett, CA; Jacksonville, FLA; Barbers Pt., HI; Midway IS; Brunswick, ME; Lajes, Azores; Keflavik, Iceland; Sigonella, Sicily; Rota, Spain; Bermuda; Diego Garcia; Misawa, Japan; Kadena, Okinawa; Cubi Pt., P.I.; Agana, Guam; Ascension Islands (notional); U.K. (notional).

FIGURE III-4
PROFILE 2 RADII FROM SELECTED BASES - USAF (REFUELED)

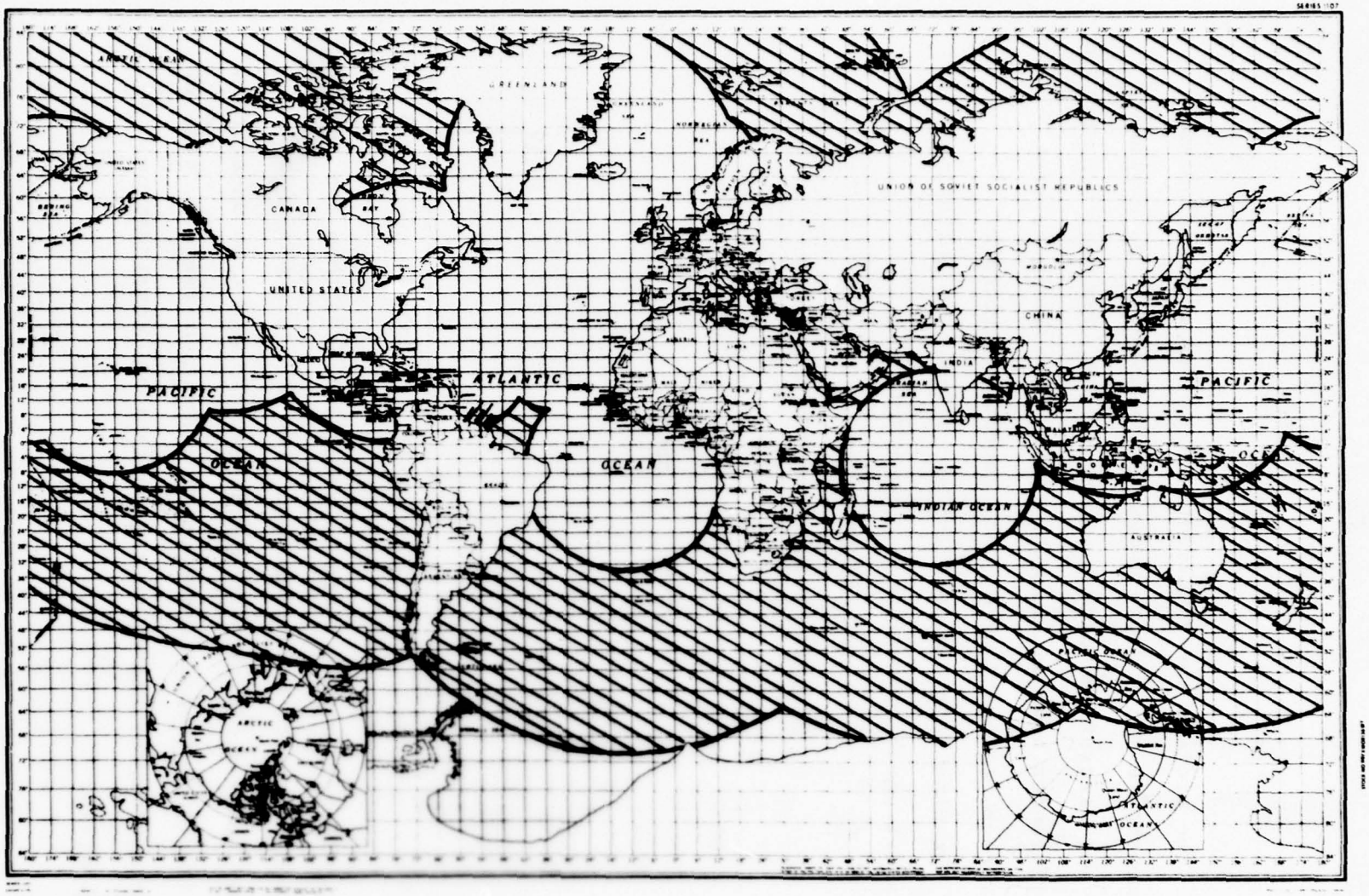
Radii: B-52 - 5060; F-111 - 2288; FB-111 - 3380; RC-135 - 4500; C-130 - 1032*(*not refuelable)



Bases: (B52) Griffis, NY; Agana, MI; March, CA; Seymour Johnson, NC; Barksdale, LA; Carswell, TX; Castle, CA; Fairchild, WA; Mather, CA; Kadens, JA (optional). (F111) Cannon, NM; McLellan, CA; Mt. Home, ID; Pease, NH; Incirclic, Turk; Boscombe Down, UK; Diego Garcia (notional); Ascencion Islands (notional); Keflavik (notional). (C130) Clark, P.I.; McChord, WA; Anchorage, AL; Andrews, DC; Dyess, TX; Abbington, UK; Chierres, Belgium; Incirclic, Turk; Torrejon, Spain; Lajes, AZ; Hickham, HI; Yokota, JA. (RC135) Kadena, JA; Eilson, AL; Mildenhal, UK; Hellenikon, GR; Diego Cargia (notional); Ascension Islands (notional).

FIGURE III-5

PROFILE 2 RADII FROM SELECTED BASES - USN-USAF COMPARISON



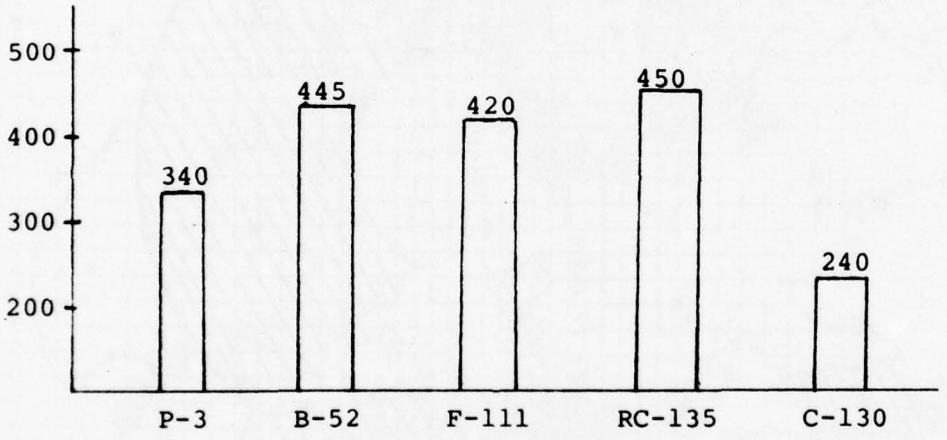
Potential USAF area coverage outside the radius of USN P-3 aircraft.

The profile and resultant tabular data presented here demonstrate major differences in the inherent capabilities of the aircraft compared. Speed, range, and fuel consumption differences have an impact on the responsiveness, area coverage, and economy of the respective aircraft.

Drawing from Tables III-5 and III-6, the following transit speed comparison can be made:

FIGURE III-6

AIRCRAFT TRANSIT SPEED COMPARISON

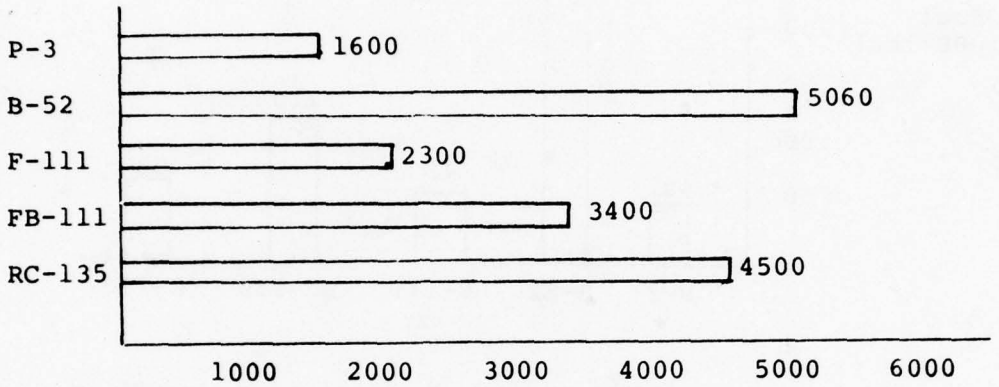


The P-3 transit speed is about 25% less than the B-52 speed. From time to launch to time on-station 1500 miles away, this difference in speed results in a time on-station difference of about one-hour. The one hour response time advantage may be useful to the operational commander in some situations.

Tables III-5 and III-6 also demonstrate differences in operational radius capabilities; Figure III-8 summarizes maximum range capabilities.

FIGURE III-7

AIRCRAFT RADIUS COMPARISON

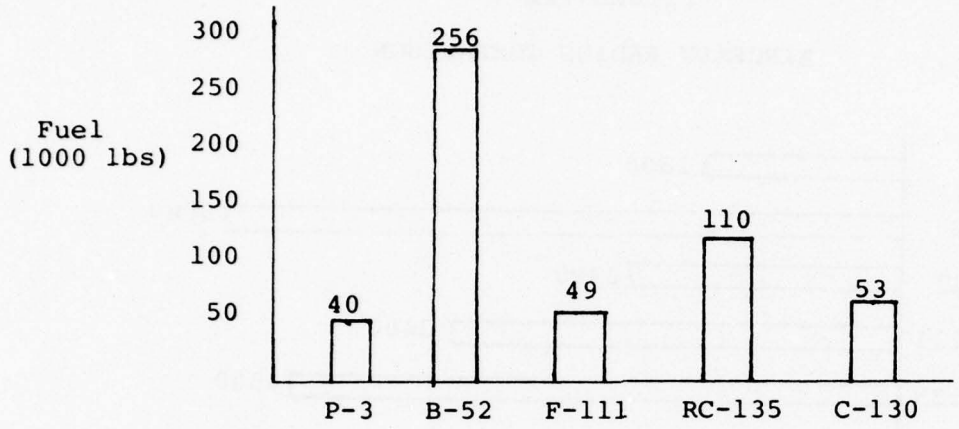


The significant radius advantage provided by air-refuelable USAF aircraft is readily apparent in this comparison. Given necessary tanker support, for instance, the B-52 can operate at more than three times the distance of a P-3. The potential area-coverage advantage resulting from such capabilities was illustrated in Figure III-5.

Fuel consumption differences are also noticeably large. The following figure, derived from Table III-4 compares fuel required for the surface surveillance profile (profile 1).

FIGURE III-8

FUEL CONSUMPTION COMPARISON



While the profile used to compare fuel economies is taken from current peacetime employment practices for the P-3 aircraft -- and is thus tailored to the P-3 -- the relative fuel consumption differences appear to be significant. The B-52 requires more than six times the fuel of a P-3 (not counting tanker aircraft fuel). Fiscal and logistic implications will thus be likely to affect aircraft employment decisions.

Surface-surveillance effectiveness cannot be predicted solely from the capability of an aircraft to fly the requisite profile; however, aircraft performance is an important factor. Using performance as a criterion, the potential usefulness of selected USAF aircraft in certain surveillance roles may be inferred from the foregoing comparisons.

d. Operating Cost Considerations. As with all military systems, given an acceptable capability, economy is a desirable characteristic in ocean surveillance aircraft. A detailed analytical evaluation of operating costs is beyond the scope of this paper. The comparison of hourly costs depicted in Table III-9 provides a reference for discussion. Such comparisons -- however simplified -- are sometimes the basis for pro and con arguments of employment feasibilities.

TABLE III-9

SIMPLIFIED OPERATING COST COMPARISON

	P-3C	B-52D	B-52+1	FB-111	F-111E	RC-135	C130E
Fuel Cost per Flight Hour ($)*	380	1809	1493	613	678	828	348
Time to Complete Profile #1 (VP Surveillance Profile)	11.0	9.7	8.7	6.2	6.9	7.0	11.6
Fuel Cost to Fly Profile 1	4180	17547	12989	3801	4678	5796	4037

*Sources: USN FY80 flight-hour cost data: U.S. Navy Operations Department (OP0501), Washington: 13 April 1979; USAF FY80 flight-hour cost data: U.S. Air Force Headquarters, ACMCM, Washington: 13 April 1979.

Comparison of the Profile 1 mission costs in Table III-9 suggest that several aircraft are relatively economical surveillance platforms. It may correctly be argued, however, that such figures do not provide an adequate base from which to judge alternatives.

The "cost-per-flight-hour" figures were developed using aircraft primary mission employment histories; consumption rates on the surface surveillance profile may differ. For example, an aircraft whose cost-per-flight-hour is developed in high altitude, maximum cruise conditions is likely to have a higher consumption rate and cost when operating and maneuvering at lower ocean-surveillance altitudes. A 10% increase in cost-per-flight-hour in the case of an FB-111 would result in an additional Profile 1 mission cost of almost $400. Conversely, an aircraft such as the F-111 whose usual mission requires high fuel-consumption maneuvers, might have a slightly reduced actual hourly operating cost on some ocean surveillance missions. A 10% decrease in F-111 cost-per-flight-hour would result in a reduced Profile 1 mission cost of almost $500.

Just as fuel consumption rate changes will affect total mission costs, changes in the time required to complete the mission will also have an effect. The times in Table III-9 are based solely on aircraft performance in flying a "track-over-the-ground." Mission effectiveness factors are not considered. For example, it may take longer for an aircraft with a 90° radar sector limitation to adequately cover an area than it would take an aircraft with a 360° radar. Crew training and aircraft equipment may thus add to the time required for the aircraft to simply fly the track. A one hour increase in B-52D time to fly the profile, for example, would result in an $1800 increase in the total mission cost.

The total cost of operating aircraft in the surveillance role cannot be fairly judged from a simple cost-per-flight-hour comparison. Other direct and indirect costs associated with the mission must be analyzed to obtain a true absolute cost comparison. Even then, relative costs will be difficult to determine because of questions concerning mission effectiveness, opportunity costs, etc.

If it were assumed that Table III-9 figures were absolutely correct, an interesting comparison might be made between the aircraft in response to a frequently raised question. It has been suggested that the money spent flying B-52s on ocean surveillance flights might be better spent in purchasing additional P-3s. Given an approximate flyaway cost of $18M for a P-3C, and given an $18,000 per mission cost of a B-52D, the B-52 could be flown on 1000 surveillance flights for the cost of one new P-3. Using the same logic, an F-111 could be flown on almost 4000 missions. While the comparison is a simplistic one, the tradeoff implications are obvious.

There are both obvious and subtle differences in the relative operating costs of different aircraft in the surveillance role. The actual cost of mission substitution or of incremental increases in total operating expenses due to surveillance operations must be the subject of a more detailed analysis before confident conclusions can be drawn. Such prior analyses and subsequent employment coordination

planning should help to ensure the most efficient use of available alternatives.

Summary

This chapter has addressed the need for ocean surveillance, the characteristics required of a surveillance aircraft, and the inherent capabilities of selected aircraft in the surveillance role.

The need for surveillance aircraft seems readily apparent in both peacetime and wartime situations. Land-based aircraft can be used as effective, complementary platforms for other surveillance systems.

The capabilities required of present aircraft in the surveillance role include search, navigation, communication, and aircraft performance factors. Among the aircraft considered, it can be seen that each has utility in some situation and that taken together, the group might provide useful employment flexibility.

The following chapter will address conceptually how the inherent capabilities of these aircraft might be employed in differing world situations.

...surface surveillance requirements adversely affect

APPENDIX A
to Chapter III

USN VP SURVEILLANCE QUESTIONNAIRE

APPENDIX A

TO CHAPTER III

USN VP SURVEILLANCE QUESTIONNAIRE

- The questionnaire on pages 55 through 57 of this appendix were presented to 28 student and staff officers at the Naval War College in Newport, Rhode Island.
- The 23 0-4 and 0-5 officers who responded to the survey have considerable experience as patrol squadron flight crew members (see page 58). Most respondents have been recent P-3 mission commanders; several had served as VP squadron commanders or department heads.
- The questionnaire has several limitations: it is limited in scope, it calls for estimates and opinions, and it is subject to sampling error due to the small sample size.
- The principle advantage of the questionnaire is that it queries a highly experienced group of professionals in a relatively threat-free, academic response environment. Quantitative responses appear to correlate with the limited data available in those areas of concern. Nonquantitative responses gain credibility from the experience level of the respondents.
- Pages 58 through 69 are a compilation of responses to the questionnaire. The author's observations are included where applicable.

VP SURFACE SURVEILLANCE QUESTIONAIRE

1. This data is based primarily on my most recent P3 a b c experience in a squadron home based at:

   a. Jacksonville
   b. Patuxent/Brunswick
   c. Moffett
   d. Barbers

2. The data is based primarily on my experience while deployed to:

   _____

3. Month/year of latest VP duty: _____

4. Estimate of percentages of deployed operational flights (i.e., not including maintenance, pilot training, logistics, etc.)

ASW Operational	_____%	(tracking Soviets/unidents,etc)
ASW Exercise	_____%	(CAST,VP-SS, fleetex, etc.)
Non-ASW Exercise (SSSC,etc)	_____%	(SSSC, Comm relay, COMORANGE,et
Crew ASW Trainer	_____%	(non-sub)
Surface Surveillance	_____%	(includes MAP, RELO, PARPRO,etc)
OTHER_____	_____%	
	+ _____	
Total	100 %	

5. Estimate of AVERAGE figures for surface surveillance flights:

   a. Number of ships investigated:
      -rigged & photographed _____
      -not rigged _____

   b. Total time from t/o to land: _____hrs.

   c. Total fuel consumed: _____lbs.

   d. TRANSIT totals (to&from oparea,combined)
      altitude _____
      TAS _____
      time _____

5. (cont.) Estimate of averages...

e. SEARCH

Altitude _____

TAS _____

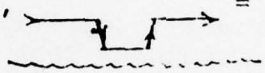
Time _____

f. RIG

Altitude _____

TAS _____

Time _____

g. Number of times you descended from Search altitude to Rig Altitude and returned (i.e.,  = 1 time) (estimated)

_____times.

6. Place an "x" by the crew members you feel are absolutely essential to a surface surveillance flight (assuming no requirement for "chance" ASW).

____ Pilot
____ Co-pilot
____ 3rd-pilot
____ Tacco
____ Nav/nav-comm
____ Flight engineer
____ Radar/SS3
____ ORD/Photographer
____ SS1
____ SS2
____ 2nd mech
____ Radio (P3A/B
____ IFT

7. Equipment for Routine surveillance missions; place a "P" by gear you feel is of primary importance and an "S" by gear you feel to be of secondary importance. If you feel some items are not required for surveillance missions, place an "NR" by them.

____ Radar
____ Hand-held camera
____ Integral acft camera
____ stabilized binoculars
____ binoculars
____ Mech or computer DRT
____ 5-10nm nav accuracy (any system)
____ tape recorder
____ HF
____ Cratt
____ Nosic/ONI Publications
____ FLIR
____ LLTV
____ Other (specify)
____
____

8. The following ideas have been expressed in Ready-room discussions in varying degrees of seriousness. Circle letters designating ideas which you think are reasonable, whether or not you think they are "politically" feasible.

a. Dedicate some VP squadrons or portions of squadrons for surface surveillance only; i.e., remove ASW gear from certain aircraft or purchase additional aircraft for surveillance only.

b. Conduct surface surveillance by satellite, computer corellation, and surface-unit reporting, thus eliminating routine surface surveillance by VP.

c. Give USAF active maritime surface surveillance role with explicit understanding that VP will retain ASW and contingent surface surveillance missions.

d. Eliminate VP surface surveillance entirely; intelligence that VP provides is insignificant.

e. Authorize more VP flight-hours in order to facilitate more surface surveillance time.

f. Other..._____

_____

_____

9. In your opinion, have surface surveillance requirements adversely affected ASW training or operational availability and readiness. _____. Comment:_____

_____

_____

_____

10. One source has said that VP forces are planned for a 90/10 ASW/SURV ratio. Do you think this is a reasonable estimate for:

Peacetime _____
War (limited) _____
War (all out) _____

Comment:_____

_____

_____

_____

Questionnaire Summary

The following summary is keyed to question numbers from the foregoing questionnaire.

1. Table III-A-1. Respondents' aircraft model and homeport experience: (numbers of respondents)

	P3A	P3B	P3C	
Jacksonville, FL	-	-	5	5
Patuxent, MD/Brunswick, ME	5	5	2	12
Moffett, CA		3	3	6
Barbers Point, HI	3	4	10	7
	8	12	10	

2. Respondents data based on deployment to: (numbers of respondents)

Iwakuni, Japan.....	1
Kadena/Naha Okinawa.....	5
Cubi Pt/P.I.....	10
Adak, Alaska	3
Sigonella, Sicily	4
Keflavik, Iceland	7
Guam	2
Vietnam/Thailand	3
Bermuda	7
Lajes, Azores.....	7
Rota, Spain	6
Argentia, Newfoundland	1

3. Latest VP duty of respondent: (numbers of respondents)

1971 - 3	1975 - 4
1972 - 3	1976 - 3
1973 - 2	1977 - 2
1974 - 0	1978 - 8

4. Table III-A-2. Estimate of employment percentages: (mean, standard, deviation, standard error of the mean)

	Pacific			Atlantic		
	Mean	SD	SE	Mean	SD	SE
ASW Operations	7.8	3.6	1.2	37.1	17.8	4.8
ASW Exercise	18.9	15.2	5.1	14.3	8.5	2.3
Non-ASW Exercise	9.8	8.8	2.9	8.9	6.3	1.8
ASW Trainer	8.	5.9	2.0	11.6	7.6	2.0
Surface Surv.	49.8	15.8	5.3	23.9	18.7	5.0
Other	5.8	9.0	3.0	4.1	7.3	2.0
		n=9			n=14	

This table highlights the higher ratio of ASW-to-surface surveillance flights flown by Atlantic-based squadrons. The relatively high standard deviations of these responses are indicative of the diverse estimates given by the officers surveyed. However, limited data available from Atlantic and Pacific patrol wings roughly correlates with these employment estimates.

The table on page 28 of Chapter III of this study was derived from the foregoing data. In that table "Non-ASW Exercise" percentages were included in the "Other" category even though some of those exercise missions may have included surface surveillance operations.

5. Table III-A-3. Estimates regarding surveillance flight mission profiles: (mean, standard deviation, standard error of the mean, number of responses).

(Table III-A-3)

	PACIFIC				ATLANTIC			
	Mean	SD	SE	N	Mean	SD	SE	N
Ships "rigged" and photographed	26.4	12.6	4.2	9	14.9	6.3	2.	10
Ships not "rigged"	12.8	8.6	3.1	8	17.3	8.3	2.6	10
Total time: Take-off/Land	10.5	1.6	.5	10	10.1	1.1	.3	15
Total fuel consumed (1000 lbs)	43.2	6.1	1.9	10	43.3	5.8	1.6	12
Transit Altitude (100 ft)	200.	14.1	5.	8	209.	41.	12.	12
Transit TAS (knots)	322.	17.	6.	8	328.	27.	8.	13
Transit time (hours)	1.7	.7	.2	10	2.3	1.3	.3	14
Search altitude	026.	016.	005.	9	055.	030.	008.	14
Search TAS	241.	31.	11.	8	224.	35.	10.	13
Search time	6.3	2.4	.8	9	5.5	2.1	.6	13
RIG altitude (100ft)	003.	.9	.3	10	003.	002.	.6	14
RIG TAS	206.	17.	6.	9	204.	23.	6.	13
RIG time	2.8	2.1	.7	9	2.2	1.3	.4	13
Number of RIG climb/descents	19.8	8.7	2.8	10	13.3	6	1.7	12

Data from this table was used to derive "Profile 1" as presented in Chapter III, page 35 . Specifically, "no-wind" distances and climb and descent figures derived from questionnaire response data were used as the basis for comparing the performance of selected USN-USAF aircraft.

In the table above, respondents agreed closely on total time and fuel consumption for the typical VP surface surveillance mission. It should be noted that these estimates indicate that the P-3 uses approximately 51 thousand pounds of

fuel on a 10+ hour flight (43 consumed and 8 reserve = 51). Since P-3 fuel capacity is nominally 60,000 pounds, the mission could conceivably be extended by 9000 pounds (2+ hours additional time.)

6. Table III-A-4. Crew members "absolutely essential" to surface operations (votes of respondents)

P-3 Crew Position	Question. Responses	Analagous Positions on USAF Aircraft for Comparison			
		B-52	F-111 FB-111	RC-135	C-130
• Pilot	23	Pilot	Pilot	Pilot	Pilot
• Copilot	23	Copilot	-	Copilot	Copilot
3rd Pilot	16	-	-	-	-
• Tactical Coord.	22	Radar/Nav	Nav or WSO	ELINT Coord.	-
• Nav/Nav-Comm.	22	Nav	(Nav or WSO)	Nav (2)	Nav
• Flt Engr	22	-	-	-	Flt Eng(2)
• Radar/ESM	23	(Radar/Nav)	(Nav or WSO)	Numerous	-
• Ordnance	23	Gunner	-	-	-
Acoustic 1	5	EWO	-	Numerous	-
Acoustic 2	1	-	-	Numerous	-
2nd Mech	17	-	-	-	-
Radio/Comm	16	(EWO)	(Nav or WSO)	(Copilot/ Nav	(Nav/Co-pilot
Inflt Tech	15	-	-	Maint.	Load-master
Total Crew 12-13	-	6	2	7-18	5-6

Respondents agreed that seven P-3 crew members are essential to USN VP surveillance operations. Most of these crew positions have counterparts in the USAF aircraft. One exception is the P-3 ordnanceman who is usually assigned duties as 35mm photographer on surveillance missions; this function would be assigned to another crew member in the USAF aircraft. Another exception is the P-3 flight engineer who has no logical counterpart in the F-111, for example. Other P-3 crew member responsibilities may be absorbed by analagous or dissimilar counterparts in the Air Force aircraft.

7. Table III-A-5. Primary (P), Secondary (S), and Not Required (NR) equipment for routine surveillance missions (votes of respondents)

Questionnaire respondents almost unanimously agreed on radar, hand-held camera, and navigation system requirements. (It is interesting to note, however, that recipients of P-3 photography in the NISC Mership Branch prefer the product of the integral aircraft camera over that of the hand-held camera.) Opinions on the relative importance of other equipment were less than unanimous.

There were only three "write-in" votes for equipment not specifically listed on the questionnaire. Sonobuoys represent the capability for the P-3 to acoustically detect surface contacts. The hand-held starlight scope is not widely available for P-3 use, nor is it standard equipment. It is interesting that ESM equipment elicited only one write-in vote. The

P-3C has a significant ESM search and localization capability; that of the P-3A and B is less capable. The absence of emphasis on P-3 ESM equipment may have been due to the fact that routine peacetime P-3 surveillance employment practice does not emphasize this passive detection system.

(Table III-A-5)

P-3 Equipment	P-3 Questionnaire Responses			Presence of Analagous Equipment on USAF Aircraft Y=Yes; L=Limited Availability				
	(P)	(S)	(NR)	B52	F111	FB111	RC135	C130
● Radar	23	-	-	Y	Y	Y	Y	Y
● Hand-Held Camera	20	2		Y	L	L	L	L
Integral Camera	9	11	2	L	L	-	-	-
Stabilized Binoculars	7	13	3	-	-	-	-	-
Binoculars	9	12	2	L	L	L	L	L
Mechanical or Computer Dead-Reckoning Tracer	9	10	3	-	-	-	-	-
● 5-10 NM Nav Accuracy (any system)	20	2		Y	Y	Y	Y	Y
Tape Recorder	3	8	10	-	L	-	Y	-
● HF Radio	16	9	-	Y	Y	Y	Y	Y
HF Teletype	7	13	2	-	-	-	Y	-
On-line encryption							Y	-
● Reference Pubs	12	11	-	-	-	-	-	-
Forward Looking Infrared (FLIR)	8	7	6	Y	L	-	-	-
Low-Light Level TV (LLTV)	1	4	6	-	-	-	-	-
Other (write-ins)								
Sonobuoys	1							
ESM		1	-	L	Y	L	Y	-
Hand-held Star-light Scope		1						

Note: See Appendix C to this chapter for a more detailed breakdown of aircraft surveillance equipment.

With some exceptions, it appears from the preceding table that the USAF aircraft have at least the major types of equipment required for the surveillance mission. This is, of course, a simplistic comparison which does not analyze the specific advantages and disadvantages of individual equipment items. Portable equipment such as hand-held cameras, binoculars, and surveillance reference publications are relatively inexpensive and easily acquired additions.

8. Opinion on VP employment concepts: (votes of respondents)

   a. Dedicate some VP squadrons or portions of squadrons for surface surveillance only..... 4

   b. Conduct surface surveillance by satellite, computer correlation, and surface units in lieu of VP surveillance..... 9

   c. Give USAF active maritime surface surveillance role..... 7

   d. Eliminate VP surface surveillance entirely..... 1

   e. Authorize more VP flight hours to facilitate additional surveillance..... 7

   f. Other respondent comments/recommendations (write-ins):

      "Present balance of SURV/ASW is good with 800-1000 flight hours for deployed units."

      "Nothing can replace <u>experienced</u> set of eyes."

      "Satellite in coordination with VP, not in lieu of; maintain all around capability of VP aircrew to respond to multiple threat."

"Improve logistics support to preclude cannibalization."

"Get better camera systems...we'll never get rid of this mission in Pacific, so let's do it right."

"Surface surveillance by VP should be on a special interest basis -- specific tasking for specific target -- Atlantic fleet operations are pretty much this way (my Pacific experience was substantially different)."

"More training (for VP squadrons)."

"Better photo capability at increased stand-off distances could significantly reduce up and down evolutions and time spent rigging. Let A.I.'s RIG using photos. That's what they do on carriers..."

"VP in anti-shipping role with Harpoon -- data-link with EW aircraft for over horizon target solution."

Author's Comments:

While the foregoing comments are self-explanatory, the reader's attention is directed to several points: (1) 30% of the respondents advocated increased USAF participation in the surveillance role. (2) Several respondents advocated better training or equipment for existing P-3 squadrons, but 43% subscribed to the concept of eliminating VP participation in the surveillance role (questions 8b and d). From these responses, it may be inferred that there are some basic differences of opinion among VP surface surveillance experts regarding this mission.

9. Do surface surveillance requirements adversely affect ASW training or operational availability and readiness?

a. YES 9

Respondent Comments:

"We flew so many...that ASW was replaced with surveillance as primary duty...on deployment. At Moffett the reverse holds true. Also, a ...sub may pop up and you have all your birds committed to surveillance ."

"There are only so many flight hours available. More spent in surface surveillance, the less that is available for [ASW] training."

"[Surveillance] mission is looked upon by crews as necessary evil. Does not provide crew training in primary ASW role except for radar - Flight hours and fuel could be better utilized for ASW ops/training - Uses multi-million dollar airplane for nickel-dime role."

"Yes, but not objectionably;...need to be able to do both."

"Anytime you're doing a mission other than dedicated ASW, your ASW readiness declines."

"Surface surveillance in Keflavik did not reduce ASW readiness, but it did in Vietnam and the Philippines."

"Limited hours total plus heavy requirement for surveillance limits ASW training opportunities."

b. NO 14

Respondent Comments:

"Gives us another opportunity to justify our existence."

"Considering Bermuda...and Lajes...scenario, surface surveillance allows crews to keep their hands in."

"Contrary-pure emphasis on ASW has degraded surface surveillance/ESM/radar capability of most crews."

"There are aspects of crew coordination that any crew flight can help."

"Crew maintains team practice between sparse (ASW) opportunities."

"Its part of the game..."

"As long as mission commander maintains a positive approach toward high crew morale-training can be accomplished to a significant degree on a training mission."

"Significant (ASW) training can be accomplished ...However, when totally occupied in the surface locator business such as West Pac,... ASW competence suffers."

"...commitments could always be accomodated within assets and still maintain ASW capability."

"Reduced flight hours in 75-76 reduced overall capability for [both] ASW and surveillance."

Author's Comments:

Responses to this question further amplify the inference that opinions are divided concerning the relative importance of VP in the surveillance role. The overall concensus seems to be that crews would prefer to spend more time on ASW tasks, but -- given the requirement for surveillance -- valuable crew coordination and ASW equipment training can be accomplished on the surface search missions.

10. Is 90/10 ASW/SURV ratio reasonable (votes of respondents):

	YES	NO
Peacetime	4	17
War (limited)	2	17
War (all out)	7	13

Respondent Comments:

"More than 90/10 in limited war."

"I think we need to focus more on surface surveillance for intell purposes and try to get into the anti-shipping role."

"The perceived sub threat is the driving factor."

"...the advent of HARPOON will probably increase the amount of surface surveillance we end up doing."

"...depends on deployment sites."

"...scenario dependent."

"In many parts of the world -- Indian Ocean, for instance -- the only source of Soviet fleet positioning is VP..."

"depends on tactical situation."

"...must remain flexible."

"...with Harpoon it may be much higher."

"...depends on use of USAF/VA/VF/VS assets in tasking..."

"...would probably be 3 to 1."

"...considerable wartime surface surveillance requirements must be met, but in hostile environment, vulnerable P-3 would be wasted."

Author's Comments:

The overwhelming inference from responses to this question is that ratios of ASW to surveillance tasking for VP assets are scenario-dependent. However, the consensus seems to be that in most situtions, VP crews will spend more than 10% of their operational time on surface-surveillance missions.

Summary

As stipulated at the outset of this appendix, the VP surveillance questionnaire is subject to a number of challenges to its validity. However, it serves here as a barometer of a portion of the VP community. Its usefulness to the USN-USAF interaction study was in the derivation of a typical P-3 surveillance profile and in development of a core of issues to be considered in comparing USN and USAF capabilities.

APPENDIX B
to CHAPTER III

A SAMPLE B-52 OCEAN SURVEILLANCE FLIGHT

APPENDIX B
TO CHAPTER III

A SAMPLE B-52 OCEAN SURVEILLANCE FLIGHT

Introduction

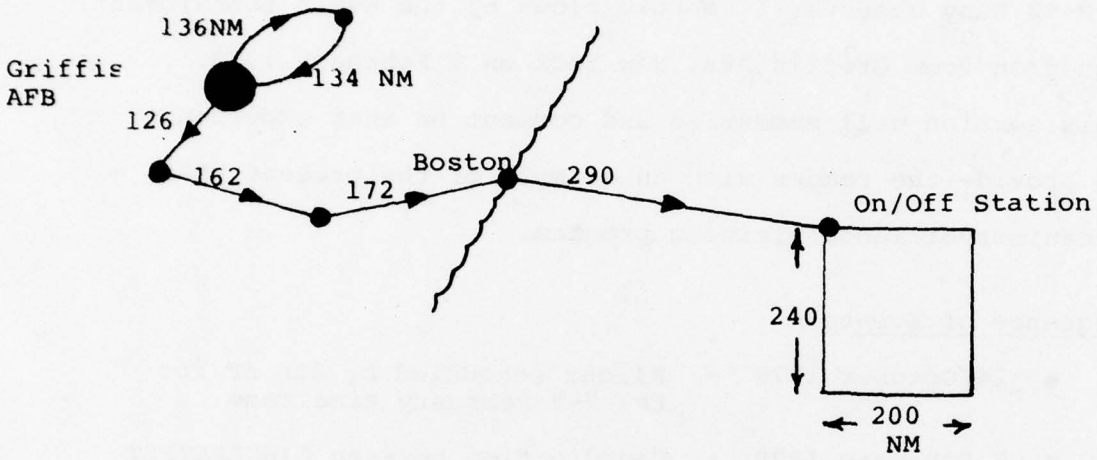
In order to obtain first-hand ocean surveillance experience in an Air Force aircraft, the author accompanied a B-52 Busy Observer I sortie flown by the 668th Bombardment Squadron from Griffis AFB, New York on 8 February 1979. This section will summarize and comment on that experience to provide the reader with an example of the present USAF ocean surveillance training program.

Sequence of Events

- 24 October 1978 - Flight scheduled by 8th AF for the 7-9 February timeframe
- 5 February 1979 - Coordination between CINCLANTFLT and 8th AF determined that no USN ship was available for training. 8th AF decided to task a "target-of-opportunity" area surveillance on 8 February.
- 7 February 1979 - Conducted crew mission planning and ground training; crews briefed and two-plane "cell" procedures were coordinated.
- 8 February 1979 - 0545 - pre-mission brief
  0835 - take-off
  1101 - on-station
  1504 - off-station
  1637 - land
  1645 - mission debrief

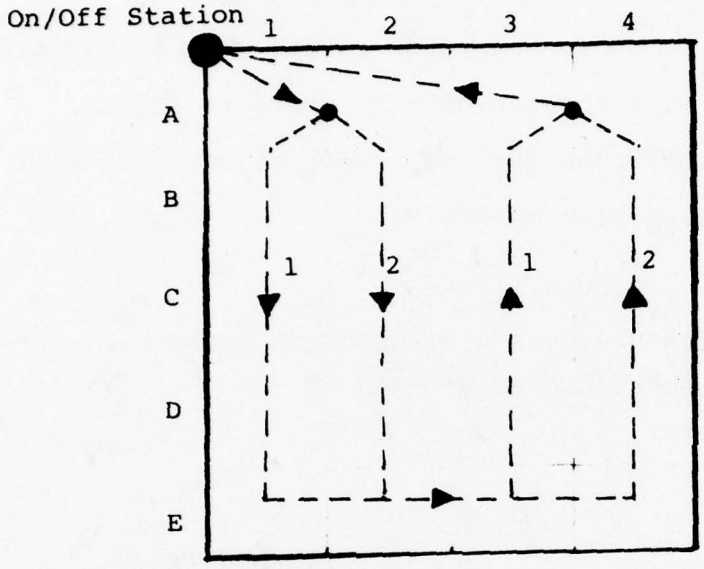
FIGURE III-B-1

SAMPLE B-52 ENROUTE TRACK



The distance from takeoff to on-station was approximately 1020 nautical miles (2.4 hours). The 700 mile overland leg was flown to allow programming and stabilization of the SRAM CAE (short range attack missile carrier aircraft equipment) which includes an inertial navigation system. The SRAM CAE was the prime system for overwater navigation (augmented by celestial and dead-reckoning navigation.)

FIGURE III-B-2
SAMPLE B-52 ON STATION SEARCH PLAN

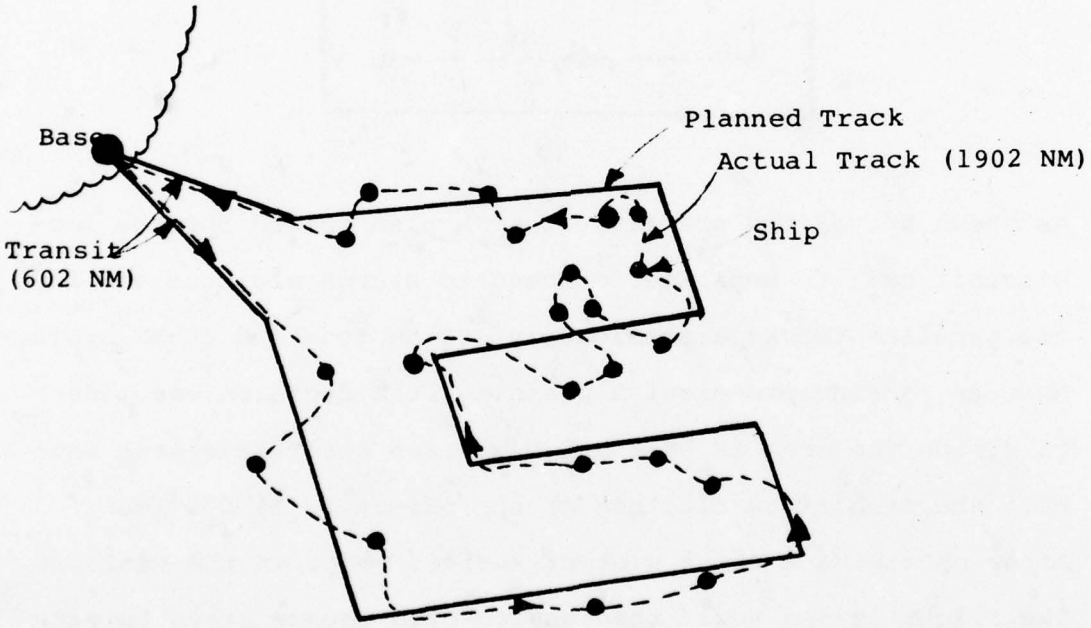


As shown above, the preflight search plan called for the two-aircraft cell to separate, descend to search altitude and fly two parallel tracks approximately 180 NM long and 40 NM apart. However, during pre-mission planning, the decision was made to divide the area in half and have each aircraft search one-half the area at an altitude of approximately 16,000 feet. After obtaining a radar plot of surface ships in the vicinity, the flight leader would then assign grid square areas to each aircraft, according to shipping density, to equalize the training opportunity. Following grid assignments, the aircraft would descend, locate, identify, and photograph the ships.

For comparison, Figure III-B-3 shows a representative USN P-3 surface surveillance track. SAC OPLAN 28-78 contains a discussion of search patterns in which a similar track is described along with the search plan shown in Figure III-B-2. The mission objective and number of aircraft will affect the type search plan chosen.

FIGURE III-B-3

REPRESENTATIVE NAVY P-3 ROUTINE OCEAN SURFACE SURVEILLANCE MISSION



NOTES: 1. Tasking normally requires investigation of contacts 50 NM either side of planned track.

2. Track distances were derived from the "VP Surveillance Questionnaire" (Appendix A to Chapter III)

RIG (Recognition Identification Group) Procedures

Crew Duty Assignments:

Pilot - assign RIG priorities; fly established RIG maneuver near ship.

Co-pilot - back-up pilot in flight duties; operate the hand-held camera; record RIG data on pilot's log.

Electronic Warfare Officers (EWO) - monitor ECM equipment; correlate and log electronic sightings; encrypt and communicate sightings using HF and UHF radios.

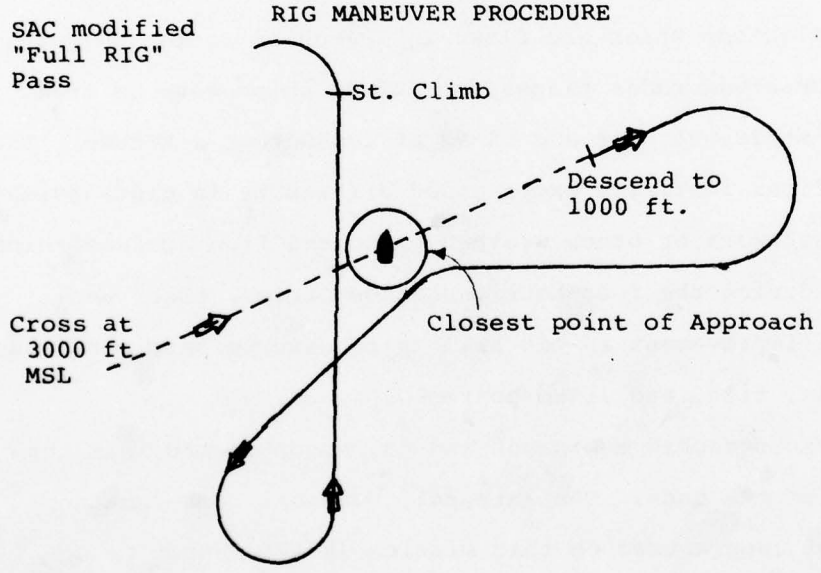
Radar Navigator - provide target location and steering directions for pilot.

Navigator - back-up radar officer, navigate, and maintain navigator's RIG log.

Gunner - assist with loading cameras; collect mission worksheets and correlate information for mission summary report.

FIGURE III-B-4

RIG MANEUVER PROCEDURE



Source: U.S. Air Force SAC Headquarters, SAC Operations Order 28-78, Offutt, Nebraska: 31 October 1977. SECRET

Observations and Comments

1. Crew and staff enthusiasm and professional determination were evident throughout the mission planning and execution.

2. Pre-mission briefing and mission conduct was more intense and thorough than analagous USN missions. The absence of seasoned ocean surveillance crew members as inflight training instructors may contribute to the difference in mission preparation.

3. The experience level of crew members on this flight was predictably low. Few crew members exceed two busy observer missions per year. One flight per year qualifies a crew for type II missions which are flown in search of Soviet ships.

4. Observed radar ranges for suface ships were as great as 65 NM at 28,000 feet and 55 NM at 3,000 feet altitude. The Radar Officer initially experienced difficulty in distinguishing rain showers or other weather phenomena from surface ships. However, during the four-hour onstation period, there was noticable improvement in his ability to discriminate contacts using gain, tilt, and video controls.

5. Photographic equipment and technique seemed less than optimum for the task. The integral, vertical bomb damage assessment camera used on this mission (K-17) cannot be adjusted for external lighting conditions during flight. The 6 or 12-inch focal length does not lend itself to high resolution photography at RIG altitudes.

The hand-held camera used was a 35mm Pentax K-2 with 200mm lens, using Kodak TRI-X black-and-white film exposed at ASA 400. Crews were instructed to operate the camera on "automatic" with a choice of two f-stops depending on lighting conditions (rather than set shutter speed and use the camera light meter to set f-stop). Given a ¼ to ½ NM CPA, the 200mm lens helps to enhance image size. However, aircraft movement, relatively slow shutter speeds which may result from automatic camera operation, and the low experience level of the photographer generally preclude high quality photography.

Photographs resulting from this mission ranged in quality from good to very poor. ("Good" meaning that the photographs can be used to identify and code the ship; "very poor" meaning that the ship's image can barely be discerned.) The overall quality was below that which might be expected of Navy surveillance crews. But considering equipment, training, technique, and experience level, it was impressive. In the author's opinion, photography is an area of great potential improvement for the Busy Observer program.

6. Navigation, detection, and location of ships was accomplished effectively and with little apparent difficulty. The conduct of the RIG maneuver was carried out as briefed. However, rote performance of the RIG maneuver reduced flexibility that might have been expected of a more experienced

crew. This observation is not intended to imply poor performance by the flight crew. It is intended to point out that rigid adherence to the SAC RIG maneuver appears to degrade photographic and visual intelligence gathering opportunities. Rather than emphasizing precise compliance with the recommended maneuver, placing more emphasis on wind direction, relative motion, sun position, etc., might enhance training and intelligence-gathering accomplishments.

7. Absence of feedback on inflight performance and inadequate ground training may affect crew effectiveness on the surveillance training missions. The importance of ground training has been recently emphasized at the 416th BMW. The author has since learned that HQSAC is considering implementation of an OSST ground training program which will help to enhance the value of inflight training.

Cross-talk and feedback between USN ocean surveillance crews and USAF crews is apparently minimal. Information is generally passed between high levels in respective USN-USAF organizations (e.g., CINCLANT and 8th AF). Actual operator-to-operator interchange may occur, but as an exception rather than as a rule.

8. CPA (Closest point of approach) limitations and absence of stabilized binoculars contributed to the inability of the crew to obtain the names of merchant ships. Ships names are required for intelligence correlation purposes, particularly with respect to merchant ships. Air Force action officers have become aware that closer approaches to surface objectives provide an opportunity for improved peacetime intelligence acquisition opportunities. During February 1979, CPA limitations were reviewed and reduced.

The following table summarizes CPA restrictions for comparison. It should be noted that political issues are a factor in B-52 CPAs; the relative size, appearance, and connotation of P-3 and B-52 aircraft and their effect on the crews of ships in international waters must be considered.

TABLE III-B-1

USAF AIRCRAFT CLOSEST POINT OF APPROACH (CPA) RESTRICTIONS
(Measured in Yards)

	1976 B-52	1978 B-52	1979 B-52
Non-combatant Vertical	(Note 1)	1000	666
Non-combatant Horizontal	2000	500	333
Combatant Vertical	(Note 1)	1000	666
Combatant Horizontal	2000	1000	333

---

[1]500 feet below floor of controlled airspace (floor in Atlantic is 5500 feet MSL; in Pacific, 5000 feet).

[2]CPA to USN combatants may be closer if two-way communication is established and new CPA agreed upon.

Source: U.S. Air Force SAC Headquarters, Operations Order 28-78, Offutt, NE: 1 Oct 1977; USAF SAC HQ, DOOCX, March 1979.

At extended CPAs, gyro-stabilized binoculars may be used to aid in visual target identification. Use of such equipment is not standardized in USN VP squadrons. As late as 1975, Pacific-deployed VP squadrons had employed a specialized and relatively expensive gyro-binocular set to increase identificaton capability during surveillance of high density shipping lanes. Unfortunately, the delicate instruments were often in need of repair and their use has generally been discontinued. However, some VP squadrons are very successfully using a more reliable, less-expensive gyro-stabilizing assembly which can be attached to the tripod mount of a conventional camera or binocular set. While there is some disagreement among Navy surveillance crews concerning the utility of stabilized binoculars, the inexpensive gyros are generally considered to be desirable equipment for surveillance missions. The use of the detachable gyro assembly might prove useful for Busy Observer identification and photography applications, particularly at extended CPAs.

8. Fuel consumption was, as expected, very high as compared with that which might be expected from other aircraft. Total fuel used by one aircraft was approximately 173,000 pounds; fuel consumption rates varied from 18-26 thousand pounds per hour, depending on altitude and gross weight. It is significant to note that approximately 50,000 pounds of fuel were consumed during the SRAM CAE navigation programming

leg. For comparison purposes, a P-3 aircraft might be expected to use 40-50 thousand pounds total fuel on a 10-hour surveillance mission, with an hourly consumption rate of 3 to 4.5 thousand pounds per hour. B-52H aircraft have considerably more efficient engines than the B-52G model flown on this mission, and can thus be expected to fly longer and/or farther. All B-52s have refueling capability which also increases range and endurance potential. Refueling is frequently practiced on Busy Observer missions, but the 8-hour flight on 8 February was not refueled. (USN P-3 aircraft do not have refueling capability.)

9. Air speed versatility of the B-52G was notable. Enroute True airspeed (TAS) at 28,000 feet was 350 to 420 kts. Low altitude RIG speeds were around 240 kts TAS. For comparison, P-3 aircraft may transit at 320-350 kts and RIG at 190-220 kts. Higher transit speeds facilitate reduced "reaction" time, while slower speeds on station decrease relative motion, thus enhancing contact identification and photography.

10. Platform stability and "ride" characteristics affect crew performance and endurance. The relatively flexible wings of the B-52G (as compared with the rigid wings of the P-3) contribute significantly to crew comfort in turbulent weather at low RIG altitudes. During this mission, the ride experienced at 1000 feet with 50 kt winds, high sea state, and significant cloud cover was as comfortable as might be expected of a P-3 in relatively calm weather. However, cabin and cockpit space

is extremely limited in the B-52 as compared with a P-3. Relatively austere B-52 crew accomodations may adversely affect crew comfort and performance during long missions.

11. The following observations related to flight safety during ocean surveillance missions were discussed with the 416th BMW Director of Operations.

a. Deceptive depth perception when flying over water: This phenomenon is a result of a lack of familiar physical references (trees, buildings, etc.) and the changing nature of wave/swell patterns resulting from meteorological conditions. Ships aid in providing a reference, but are not continuously available during low visibility and during aircraft turns. This characteristic of overwater flight is especially relevant to B-52 peacetime surveillance missions because: (1) the B-52 radar altimeter is less reliable over water than over land, (2) accurate barometric altimeter readings are not generally available over open-ocean areas, (3) mission unfamiliarity and flight station duties are conducive to distraction. This is not to say that B-52 pilots are less capable than any others; low altitude, overland penetration bombing runs at tree-top level using terrain-clearance radar in a 400-thousand pound airplane give the B-52 pilot respectable credentials. However, the relatively alien, over-ocean environment and the infrequent scheduling of crews on Busy Observer flights may be cause for increased concern.

b. Radar run-ins to targets in low visibility weather: In some oceans of the world, there are sparsely charted islands which give a deceptively ship-like radar return, but extend hundreds of feet into the air. As a result of near-miss experiences by some crews, Navy ocean surveillance flights "off-set" radar approaches to surface contacts in low visibility conditions. This is a simple procedural technique which may prove prudent for USAF crews.

c. Effects of salt spray on surveillance aircraft: Salt is deposited on ocean surveillance aircraft in noticable amounts at altitudes below 2500 feet during high-wind conditions. Accumulations on the windshield can significantly obscure forward vision. Salt on the airframe contributes to corrosion problems. Salt in the engines may have residual degenerative effects (e.g., P-3 turbine blade deterioration due to sulfidation occurs in the presence of high operating temperatures and salt deposits). There seems to be a relatively low level of awareness among USAF Busy Observer flight crews of these ramifications of operating in a salt-laden environment.

12. ESM/ECM capability. Electronic support measures (ESM) capability in the B-52G is relatively slight. However, detection using electronic countermeasures (ECM) sensors is possible, though correlation of emitters to specific surface contacts is

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somewhat difficult and depends largely on EWO/Navigator coordination. The P-3C ESM suite is more functional for ocean surveillance, however, the B-52 ECM capability suggests greater potential if surveillance is required in a high-threat environment.

13. Communications. During this flight, over-water communications requirements included establishing HF contact with a naval communications center. Only one HF frequency was assigned and no contact was established. The electronics warfare officer (EWO) is responsible for the communications on Busy Observer flights. Frequent, routine communications can be a distraction from his other duties. Since long-range communications are essential for flight-following and target reporting purposes, additional consideration might be directed to providing back-up, or supplementary communication channels. Once communications are established, the absence of on-line encryption capability for contact reporting can be expected to delay intelligence reporting (as compared to reporting using on-line encrypted voice or teletype equipment).

14. Two-plane cell: Two aircraft are tasked for each mission for purposes of mutual radar, communications, and safety support. In addition, more crew training can be accomplished during each scheduled surveillance period. However there are complications which may degrade the training accomplished. Sharing targets or sharing time on a single target decreases the amount of time each crew might have on target if it were

operating alone. Aircraft separation and inter-aircraft communication requirements also affect time available to conduct surveillance training. It may be that primary mission training (such as CHAFF exercises) which can be accomplished in two-plane cells outweighs the slight degradation caused in the collateral surveillance mission training.

15. Although Busy Observer missions are training flights, there is frequently an opportunity to gather useful intelligence. For example, on this mission a number of merchant ships were identified and photographed. There seems to be some uncertainty at all levels in the Busy Observer program about what constitutes useful intelligence. Feedback to USAF squadrons from ocean surveillance intelligence processors (e.g., DIA or NISC) seems to be relatively sparse. Increased interaction in this area might enhance the intelligence product of the training flights.

Summary

This B-52 Busy Observer flight was non-standard in that it was not directed to locate a specific surface ship objective. For the same reason, however, it more closely resembled a routine, peacetime Navy ocean surveillance patrol. The following points summarize the author's opinions on B-52 employment in ocean surveillance roles. They are drawn from an extensive background in P-3 surface surveillance operations, as well as from this first-hand observaton of a B-52 training mission.

- Inherent potential capabilities of the B-52G aircraft and crew in the ocean surveillance role are significant. Radar, navigation, ECM, crew coordination, and aircraft performance characteristics are all adaptable to the role. With a minimum of additional instruction, mission accomplishments as measured by photography and post-mission summary reports could be noticeably improved. There seems to be a lack of interchange and feedback between Naval Ocean Surveillance experts and Air Force flight crews at the operational level; such an interchange might increase the effectiveness of the present training program.

- While high fuel requirements are a drawback, speed and refueling capabilities are an asset in B-52 ocean surveillance operations.

- ECM capabilities should give the B-52 an advantage in entering high-threat areas during ocean surveillance flights.

- Photographic results of Busy Observer missions can be improved with additional ground training of crews and with increased feedback to intelligence officers from users of aircraft photography.

- Busy Observer missions -- at least in this one sample -- are conducted in an earnest professional manner. Staff and crew members seem very receptive to suggestions for improvement of their ocean surveillance capability.

APPENDIX C
to CHAPTER III

AIRCRAFT SURVEILLANCE-RELATED EQUIPMENT

APPENDIX C
to CHAPTER III

AIRCRAFT SURVEILLANCE-RELATED EQUIPMENT

This appendix summarizes the major surveillance-related equipment found on the aircraft which are compared in Chapter III. Since some aircraft of a given model have been fitted with advanced equipment, following lists will not be all-inclusive. However, the lists are, according the sources which provided them, representative of the aircraft types.

Using these equipment lists, and the list of "essential equipment" on page 58 of Appendix III-A, the author made the relative comparison of selected aircraft found on page 39 of Chapter III.

P-3 A, B

Radar		
	AN/APS 80	- dual radar sets (360°)
	APA-125	- indicator scope
Navigation		
	ASN 42	- inertial navigation system
	APN 70B	- LORAN
	APN 153	- Doppler radar
	LTN 72	- (some aircraft)
	ASA 47	- air mass computer
	PT 396	- ground track plotter periscopic sextant
ESM		
	AN/ULA-2	- pulse analyzer
	AN/ALD-2B	- receiver indicator
ECM		
	None	
Communications		
	TT 264	- HF teletype plain/on-line encrypted
	ARC-94	- HF plain voice
	ARC-51	- UHF plain/secure voice
	ARC-84	- VHF plain voice
Photography		
	KB 10A	- integral system (70mm 70-230 frames)
or	KS 89A	- integral system (70mm 500 frames); 6" focal length
	KE-51/ KS-94	- Beseler Topcon 35mm hand-held camera and motor drive system; 100mm lens
Other Surveillance Equipment		
	AVQC	- 70 million candlepower search light
	FLIR	- (Forward Looking Infrared) (some aircraft) acoustic analysis equipment (not routinely used)
	MX-8001/U	- binocular gyro-stabilizer
	MI 32	- binoculars (7x50mm)
Weapons		
	air-to-air	- none
	air-to-surface (antiship)	- FFAR 10D rocket AGM 12B Bullpup (17km) AGM 84A Harpoon (planned capability) (110km) various mines MK-46 torpedo

Source: Patrol Squadron 30/NATOPS Office
NAVAIR 01-75PAA-1 NATOPS Flight Manual

P-3C

Radar

APS-115	- (360°)

Navigation

ASN-84 (2)	- inertial navigation systems
ARN-81	- LORAN A&C
APN-187	- doppler radar
ARN-99	- Omega (updated aircraft)
ASQ-114/ AYA-8	- general purpose computer and data processing equipment - periscopic sextant

ESM

ALQ-78	- electronic support measures system

ECM

None

Communications

ARC 161(2)	- HF plain
ARC 143	- UHF plain and voice encryption
ARC 101	- VHF plain
AGC-6	- teletype; VHF/HF; plain/encrypted

Photography

KS-91	- integral camera system
KA-74	- camera (100 ft. 5" film) computer assisted; 6" focal length
KB-18	- attack assessment camera (horizon-to-horizon) 70mm, 300 exposures
KE-51/ KS-94	- hand-held 35mm camera, 6" focal length

Other Surveillance equipment

	- FLIR
MK 32	- binoculars (7x50mm)
MX-8001/U	- binocular stabilizer

Weapons

air-to-air	- none
air-to-surface:	
FFAR 10	- Rocket
AGM12B	- Bullpup (17km range)
AGM84A	- Harpoon (110km range)
	- various mines
MK-46	- torpedo

Source: VP 30/NATOPS Office
NAVAIR 01-75PAC-1 NATOPS Flight Manual

B-52D

Radar

AN/ASQ-38 or 48	- bombing navigation system
AN/APS-104	- search radar

Navigation

APN-107	- doppler radar
MD-1	- auto astro compass

ESM

(see ECM)

ECM

ALR-18 ALE-20	- various receivers, transmitters, and early warning sets
ALT-16 ALR-20	
ALT-15 APR-25	
ALT-6B ALT-28	
APR-9 ALT-22	
APS-54 ALT-32	
ALE-1 or ALE-27	- CHAFF dispenser

Communications

ARC 58 or ARC 65	- HF voice, plain
ARC 34	- UHF voice

Photography

K-38	-(36 in lens)
K-17 or K-22	- (6 or 12 in. lens)

Other Surveillance Equipment

Binoculars	- some aircraft

Weapons

Air-to-Air:

M-3 guns (4)	- .50 cal; 600 rounds each

Air-to-Surface:

GBU-15	- (9 aircraft) glide bomb unit
-	- various conventional bombs
-	- various mines

Source: HQUSAF/XOOTS
AFG 2, Vol. I, Addn 55

B-52 G/H

Radar

AN/ASQ-48	- bombing navigation system
AN/APN-89A	- forward surveillance radar

Navigation

MD-1	- auto astro compass
AN/APN-89A	- ground speed/drift radar
AN/AJA 1 or AJN-8	- true heading comp
SRAM CAE	- short range attack missile, carrier aircraft equipment (inertial navigation)

ESM

(see ECM)

ECM

ALT-6B ALT-13	- various countermeasures, transmitter and receivers
APR-25 ALT-15	
ALR-20 ALT-16	
APS-54 ALR-18	
	- CHAFF dispenser

Communications

ARC-34	- UHF plain
ARC-58 or 65	- HF plain
AVSATCOM	- satellite communication set estimated (1978-1982)

Photography

K-38	- (36 in. lens)
K-17	- (6 in. or 12 in. lens)
-	-35mm hand-held camera; 200mm lens

Other Surveillance Equipment

AN/ASQ-51	- EVS - Electrooptical viewing system (includes AAW-6 FLIR and AVQ-22 LLTV)

Weapons

Air-to-Air:	
M-3	- .50 caliber guns (B-52G)
M-61	- 20mm gun (B-52H) (1242 rounds)
Air-to-Surface:	
	- various bombs and mines

Source: HQUSAF/XOOTS
AFG 2, Vol. 1, Addn 66
Jayne's All the World's Aircraft 1978-79

F-111, A, D, E, F

Radar

APQ-113, 144	- F-111 A/E/F (± 45° of nose)
APQ-130	- F-111D (± 60° of nose)

Navigation

AJQ-20A	-F-111 A/E inertial bomb nav system
AJN-16	- F-111 D/F inertial bomb nav system
APN-185	- (F-11D) Doppler radar

ESM

APS-109	- radar warning receiver
ALR-41	- CM receiver set
AAR-34	- IR receiver set

ECM

ALQ-94	- countermeasures set
ALE-29	- CM dispenser set
ALQ-87/101/119	- ECM external pods

Communications

ARC-112	- F-111A: HF voice
ARC-123	- F-111 D/E/F: HF voice
ARC-109	- UHF

Photography

KB-18	- strike camera (180° horizon-to-horizon)

Other Surveillance Equipment

FLIR	(some aircraft)

Weapons

Air-to-Air:	
AIM-9	- missile
M61A1	-20mm gun
Air-to-Surface:	
M61A1	-20mm cannon
	-precision guided munitions
	-general purpose bombs
	-cluster bomb units

Source: HQUSAF/XOOTS

RC-135

Radar

AN/APN-59/APN-59B

Navigation

APN-121	- stellar inertial doppler system
APN-81	- doppler
	- sextant
TDL-800	- Loran (RC-135S)

ESM

Various COMINT/ELINT collection equipment

ECM - none

Communications

- UHF plain/secure voice
- VHF plain voice
- HF plain voice
- HF teletype/secure teletype

Photography

- hand-held camera

Weapons - none

Source: HQUSAF/XOOTS

C-130

Radar

AN/APN-59	- navigation & search radar (range 3-240 NM)

Navigation

AN/ARN-131	- Omega navigation system
AN/APN-147	- Doppler
AN-ASN-35	- Doppler computer system
	- periscopic sextant

ESM - none

ECM - none

Communications

- UHF plain voice
- VHF plain voice
- HF plain voice

Photography

none	- (hand-held capable)

Weapons - none

Source: HQUSAF/XOOTS

CHAPTER IV

CONCEPTS OF EMPLOYMENT

Having considered the relative advantages of selected USN and USAF aircraft, and having concluded that each has common as well as unique capabilities, one is left with considering when they might be available and how they might be employed. Section 1 of this chapter considers a number of factors which have an impact on employment. Section 2 discusses these factors in the context of three conceptual world situations: peacetime, pre-war, and wartime.

1. RELEVANT FACTORS

The following employment planning concepts will be discussed:

- Complementarity - Substitution
- Command, Control, and Communications (C^3)
- Dollar and Opportunity Costs
- Threat - Need
- Vulnerability - Attrition - Conflict Duration
- Platform Capability
- Political Considerations
- Uncertainty

Complementarity - Substitution. All of the aircraft presently capable of ocean surface surveillance have other roles; e.g., ASW, strategic bombardment, or tactical air superiority. In addition, as discussed in Chapter III, potential ocean surveillance aircraft have inherent capabilities which are not equally distributed among aircraft types. For example, such capabilities as acoustic analysis, airborne refueling, and electronic countermeasures are not present in all of the various long-range, land-based aircraft. It is therefore difficult to speak in terms of simple substitution of one aircraft for another in the surveillance role; an F-111 cannot be substituted for a P-3, nor can a P-3 be substituted for a B-52 in ocean-surveillance employment, without sacrificing the unique characteristics of the aircraft replaced. However, where the task at hand falls within the capability of all aircraft, one may replace another with no degradation to mission accomplishment.

The same characteristics which complicate simple substitution of platforms result in enhanced complementarity. Where long-range and electronic counter-measures are required, the B-52 effectively complements the P-3. Where acoustic indentification and medium range missile capability are required, the P-3 complements other aircraft.

The complementarity-substitution factors are also applicable to the land-based versus sea-based and aircraft versus

satellite issues. Long-range, land-based aircraft can substitute for sea-based air in some situations, but more often they provide a complementary capability. While sea-based aircraft are more responsive and intimately linked to close battle group support, land-based surveillance aircraft can provide more distant or independent surface intelligence information. Aircraft complement satellite systems in that aircraft are generally more responsive, they have a broader range of capabilities, and they can carry weapons if required.

The complementary characteristics of surveillance aircraft provide the basis for mutual reinforcement advocacy. In certain situations, one may be substituted for another, but in overall planning, the unique characteristics of each must be considered when allocating them for employment.

Command, Control, and Communications (C^3). Interactions of USN and USAF aircraft in maritime roles have a number of C^3 ramifications. Two principle factors affecting command and control are:

1. scope of the task (localized or widespread; sporadic or long term), and

2. proximity to naval surface units, especially sea-based air platforms.

Given short-term surveillance requirements in the vicinity of a naval battle group, for example, the naval commander

might request assistance from the unified commander who might then require the Air Force commander to task his force appropriately. While remaining under the operational command of the USAF organization, the on-station aircraft would be under the tactical control of the naval commander he is supporting.

In a long-term close task group support campaign, Air Force resource allocations might reasonably be under the operational command, as well as tactical control, of the naval commander.

When providing long-term, independent surveillance tasks, operational command and tactical control would likely remain with the Air Force commander.

Communication is essential for command and control. Channels of communication will normally follow the logic of command and control arrangements. In the event the unified commander desires reallocation of Air Force aircraft from the surveillance function to another role, he must have the means to recall those assets via the command or control agency in immediate contact. Also, when a USAF aircraft is operating in the immediate proximity of naval surface units, it must be capable of tactical communications with the applicable controller; this has implications for both procedural technique (comm plan, circuit allocation, air control procedures) and equipment capability (secure voice, data-link, teletype, etc.).

The C^3 factor is neither insignificant, nor insurmountable. It is, however, one that bears close consideration when postulating joint employment concepts.

Dollar and Opportunity Costs. Considerations of dollar cost seem simple and straightforward at first glance. As discussed in Chapter III, there are great differences among basic fuel and oil costs per hour for the different aircraft. Adding maintenance expense, crew salaries, base support costs, etc., complicates the comparison, but more closely approaches reality. Given a detailed and accurate cost analysis, and an intelligence need which can be fulfilled by several aircraft, the decisionmaker will be inclined to choose the least costly alternative. However, given an urgent need which can be met by only the most expensive platform, dollar cost will play a less restrictive part.

In addition to dollar cost, opportunity cost considerations play a major role in the conceptual employment of various Air Force aircraft in the surveillance role. All of the aircraft considered in this study have primary roles for which they are optimized. Strategic bombardment, ASW, air superiority, signals intelligence, and air lift requirements are the reasons for their existence. When the unified commander makes a decision to employ a bomber in a surveillance role, he "pays" with the potential results of the bombing mission that is forgone.

Accurately quantifying opportunity costs for the purpose of comparison is perhaps impossible; however, this is

an aspect of USN-USAF surveillance interaction that is frequently addressed. For example, "That aircraft won't be available, because it'll be too valuable in its primary role to waste on surveillance." Nevertheless, when faced with urgent needs in conflicting mission areas, the unified commander will be required to choose between the opportunity costs related to the surveillance and those related to the alternative mission.

Threat - Need. As discussed in Chapter III, there are many potential targets for ocean surveillance. The density, type, and distribution of targets will affect the employment of surveillance aircraft. The intelligence data-base and availability of data from other means will also be factors. As the threat from potential surveillance targets increases, the need for surveillance will also increase. Knowledge of hostile combatant or logistic ship location is needed for effective friendly force planning and correlation.

Threat to the surveillance aircraft itself is a related factor for consideration. Since the surveillance aircraft poses a significant problem for the enemy force, the aircraft will be a highly desirable target. The choice between surveillance aircraft may thus be driven by the capability of that aircraft to endure a predicted environment of airborne intercept or surface-to-air missile engagement.

The threat to friendly forces posed by the hostile force affects the need for surveillance. Given availability of several surveillance aircraft types, the threat to the surveillance aircraft will affect the choice of aircraft employed for the task.

Vulnerability - Attrition - Conflict Duration. To varying degrees, long-range, land-based ocean surveillance aircraft are vulnerable to destruction by intercepting gunfire, missiles or aircraft. Countermeasures to these threats include available aircraft speed, maneuverability, weapons, and electronic equipment. Relative to most other alternatives, the P-3 is very vulnerable. It has no tail gun or ECM equipment and its speed and maneuverability capability is limited. In a conflict it is susceptible to attrition by a number of threats. However, in a "stand-off" air-to-surface environment, weapons attributes of the P-3 may outweigh its disadvantages due to vulnerability. Additionally, acoustic and ESM capabilities may make it less vulnerable in an alerted employment situation.

In any case, relative platform vulnerability is a factor in employment planning. Attrition to surveillance aircraft not only affects the intellignece data-base, it also has an impact on the aircraft's primary mission area.

Conflict duration plays an important role in considering platform vulnerability and anticipated attrition. High vulnerability and high attrition rates may be bearable in a

short-term conflict, if mission objectives are fulfilled. However, high risk and vulnerability in a longer-term conflict may not be acceptable.

Platform Flexibility. When choosing a surveillance aircraft from available USN-USAF assets, the planner must consider not only whether the aircraft can perform the surveillance mission, but he also must consider what else the system can do (e.g., the P-3 can perform subsurface surveillance, the F-111 can interdict an air threat, the B-52 can deal with a surface-to-air missile threat, as well as provide some surface surveillance tasks).

The margin of additional capability may be a deciding factor in surveillance aircraft employment.

Technology. For the most part, this study addresses currently available land-based aircraft and their equipment. Given the introduction of new aircraft or equipment capabilities, employment concepts will be altered. However, it seems reasonable to expect that weapon systems designed for other roles will continue to have applicability to surface surveillance needs. Improvements in some systems will likely enhance alternative maritime mission capability (e.g., improvements in communications, aircraft performance, stand-off detection systems and weapons will enhance both primary and collateral mission abilities).

Political Considerations. Aside from the inter-service political implications resulting from employment of USAF aircraft in maritime surveillance roles, international politics must be considered.

Using a strategic bomber for peacetime surveillance is an incongruity subject to misinterpretation. For example, diplomatic problems related to overflight or proximity may be more likely to occur with B-52 aircraft than with C-130s.

While such considerations can be a problem for decision-makers, they can also be tools. The message inferred from B-52 or F-111 aircraft surveillance may be more forceful than that resulting from the presence of P-3 or C-130 aircraft.

Whether as a problem or as a tool, the employment of alternative surveillance aircraft carries an interpretive connotation which must be considered by the planner.

Uncertainty. Inability to conclusively predict the outcome of future events is a characteristic of force employment planning that can only be dealt with by attempting to understand relevant factors and preparing for alternative courses of action. Flexibility need not be maintained by indecision, however. Consideration of procedural alternatives as well as hardware application alternatives before the decision situation occurs should enhance probabilities for success. Uncertainty as a concept is an effective challenge to theories of employment which are based on conditions assumed "always" or "never" to be present.

While uncertainty complicates force structure and service-interaction planning, the decisionmaker cannot afford to ignore its existence until the reality of conflict removes it as a planning factor. Procedural and conceptual interaction must be emphasized during peacetime to ensure greater wartime flexibility and adaptability.

2. EMPLOYMENT SITUATIONS

This section will address three world situations as a forum for discussing concepts of USN-USAF aircraft employment for ocean surface surveillance tasks. The situations are:

- Peacetime
  - Status quo
  - Routine Surveillance
  - Crisis Situation
  - Presence
- Pre-War
- Wartime

Peacetime - Status quo. Since the signing of the 1975 USN-USAF collateral functions agreement, the Air Force has participated in various maritime roles, including surveillance. B-52s have been flying Busy Observer OSST (Ocean Surface Surveillance Training) RF-4s and F-111s have been flying Sea Raven, Sea Crow, and Sea Flirt missions which involve Recce, Strike, EW, and TSST (Tac Sea Surveillance Training). In addition, USAF TAC and SAC aircraft have participated in such joint exercises as SOLID SHIELD, COMPUTEX, SPRINGEX, GULFEX, MARCOM, TEAMWORK and NIFTY NUGGET. Also, the LANTFLT TCRP (Tactical Command Readiness Program) war games at the Naval War College Center for War Gaming have routinely included USAF participants.

Of course, not all the present peacetime interaction involves ocean surveillance. But all of the USAF ocean surveillance that is tasked is aimed at preparing the Air Force for its collateral function. In other words, the emphasis is on training, as opposed to operational flights.

The peacetime scenario which will be briefly presented here makes a significant departure from the status quo in that it considers "operational" employment of USAF aircraft in the ocean surveillance role. Bureaucratic or "roles-and-missions" issues raised by this concept will not be discussed here, but will be deferred to Chapter V (Implementation Issues).

Peacetime - Routine Surveillance. In addition to, or in lieu of, employing B-52, F-111, and RF-4 aircraft on dedicated training missions, these aircraft would be used to complement USN VP surveillance coverage. Such employment in peacetime would not be hampered by conflicts due to primary role tasking; however, it would have to be accomplished without significantly detracting from primary mission training responsibilities.

The level of participation would conceptually be no greater than that for present peacetime training. Mission requirements would be established by CINCPACFLT or CINCLANTFLT, or subordinate naval commands. Tasking would be through the applicable Air Force chain of command (SAC, TAC, 8th AF, etc). Liaison between cognizant patrol wings and participating Air Force wings would be authorized for radio communications, and prevention of mutual interference. Intelligence reporting would be

accomplished through Navy intelligence commands in the same manner that USN VP squadrons presently report.

Since a partial objective of the tasked mission would be to train the Air Force crew in the collateral maritime mission, interchange of suggestions, feedback on results, and "open communications" between operational USN patrol wings and the tasked USAF wing would be strongly encouraged. If time permitted, exchange of personnel using the "inter-type training" concept would be conducted to help facilitate the exchange of ideas and information. The personnel exchanges would be accomplished on a volunteer basis for the duration of the tasked mission. Transportation would be provided by organic assets using routine training or logistics flights.

Operational missions would fall into three categories:

1. Target locator outside the operational range of P-3 aircraft (e.g., outside P-3 operating radius in the Indian Ocean, or in the southern hemisphere oceans).

2. Routine ocean surface surveillance in geographical areas within the range of P-3s, but not normally patrolled by P-3s.

3. Surveillance in areas usually covered by P-3s, when presence of USAF aircraft is desired for political purposes.

Using Air Force surveillance-capable aircraft in this peacetime scenario has a number of implications which are itemized below.

Disadvantages:

1. The use of crews-in-training when intelligence is needed may produce less than successful results.

2. Fuel required for USAF surveillance aircraft and tankers may be too great to warrant employment.

3. Responsiveness of Air Force training assets for operational missions may be inadequate for irregular or short-notice tasking requirements.

Advantages:

1. "Real-world" operational missions would provide the same type of realistic training for Air Force crews that USN VP crews normally receive (though not as much of it).

2. Exposing their ships to USAF aircraft more often and in more different places would complicate the Soviet defense planner's job.

3. Intelligence agencies would benefit from a wider geographical sample of ocean surface traffic.

4. Operational surface surveillance crews and action officers would benefit from the exchange of ideas and increased awareness of mutual capabilities and responsibilities.

Peacetime - Crisis Situation. This situation assumes a peacetime crisis of the order of Pueblo, Mayaguez or the Korean Axe Murders. Each of these crises occurred within the range of P-3 aircraft surveillance. (In the axe-chopping incident P-3 coverage was limited to maritime

surveillance in the vicinity of the Tsushima Straits.) The notional crisis situation may occur either inside or outside of P-3 range. In either case, it occurs in a location temporarily remote from carrier-based aircraft.

If the crisis occurs within P-3 range, the decisionmaker must determine whether the risk to the P-3 is worth the value of the intelligence that might be gained. If time permits, employment of an ECM capable, gun-equipped, higher speed aircraft might be more desirable.

In addition to diminishing the risk to the surveillance aircraft, the measure of resolve demonstrated by the presence of a strategic bomber or air-superiority fighter might be more useful than that provided by an ASW aircraft, especially if the offending country has little or no submarine force.

If a show of carrier battle group force is planned, Air Force aircraft might be responsively employed until relieved by the carrier. If no carrier presence is planned, Air Force and Navy land-based aircraft might share on-scene responsibilities correlating with their respective capabilities (e.g., higher speed ECM-equipped aircraft in immediate proximity, with P-3 acting as more distant stand-by and communications relay [via secure HF teletype or HF computer data link]).

Implications of the peacetime crisis scenario follow:

Disadvantages:

1. Places less-experienced ocean surveillance aircraft in the "hot-spot."

2. Since the majority of potential USAF aircraft are based in the continental U.S., their responsiveness may not be greater than that of sea-based air.

3. USAF aircraft communications or photographic capabilities may not be adequate for the needs of the situation.

Advantages:

1. The void in perceived capability and "forcefulness" between carrier-based aircraft and USN land-based aircraft would be filled.

2. The opposition against which U.S. forces are reacting would be forced to ponder the alternative uses of airborne strategic bombers or air-superiority aircraft.

3. Wartime coordination of USN-USAF assets in the maritime role would be tested.

Peacetime - Presence. Recently there has been increased discussion concerning the role of U.S. forces in peacetime presence missions, particularly in the Indian Ocean area. A December 1978-79 Congressional Budget Office study considered one alternative to carrier-based air in that theater. The CBO scenario involved F-111s based at Diego Garcia with tanker support.[1] Using tanker support and complementing P-3 presence, land-based USAF aircraft are capable of widespread Indian Ocean operations.

The presence of USAF aircraft adds variety to the menu available to decisionmakers in terms of capability and intent. Whatever the specific situation, use of USAF aircraft in addition to USN surface and air platforms adds to the demonstration of U.S. presence on the world's oceans.

Disadvantages:

1. Land-based aircraft may not have the perceived impact that the presence of aircraft carriers and their aircraft present.

2. The use of tactical or bomber aircraft in routine ocean surveillance roles to demonstrate presence may represent too high an opportunity cost due to lost training for primary missions.

Advantages:

1. U.S. presence may be perceived as being more widespread.

2. Use of USAF aircraft in presence roles complicates defense planning for potentially hostile forces.

3. Peacetime availability of assets is not hindered by operational needs for the aircraft's primary function.

4. Use of land-based aircraft in long-range presence missions may be less expensive than periodic deployment of carrier battle-groups in distant theaters such as the Indian Ocean

Pre-war. As tensions conceptually increase, predictions of USAF aircraft availability for surface surveillance roles decrease. The pre-war condition assumes a situation in which decisionmakers consider the likelihood of war to be great, although general hostilities have not begun. Military commanders are preparing to execute dispersal and preposition plans and mobilization is being considered. Soviet submarine movement has significantly increased.

Land-based naval ASW aircraft can expect to be tasked with detecting and tracking potentially hostile submarines until authorized to attack. Given a 2-hour transit distance, 6-hour on-station period, 1-hour onstation overlap, and 80% aircraft availability, each P-3 squadron can expect to continuously track no more than 2 submarines (and this estimate is optimistic). Multiplying 24 squadrons (assuming all active duty squadrons are employed), land-based naval aircraft can account for no more than 48 Soviet submarines -- between 10 and 25% of the Soviet inventory.

While this is a simplistic representation of probable P-3 ASW requirements and employment, it illustrates a situation in which P-3 availability for surface surveillance can be predicted to be very low. During the same time period, aside from dispersal and prepositioning requirements, USAF aircraft availability could be high compared to that of P-3s. USAF availability during this time frame is somewhat controllable. For example, heavy employment of Air Force aircraft in ocean surveillance roles may be an exceptionally effective means of

protective dispersal. In addition, aircraft which are pre-positioned from a CONUS base to the NATO or Pacific theaters might be employed enroute for certain surveillance tasks.

The increasing tension, pre-war world situation is one which requires considerable prior planning and training.

Disadvantages:

1. Dispersal, tanker, and primary mission readiness requirements may diminish USAF aircraft availability.

2. Command, control and service coordination requirements would require considerable peacetime effort, without which the range of flexibility during a high tension pre-war period would be reduced.

Advantages:

1. As a complement to limited P-3 surveillance and other surveillance systems (SR-71, satellite, surface ships, HFDF, etc.), available USAF aircraft could be valuable assets.

2. Opposing forces would have to consider the additional capabilities of the USAF aircraft in planning subsequent action.

Wartime. The wartime situation is the one in which availability of USAF assets for maritime roles seems least likely. Yet it also is the one in which the value of any available surveillance platform will be greatest, especially those platforms which have the capability to deliver weapons against the surveillance target.

In a conventional conflict, action in the central front of Europe is assumed to exist. However, confrontations in all theaters are likely during the progress of the war, occurring sporadically or simultaneously as affected nations commit their forces. For hostile naval forces, severance of allied sea lines of communication (SLOCs) will be a principle mission. Threats to U.S. naval and maritime resources will come from ships, submarines, and aircraft.

As in the pre-war situation, P-3 patrol squadrons will be primarily employed against the submarine threat. Those land-based naval aircraft which are Harpoon-equipped will be tasked with antiship as well as antisubmarine functions. Logistic ship escort, battle-group screen, and independent antisubmarine tasks will greatly restrict P-3 surface surveillance operations.

USAF surveillance-capable aircraft will also be employed in primary roles. Availability for contingency roles will be severely restricted. It is in this situation that most observers reflect skeptically that no USAF aircraft will be available for maritime roles, including surveillance.

Surveillance requirements will be higher than those in peacetime, and all capable assets will be in short supply. The dilemma may be portrayed by a notional graph (Figure IV-1).

During peacetime, the availability of surveillance-capable aircraft generally exceeds surveillance requirements -- whether or not the aircraft are employed in surveillance tasks. As

pre-war tension increases, non-deployed active duty squadrons are permitted increased flight-hour expenditures; some routine operational unit training and logistics activity is eliminated; and some USAF aircraft become available. However, an overall decrease in availability results from requirements for ASW tracking, dispersal, and pre-positioning of forces. Surveillance requirements in the pre-war period dramatically increase as decision makers attempt to closely monitor the developing situation. During the wartime period, surveillance requirements remain critical, but availability of surveillance-capable aircraft is sharply diminished by primary role responsibilities and then gradually diminish as a result of attrition.

The notional graph in Figure IV-2 illustrates the relative value of a single surveillance platform over the range of world situations. As surveillance platform availability decreases the relative value of each aircraft increases.

FIGURE IV-1

Notional Graph Comparing Surveillance Requirements with Available Surveillance-Capable Aircraft in Three World Situations

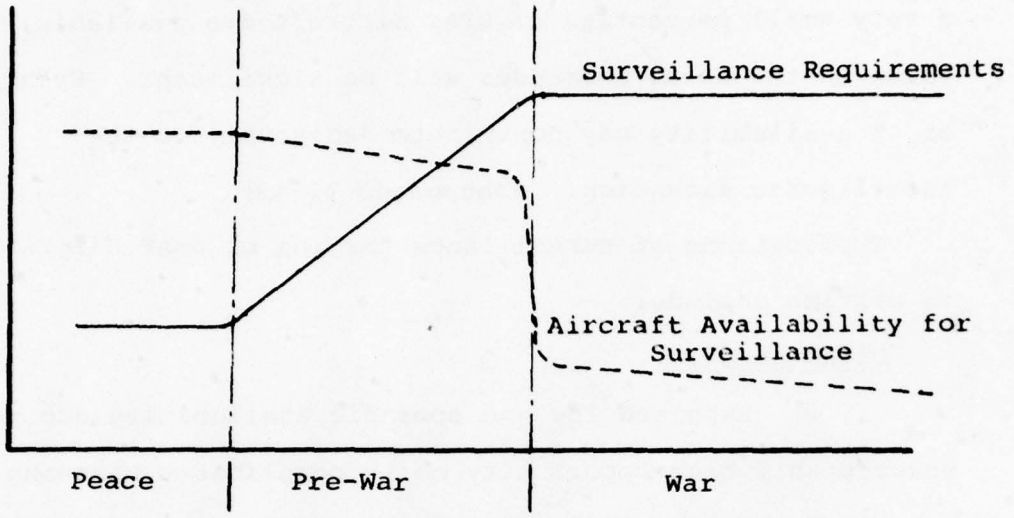
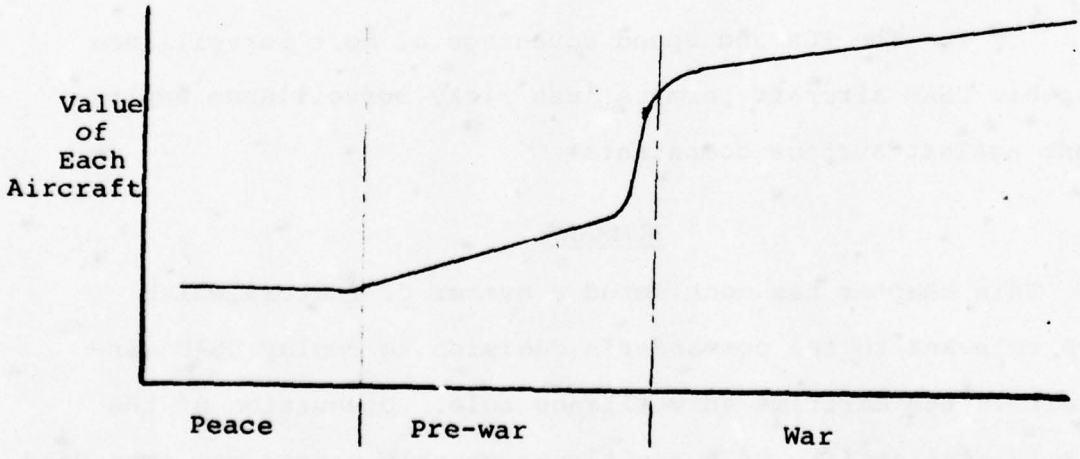


FIGURE IV-2

Notional Graph of the Value of an Individual Surveillance Platform During the Three World Situations



The point of these illustrations is that even if only a very small percentage of USAF aircraft are available, their value to the Naval commander will be significant. Even a 3 or 4% availability may contribute decisively to the intelligence situation. (see pages 41-43)

Implications of surveillance tasking of USAF aircraft in wartime include:

Disadvantages:

1. Expected low and sporadic availability due to unacceptably high opportunity costs complicates planning.

2. Nonavailability of stand-off antiship weapons on surveillance-capable USAF aircraft decreases utility in wartime surveillance role.

Advantages:

1. The value of each aircraft employed in the surveillance role in wartime is expected to be great.

2. The ECM and speed advantage of most surveillance capable USAF aircraft permits less risky surveillance employment against surface combatants.

SUMMARY

This chapter has considered a number of factors which are relevant to the commander's decision to employ USAF aircraft in the maritime surveillance role. Discussion of the likely availability of surveillance capable assets was presented

with the assumption that, if available, the aircraft can be effectively employed in the needed role.

Given the conditions discussed, it appears that there will be some aircraft available in all three notional world situations. The specific extent to which they will be available is necessarily scenario-dependent and thus highly susceptible to uncertainty. It is this uncertainty which may , in the absence of more intensive analysis, prompt some to defer planning for the necessary coordination of potential surveillance assets. However, most observers agree that the time for planning is during peacetime, in advance of potential hostilities; deferral of necessary prior coordination in anticipation of more definitive planning factors is not considered conducive to success.

Given the possibility of Navy-Air Force interaction in surface surveillance at many levels of availability, the responsible commander is left with the problem of implementing the programs necessary to ensure effective use of available assets in all world situations. Chapter V, "Implementation Issues," will address this critical area for concern.

CHAPTER V

IMPLEMENTATION ISSUES

The preceding chapters have discussed capability and employment issues associated with the application of USAF aircraft to the ocean surface-surveillance role. The thrust of those chapters is that, with certain stipulations, several USAF aircraft are both capable of, and likely to be available for, surveillance tasking in certain situations. Given a stipulated availability and capability, the remaining issue is how the usefulness of those aircraft might best be exploited.

Implementation of a program which effectively combines USN and USAF aircraft assets in the maritime surveillance role is conceptually simple; however, the execution of interaction plans is complex.

The fact that USAF B-52 crews are asking -- after almost three years of corporate experience -- what the Navy wants from ocean surveillance aircraft illustrates the problem of implementing a relatively simple concept. For reasons which will be considered in this chapter, even the program for peacetime training of Air Force crews has been complicated by factors which degrade its effectiveness. If peacetime training is complicated and less than totally effective, it is probably optimistic to expect anything better during

crisis or wartime situations. Implementation difficulties are not insurmountable. Identification of some of the sources of difficulty may lead to their removal and thus enhance the effectiveness of Navy-Air Force interactions in the surveillance role.

Section One of this chapter will address some of the organizational issues which complicate service interaction in many areas, but particularly those areas which relate to USAF collateral maritime functions. Section Two will address some relatively inexpensive existing and conceptual resources which may be used to overcome the interaction difficulties.

1. ORGANIZATIONAL CONSIDERATIONS

This section consolidates most of the "sensitive" organizational issues which surround the question of USN-USAF interaction for ocean surface surveillance. The discussion focuses on frequently raised arguments and concerns related to parochialism, roles and missions, fiscal considerations, force capabilities, Air Force availability, and service interaction and cooperation.

The Issues. The original objective of this study was to analytically consider the quantitative issues related to joint service ocean surveillance using land-based aircraft. It became apparent early in the research phase, however, that the subject is delicately balanced on sensitive organizational issues. Chapter II provided an orientation to the historical

background of the issues while this section predominantly addresses the present situation.

The following paraphrased quotes summarize some of the issues associated with Navy-Air Force maritime role interactions. It is hoped that development of the ideas in this section will help to clarify the issues. No attempt will be made in this section to offer solutions or recommendations to problems raised. The intent is to consolidate the major organizational issues so that points and counterpoints can be reviewed to provide a clear perspective of the ocean surveillance interaction issue.

> This is a very sensitive issue because it deals with 'roles and missions' and because it can affect the allocation of scarce fiscal resources between the Air Force and Navy.
>
> In the event of an all-out war, there will be plenty of work for all services to do, on land as well as at sea.
>
> I used to think we were fighting on the same side in the interest of national security but I sometimes wonder if parochial obstacles will be overcome in time to effectively fight the next war.
>
> Interactions between some staff members exemplifies the worst aspects of parochialism.
>
> The Air Force is looking for a peacetime mission.
>
> The Air Force is trying to get its foot in the door for maritime roles.
>
> The Navy is overprotecting its land-based aircraft and its sea-based aircraft empires.

If the Navy would just tell us what they want, we'd be better able to provide it.

If we really need the Air Force in future maritime tasks, they won't be available.

If the Navy needs help in maritime missions using land-based aircraft, buy more P-3s; don't co-opt the Air Force for services they can't provide in time of war.

Sure, it's logical to say the Air Force should support the Navy in maritime roles, but logic hasn't hindered either service from mistakes in the past.

Focal points in the foregoing statements may be categorized as follows:

- Parochialism
- Roles and Missions
- Fiscal Considerations
- Air Force Capability for Maritime Roles
- Air Force Availability for Maritime Roles
- Service interaction and Cooperation

Parochialism. There is no question that "parochial" interest is a factor in the question of Air Force participation in maritime roles. In the face of directives which explicitly assign primary and collateral responsibilities to the services, pride, association, and honest concern produce unquestionable service biases.

It should be mentioned hastily, however, that service bias does not seem to consciously detract from the earnest concern of the most outspoken parochialist in the ultimate security

of the country. The issue is obviously related to one's belief about what is the best way to provide for national security.

Given huge areas of uncertainty, there is certainly room for honest debate as to which aspect of national defense requires the most emphasis (i.e., where the money should be spent). This is true whether the question is ocean surveillance or tank defense. Because uncertainty is integral with force planning and role responsibility issues, parochialism has likely been a useful mechanism for ensuring reasonable "checks and balances" on defense systems evolutions.

While useful as a balancing force, parochialism can also be dysfunctional. For example, retired Admirals Zumwalt and Bagley have implied that the intra-service dispute between nuclear and non-nuclear ship proponents has become an issue of vital concern to the viability of the future Navy.[1] In another example, concerning USA-USAF interaction, USAF General R. J. Dixon stated that "differences between the military services led to budget reductions, reduced resources and/or capabilities within the resources available...."[2]

Nor is parochialism restricted to the military services; it can be a tool for use by private or political elements. For example, those desirous of industrial production of a weapon system in a particular state can be expected to levy considerable pressure in support of the military

service branch which would use that system. This pressure will be evident in private lobbying and media reports and it can have the effect of fueling interservice competition.

The existence of parochial interest is difficult to challenge. It occurs within, between, and outside of the military services. Some of its effects are dysfunctional, while others are beneficial.

Roles and Missions

As has already been discussed in Chapter II, service roles and missions are carefully delineated to provide legal boundaries as well as guidance for the military branches.[3]

When discussing Air Force participation in maritime surveillance, both Air Force and Navy proponents cite the existing "collateral" nature of this role for the Air Force. Of course, the direction of ensuing arguments is influenced by the respective bureaucratic or parochial interest of the speaker.

Current directives clearly state that such maritime roles as ocean surveillance are collateral -- not primary -- functions of the Air Force. Proponents of the Navy firmly support this organizational restriction which was born of carefully negotiated attempts to map out service responsibilities and to prevent overlapping primary responsibilities. Navy proponents also firmly support the concept of "mutual reinforcement" which includes the employment of available,

existing Air Force assets for ocean surveillance support of naval forces. The line is drawn, however, when discussion turns to the question of whether maritime roles of the USAF should be primary, rather than collateral functions.

Besides the threat of reopening old parochial arguments, Navy proponents are concerned with the tactical ramifications of Air Force involvement in primary sea control missions. The synergistic effect of coordinated fleet operations is vitally dependent on integrated training, line-officer familiarization with diverse naval force elements, and system compatibility and complementarity. It is argued that even if USAF maritime roles were changed to primary functions, the scope of force structure changes which would be required to ensure the synergism would exceed the limits of feasibility. Therefore, most proponents argue, the present collateral nature of Air Force involvement is appropriate and useful, but changing it to a primary role would be inappropriate.

Air Force proponents assert that their primary interest is to assure a real capability for the employment of existing assets in maritime roles as is presently required by directive. Given requirements to provide such services, they are intent on fulfilling their task responsibly. They also point out that their present primary functions provide ample sources for attention, and that they thus do not require additional primary missions to help justify their existence. Pursuit of increased maritime role responsibilities might even result in charges of excessive primary role resources.

Some Air Force proponents, however, are not at all reluctant to question the collateral versus primary functions directive. Retired USAF General R.N. Ginsburgh, in an article titled, "A New Look at Control of the Seas,"[4] wrote that additional attention should be given to the question of the scope of Air Force participation in maritime roles. Implicit in that assertion is a question of changes in roles and missions. L. Edgar Prina, editor of Seapower magazine, outlined the roles and missions issues in a 1976 article which discussed the 1975 Holloway/Jones Collateral Functions Agreement. Prina's article points out that while the 1975 agreement was intended to advertise CNO/CSAF interest in mutual reinforcement principles, it also raised questions of role changes or role modifications for the services.[5]

One logical extension of the roles and missions issue revolves around the question of whether land-based air is more effective than sea-based air for certain sea control missions. Studies which deal with that question predictably offer varying answers. Treatment of questions of carrier vulnerability, land base availability, political impact, sustainability, firepower, etc., lead to differing conclusions. Without quoting or commenting on the specific studies which address this problem, it can safely be said that "Navy" solutions to sea control problems tend to emphasize sea-based air, while "Air Force" solutions tend to emphasize land-based aircraft.

Given varied assumptions and uncertainties, a logical case can be made for either solution. It may be assumed that the service assigned primary sea control roles will maximize employment of the forces it judges to be most effective for those roles. A major shift to primary sea control responsibilities for the Air Force would tend to de-emphasize the very strongly supported air-capable naval battle group concept. Organizational sensitivity to this aspect of the roles and missions debate is predictable.

Air Force collateral function participation in maritime roles leads inevitably to questions of roles and missions allocations. Most Navy and Air Force proponents generally agree that responsibility for control of the seas should rest with the Navy but that the Navy can certainly take advantage of Air Force collateral capabilities in certain situations.

Fiscal Considerations

Competition for budget dollars motivates bureaucratic machinations, fuels parochial fires, and is centered on the roles-and-missions issue. DoD Directive 5100.1 assigns several sea control missions to the Air Force as collateral functions, but specifically prohibits the Air Force from using collateral mission assignments as primary justification for increased budgetary allotments.

10108...The assignment of collateral functions to an individual Service may establish further justification for stated force requirements, but such assignments shall not be used as the basis for establishing additional force requirements.[6]

Two "classic" fiscal arguments are outlined below:

Navy Proponents:

- DoD Directive 5100.1 is quite clear; no money for collateral functions.

- If the Air Force were to obtain collateral function funding in spite of the Directive, the money would inevitably come out of the Navy's budget.

- Shifting funds from Navy to Air Force coffers would ultimately lead to shifting of land-based naval aviation assets to the Air Force.

- Such a shift would be contrary to JCS Pub 2 and DoD Directive 5100.1 mission responsibility assignments, and it would jeopardize a most important and capable naval force component: USN land-based ASW aircraft.

Air Force Proponents:

- DoD Directive 5100.1 forbids funding requests for collateral functions, however, exceptions to the rule have occurred in the past. The Navy has had fiscal support to conduct strategic air warfare (a primary Air Force function), as well as strategic warfare using nuclear submarines. Also, Army helicopers have been assigned "aerial fire support" missions.

- The Navy needs help in its maritime roles because of its dwindling size and because of the increasing Soviet threat.

- In order to provide necessary capabilities and flexibility for Air Force support for maritime roles, funding is required.

- It is therefore appropriate that funding restrictions for collateral missions be reevaluated and changed to support increased Air Force participation.

Some examples of notional funding issues related to ocean surveillance can be extracted from the foregoing arguments:

- Ocean surveillance requires certain specialized equipment and personnel: integral camera systems, specialized radar and navigation systems, crew assignment and training, fuel efficient aircraft, etc. While Navy P-3s are optimized for ASW rather than surface surveillance, they are accepted as being superior to present Air Force aircraft systems for the ocean surveillance role. If the Air Force were to be assigned a primary surveillance role, it might therefore request funding for surface surveillance equipment.

- Upon acquiring a viable surface surveillance capability, "giving teeth to the dog" would require expenditure for an effective weapon system such as Harpoon. Backfitting all P-3s presently in the force with Harpoon will cost around $.4 million per aircraft, while providing 50 F-111s with 4 Harpoons each would cost about $1.4 million per aircraft and backfitting 20 B-52s with 12 missiles each would cost about $4.75 million per aircraft.[7]

- Support requirements (command and control, photo processing, training, etc.) would also necessitate funding.

- Given a viable surface surveillance capability, proposals for adding a subsurface surveillance capability might logically follow. The high expense of applicable ASW systems is evident in Navy P-3 budget allocations.

- - Assuming that Air Force funding would ultimately result in Navy sacrifices for like programs, P-3 budget allocations could be expected to be the most likely target. However, funding reductions of a weapon system which has proven extremely effective hardly seems logical.

- Funding reductions from other Navy or Air Force systems in order to provide the Air Force with additional surveillance capabilities can be expected to elicit considerable resistance in an already austere budgeting environment.

Fiscal ramifications of an Air Force role change have been simplisticly presented above to demonstrate how the role change issue can gravitate toward major budgeting concerns. There are also fiscal considerations inherent in no role change at all; i.e., in simply maintaining the present USAF collateral function capability.

Using its inherent capability for the maritime collateral function means the Air Force is forced to use aircraft that are generally more expensive to operate than the Navy's P-3 (see Table III-9 in Chapter III). This means that simply flying missions to train for the collateral role requires more money for the Air Force than for comparable Navy training (other factors being equal). Since funds are not specifically allocated for this training, other mission area funds must be sacrificed. It is not clear at what point the value of the ocean surveillance training equals the dollar expenditure for the flights and the opportunity lost for primary mission training. Some critics of the Air Force ocean surveillance training program complain that the slight capability increase which results is not worth the price paid, especially considering the likelihood of wartime or contingency employment restrictions of Air Force assets in those roles.

Air Force Capabilities

Chapter III discusses specific aspects of inherent Air Force capabilities. It is evident that current Air Force aircraft have advantages and drawbacks as ocean surveillance platforms.

Disputes of capability are thus dependent on situational factors. If the area to be surveyed is outside range limitations of P-3s, B-52 capabilities may prove significant. If precise overwater navigation and relative plot information are required during long, low-level surveillance missions, Air Force systems measure up less favorably. The same is true with respect to photography. If detailed photography is needed for analytical purposes, empirical experience suggests B-52s are not presently equipped or trained to provide such service.

Air Force proponents might argue, though, that Navy surface surveillance assets have shortfalls, too. The P-3 is optimized for ASW tasks, not surface surveillance roles. Although subsurface surveillance equipment provides inherent surface surveillance capabilities, enhancement of radar and photographic equipment would certainly result in improvement of the P-3 system.[8]

The crux of the capability issue can be summarized as follows: both Air Force and Navy land-based, long-range aircraft have certain capabilities for ocean surveillance missions. Generally speaking, Navy equipment and operational practice result in a more significant maritime capability. Inherent Air Force systems provide adequate capabilities for certain surveillance situations.

Air Force Availability

The question of Air Force availability in certain conflict scenarios is one of the most frequently cited problems of joint maritime operations. Chapter IV deals with notional situations involving Air Force-Navy interaction in surveillance roles. Given the assumptions and conditions presented, it can be concluded that there are at least some situations in which Air Force assets might be available in quantities sufficient to provide flexibility in surveillance tasking.

The most frequent argument related to Air Force participation in surveillance roles is that one likely surveillance platform -- the B-52 -- will be substantially committed to strategic missions when need for its collateral capability will be greatest. The counter-argument concedes the point of relative non-availability, but asserts that even a 5% contribution would be better than none at all. This latter argument supports the view that in a general war, there will be "more than enough opportunities" for all to participate.

Air Force availability is generally considered to be a problem in collateral maritime roles, but it is also accepted that whatever assets may be available will be welcomed additions. Effective use of such assets will, however, require considerable advanced planning.

Service Interaction and Cooperation

There have been many written affirmations of the need for joint service cooperation to solve national defense problems. Service Chiefs have pledged support of collateral function areas and mutual reinforcement policies. With respect to maritime operations, Air Force-Navy interaction philosophy has been tested in peacetime exercises. A 1976 RAND study titled, Potential Air Force Contributions to Sea Control in Limited War: a Contextual Analysis(U), referred to such joint exercises. he study asserted that the exercises were needed to eliminate operational confusion and to eliminate problems generated by doctrinal differences.

Table V-I is a sampling of exercises or programs in which joint service participation or Air Force participation in maritime roles have been stressed. The security classification of most of the exercises restricts detailed discussion in this paper, but the size of the list is indicative of the recognized importance of USN-USAF interaction and cooperation.

TABLE V-I

LIST OF USAF MARITIME TRAINING PROGRAMS
AND JOINT USN-USAF EXERCISES

Busy Observer/ Buccaneer Haven	SAC collateral functions surveillance training programs
Sea Raven/ Sea Crow	9th AF/2nd Fleet and 12th AF/3rd Fleet recce, EW and strike exercises
Sea Flirt	TAC sea surveillance training
Solid Shield	Large-scale, Atlantic, joint field exercise
Computex (Gulfex)	War-at-sea exercise in the Gulf of Mexico
Federal Vantage/ Federal Virgo	LANTFLT exercise
Teamwork	NATO sea control and air support exercise
Northern Wedding	NATO Baltic maritime exercise
Dawn Patrol	NATO Mediterranean exercise
Ocean Safari	NATO Eastern Atlantic exercise
Springex	Norwegian Sea exercise
Marcot	Canadian-American maritime exercise
Sea Fox	Joint SEATO exercise
Midlink	Mideast joint exercise
Nifty Nugget	Command post mobilization exercise
LANTFLT TCRP	Tactical Command Readiness Program (war games) at Naval War Gaming Center

Not all of the programs or exercises in the above table involve dedicated Air Force employment in surveillance and reconnaissance roles, but most do. "Lessons learned" during the exercises are varied; however, representative concerns include:

- Target location reporting, correlation, and dissemination in a timely manner proved to be a problem.
- Tactical tanker force management resulted in refueling problems.
- Long lead time is desired for exercise planning to permit procedural preparation to minimize problems.

- Some problems existed in control terminology and procedures.
- USAF aircraft had difficulty establishing communications with the Navy communications authority.
- Additional emphasis on Air Force intelligence support (maritime reference publications, recognition guides, etc.) would enhance USAF maritime capability.
- Additional USAF practice using the computer formatted RAINFORM message reporting system should enhance information processing.
- USAF maritime photography remains mediocre.

This sampling of lessons learned provides some evidence of the existence of problems despite the occurrence of numerous training programs and exercises. The problems seem to be both between the services and within each service. However, the concensus among most observers is that the difficulties can be overcome, if only the participants can "sit down and talk them out."

Generally speaking, cooperation seems to be less a problem than communication. Communication among principle participants in the ocean surface surveillance interaction area is complicated by inter and intra-service organization. Action officers during exercises are usually only able to devote time to problem areas in a piece-meal, "crisis management" fashion. Action officers for long-term programs such as OSST

and TSST would seem more able to devote considerable effort to procedural and technical problem resolution.

The USAF OSST program is a relatively well established surface surveillance training program aimed at enhancing the capability of B-52 squadrons to perform the maritime surveillance collateral function. The principle Navy and Air Force action offices which coordinate the program are listed in Table V-2.

TABLE V-2

PRINCIPLE USN-USAF BUSY OBSERVER ACTION OFFICES

COMMAND	BILLET	COLLATERAL FUNCTIONS TRAINING IS PRIMARY OR SECONDARY DUTY
CINCLANTFLT	N351B:CTF 24/81 Asst. Air Ops	(S)
HQSAC	DOOCX: Contingency Div., Collateral Functions Branch	(P)
HQ Numbered AF	DOTO: Current Ops	(S)
USAF Bombardment Wing	DOTO: Current Ops	(S)
CINCPACFLT	N323: Land-Based Ops	(S)

Only the HQSAC action officer is assigned full-time responsibility for the Busy Observer Program. Other action officers deal with procedural problems as they occur during periodic scheduling and tasking situations. Full or partime action

officers are generally assigned at CINCLANTFLT and above in the Navy, the Bombardment Wing and above in the Air Force. Other officers who deal with the program do so on an ad hoc basis.

There are no formal direct interactions between the USN surface surveillance "experts" in the patrol wings and the USAF units under training. There is very little naval intelligence feedback directly to Busy Observer crews as to how well or poorly they have accomplished their task. While there is occasional communication between LANTFLT and PACFLT counterparts, there are procedural differences between the two oceans. There is very little coordination between action officers in the TAC and SAC maritime surveillance training offices.

The ultimate result of the various information exchange disconnects is that OSST crews in B-52 squadrons have not, in the author's opinion, progressed as well as might have been expected since the program began in 1975. Assigning "blame" to specific individuals or offices in the USN-USAF Busy Observer interface organization does not seem to be appropriate. Throughout the interviews conducted while pursuing this study, officers of both services had high esteem for their counterparts in the other services. Yet Air Force officers expressed frustration that they weren't sure what the Navy wanted, and Navy officers expressed doubt that the Air Force would ever get any better in the surveillance

role. The problem thus does not seem to lie in a lack of co-operation among action officers. Rather, it seems to be a function of the peculiar nature of the collateral function relationship and the lack of coordinated feedback and training controls.

There are some who express the belief that Air Force surveillance crews are as capable as they need to be considering the collateral function of the mission, and that additional controls are unnecessary. Others, within the Air Force, believe that "in-house" training and procedures should be more fully refined before additional interaction with the Navy is pursued. But whatever their reason, most agree that USAF performance in the martime surveillance role is not as effective as it might be.

Organizational Issues Summary

Chapter II of this study addressed the recent historical background of the USN-USAF interaction issue. Section One of this chapter has consolidated the essence of current controversies between the services concerning the employment of Air Force assets in the maritime surveillance role.

While parochial and roles-and-missions issues affect service interaction, questions of capability, availability, and cost also complicate the situation. Despite difficulties, there is considerable coordination between the services in the form of training and exercise programs. Most principle participants agree that Air Force effectiveness in maritime roles has not yet realized its potential.

2. RESOURCES

This section will address a range of "solutions" to the dilemma concerning USAF effectiveness in the ocean surface surveillance function. While this is not intended to be a "menu" of alternative actions, in the author's opinion, exploitation of the concepts presented here may increase the relative effectiveness of USN-USAF interaction in this maritime role.

Continued Emphasis on Joint Exercises

Even though problems will undoubtedly recur, the physical employment of people and weapons systems in exercise scenarios is a tangible method of transferring the plans of decision-makers to the experience of operators. Continuing to build the empirical data-base on unit-level coordination through exercises should enhance flexibility and coordination.

In the planning and conduct of such exercises, exchange of key personnel such as aircraft commanders, weapons systems officers, and communicators should be encouraged. Such face-to-face experience will not only increase awareness of mutual capabilities, it could also be the root of meaningful procedural improvement. For example, during the course of interviewing for this study, the author found a very strong supporter of the sea-based air concept in an Air Force fighter pilot whose "exchange" tour during the Vietnam

war included over a hundred carrier landings. The benefit of personnel exchanges during exercises should reap similar benefits in awareness and cooperation.

Operator-level Information Exchange

Given the opportunity for interaction, exchange of information is an intuitive and critical requirement for performance improvement. Shortcomings in this area have already been mentioned. Frustration expressed by Air Force action officers that they weren't totally aware of Navy desires is a symptom of this problem area. There are several potential methods by which ocean surveillance expertise might be enhanced through attention to the concept of information exchange.

the 1975 Collateral Functions MOA (see Appendix A to Chapter II) provides for Navy training of Air Force personnel on a "space available" basis. Perhaps the most experienced operators of land-based aircraft for ocean surface surveillance are found in USN P-3 patrol squadrons. Training within these squadrons is conducted primarily "on-the-job." Fleet training squadrons provide only an introduction to the mission; the fleet squadrons themselves indoctrinate and train new crew members as they perform actual surveillance missions in the company of more experienced crew members.

If each USAF key crew member (e.g., pilot, navigator, radar operator) had an opportunity to fly with an experienced

USN crew, before training in his own aircraft, a significant gain in performance might be realized. Only a few such cases of actual operator-to-operator experience have occurred to date. During one such exchange, involving a B-52 crew flying with a P-3B crew from Brunswick, Maine, the B-52 aircraft commander wrote in his post-visit report, "I had the...opportunity to gain from the higher experience level of our Navy counterparts. ...the opportunity for inter-service dialogue at the operational level will show... dividends in the long run."[9] The author's experience flying with a B-52 crew, as described in Chapter III, Appendix B suggests that benefits may also accrue from encouraging naval crew members to fly with USAF counterparts.

In addition to interaction between flight crew members, exchange of wing operations and intelligence personnel within the theaters that they will most likely interact could be effectively and inexpensively accomplished. While it is helpful to have representatives from all services at the unified staff level, periodic dialogue between counterparts who are not co-located should increase joint employment effectiveness.

Incorporation of such operator-to-operator liaison visits into established training programs might be needed to ensure some consistency of interchange as key personnel relocate. However, timing and structure of such visits should be left flexible enough to ensure latitude for creative development.

Feedback

Closely related to the concept of information exchange is the idea of feedback. While interviewing key personnel in the USN-USAF surface surveillance communities, the author noted that many of the opinions and critical comments evident at one place in an organization did not seem to be fully apparent at another. Comments by a user of intelligence photography which might greatly affect the procedures employed by crews in peacetime were new or surprising to some operators. Complaints about communications difficulties were mirrored by parallel questions about the procedures and intent of the communications requirement.

There are other examples concerning surveillance interaction difficulties which support the need for feedback between agencies. The methods for improving feedback are relatively simple and inexpensive. Long reports or in-depth analyses are not routinely necessary. For example, following a Busy Observer training mission and submission of all photography the users of surveillance photography might respond directly to the submitting bombardment wing with critical comments and suggestions for improvement. The naval communications agency and surface unit involved in the training might report briefly to the participating Air Force unit as well as to the fleet commander concerning the interaction. SAC and numbered Air Force commanders would

receive copies of such reports, and would use them as the basis for procedural modification or effectiveness monitoring.

In all cases, comments should be laudatory where due, but aimed at constructive criticism and critical review, rather than automatic "at-a-boys." An important feature of this feedback concept is a liberal liaison policy allowing direct exchange of feedback between primary participants. Time delay and loss of detail while information travels up one chain of command and down another may degrade the effect of feedback. However, procedural and policy changes must be reserved for cognizant program coordinators.

"In-house" Training

Whether the collateral function aircraft employed for surface surveillance is a C-130 or an F-111, specific crew training is required within the respective service community to ensure effective employment of the "capable," "available" aircraft. Benefiting from exercises, personnel and information exchange, and timely feedback on performance, USAF training organizers might combine resources to produce an effective "in-house" program.

Inputs from currently qualified operators as well as higher command policymakers are essential to any such training program. In the case of USAF surface surveillance training, critical reviews by USN experts from patrol, intelligence, and communications communities would seem vital to a workable interservice operation.

A number of reference materials presently used by USN surface surveillance training crews should find applicability in the USAF training program. A representative sample is shown in the following table.

TABLE V-3

REPRESENTATIVE REFERENCE MATERIALS USED FOR USN VP SURFACE SURVEILLANCE CREW TRAINING

- Janes Fighting Ships
- NWP-55-2-P-3 (Rev A) P-3 Tactical Manual (U), Chapter 10
- NWP 55-7-1, Air Reconnaissance and Surveillance Manual
- ATP-34, Tactical Air Support for Maritime Operations
- NAVAIR 10-1-795, Airborne ASW and Shipping Surveillance Photography
- ONI-CS-35-7, World Wide Merships Alpha-Name Order
- VP-31, Merchant Ship Recognition (sound slide videotape)
- VP-31 Rigging (sound slide videotape)
- FASOTRAGRUPAC Det Moffett, CA, "Photo/Rig Procedures" (U) (in draft as of April 1979); P-3C Naval Flight Officer Lesson booklet.
- Commander Patrol Wings Pacific/Atlantic Instruction C3500.26 Patrol Aviation Qualification Exercise Manual (U) Photo-Rigging Exercise A-3-U(a/b)

Air-Naval Force Applications (ANFA) Agency

Application of the foregoing resources to the USN-USAF ocean surveillance interface may significantly increase the employment capability of USAF crews. However, many procedural difficulties can be expected in the interface between such large organizations as the USN and USAF. A combined agency to implement policy decisions by developing workable inter-service procedures may increase the effectiveness of joint operations.

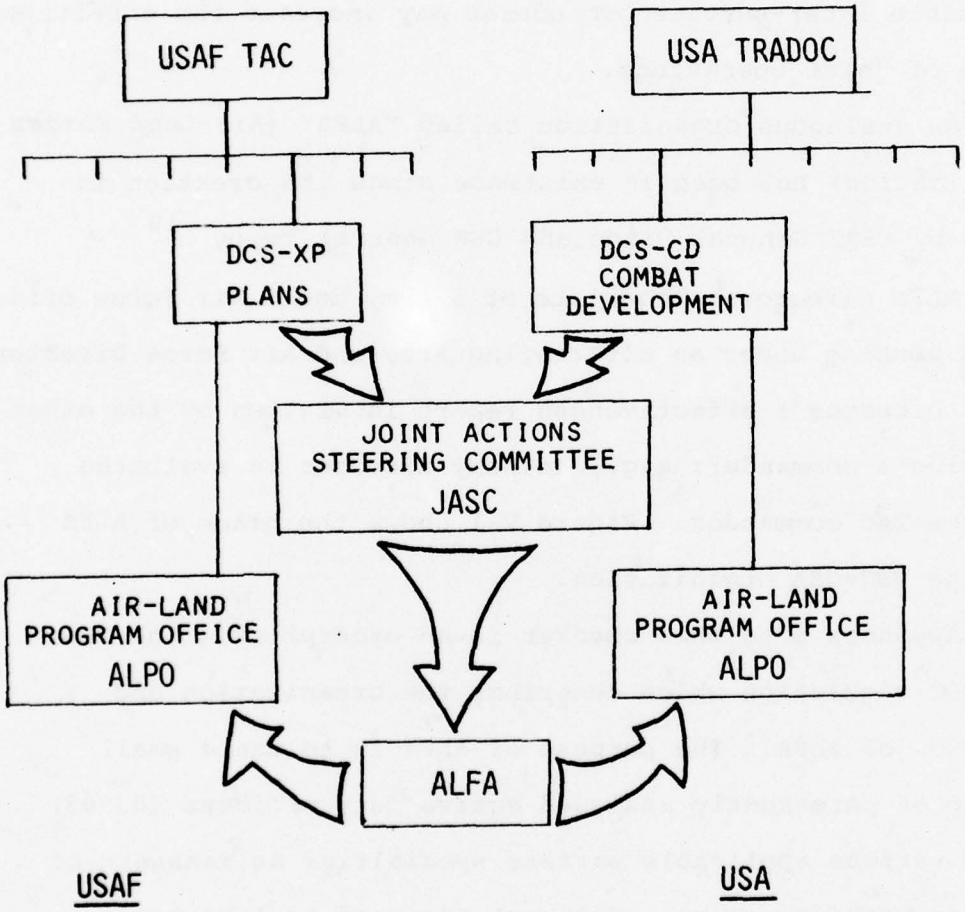
An analagous organization called "ALFA" (Air-Land Forces Application) has been in existence since its creation in 1973 by USAF General Dixon and USA General Dupuy .[10] The ALFA directorate consists of 5 Army and 5 Air Force officers working under an alternating Army and Air Force Director. Each Director's effectiveness report is written by the other Service's commander; e.g., an Army director is evaluated by the TAC commander. Figure V-1 shows the place of ALFA in the USN-USA organization.

Appendix B to this chapter is an excerpt from the TAC/TRADOC regulation which describes the organization and mission of ALFA. The purpose of ALFA is to use a small group of permanently assigned active duty officers (03-05) from various applicable warfare specialties as managers of ad hoc working groups. Officers assigned to ALFA have very recent operational experience but they are not trained

analysts. Any analytical assistance they may require is available to them through the TAC/TRADOC organization. Most officers have had an intermediate service school before reporting.

FIGURE V-1

THE ALFA ORGANIZATION



ALFA was specifically conceived to be product oriented. Its function is not to deal with questions of roles and missions or policy; rather, it is required to develop concepts of operational procedure and employment. Direction for its efforts comes from the Joint Actions Steering Committee (Figure V-1), as well as from periodic "8-star" meetings between the commanders of TAC and TRADOC.

Once an ALFA working group has formulated a procedural concept to solve a perceived interaction problem, the Air-Land Project Office (ALPO) of each service acts to refine and implement the joint procedures within their respective organizations.

The net result of ALFA's work is reflected in its tangible products, some of which are: AFM 2-14/FM 100-42 (USA-USAF Airspace Management); Air-Land Battle Primer; EW Procedures for Employment of Joint Ops; Concept of Ops for Battlefield Exploitation and Target Acquisition (BETA).[11]

Testimony to the effectiveness of ALFA is found in the following quote by Malcolm R. Currie, former Director of Defense Research and Engineering (DDR&E):

> [TAC and TRADOC] are reaching interservice agreements that are cutting through the layers of institutional inertia, institutional concerns about roles and missions, and institutional dogma. They are addressing and solving close air support problems in areas where progress has been glacial in the past.[12]

Application of the ALFA concept to the USN-USAF interface and formation of an ANFA Directorate seems particularly apropos. In fact, the concept may be even more useful to the USN-USAF interface. The Army and Air Force have missions which are more closely tied together by law; viz., the Air Force must provide close air support for the Army land battle. Navy and Air Force missions overlap primarily in the relatively less definitive collateral functions area. The closeness of the TAC and TRADOC resulting from mission overlap as well as their geographical proximity at Langley Air Force Base would seem conducive to closer working relationships, even if ALFA didn't exist. Since Air Force and Navy commands are generally separated both by primary mission responsibilities and physical location, existence of an ANFA to solve interface problems would seem most useful.

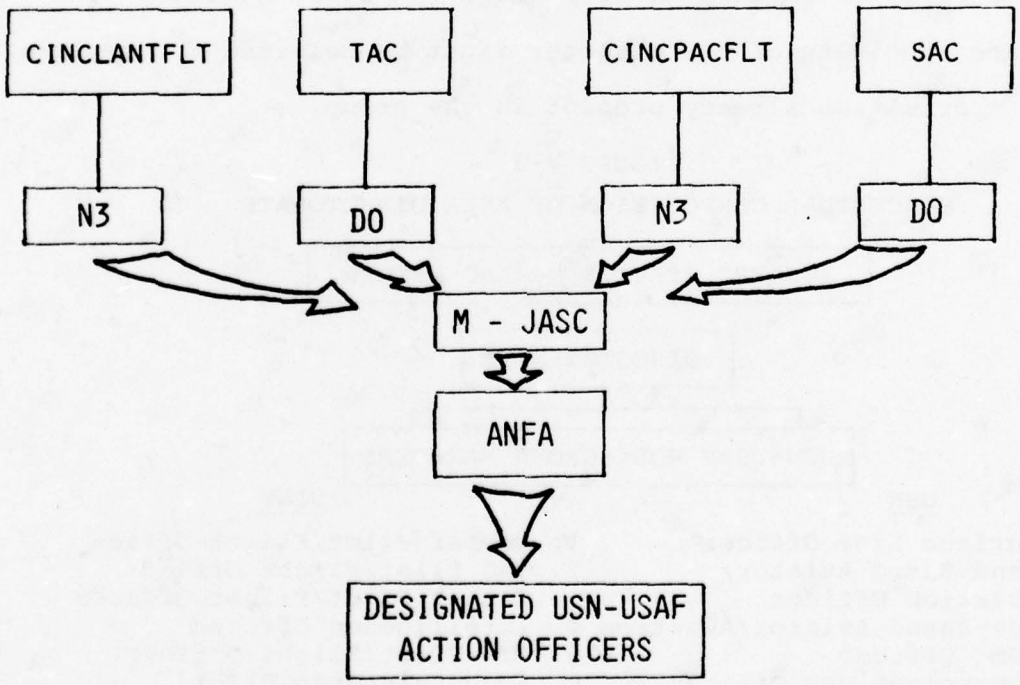
An attempt was made in 1976 to initiate a USN-USAF program analagous to the TAC/TRADOC Dialogue. Discussions were initiated by the TAC Plans Staff and were followed by an exchange of correspondence between TAC's commander, General Dixon, and CINCLANT, Admiral Kidd. At that time, however, development of a structured dialogue was not adopted. An undermanned staff and an inability of LANTFLT personnel to speak for the rest of the Navy were cited as obstacles to such a formal arrangement. Rather than a formal major command-to-major command organization such as the conceptual "ANFA," TAC presently interacts with the Navy in a component command-to-component command relationship between AFLANT and LANTFLT.[13]

A small, formal USN-USAF organization to pursue and resolve procedural interface problems may help to increase the effectiveness of USN-USAF interaction for maritime roles. The following will describe how such an organization might be composed and structured.

The scope of ANFA would be greater than that of ALFA in that it would deal with SAC and TAC assets from the Air Force, as well as land and sea-based air and surface naval assets (see Figure V-2). The Maritime Joint Actions Steering Committee (M-JASC) would thus be larger and broader in scope.

FIGURE V-2

CONCEPTUAL STRUCTURE OF AN AIR-NAVAL FORCES APPLICATION DIRECTORATE (ANFA)

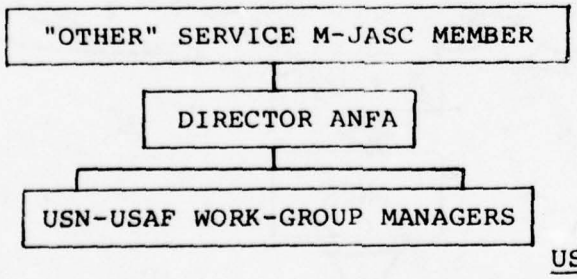


To ensure firmly rooted operational representation on the ANFA staff, billet assignments would be reserved for 0-4 and 0-5 level officers from specific warfare disciplines. Besides being current in their operational fields, they will have been graduates of a service college. (Graduates of a service college whose tour immediately preceding the college was "operational," might be prime candidates for assignment to ANFA.) Figure V-3 illustrates how ANFA might be composed to ensure multi-discipline presentation.

Warfare specialties would be selected to ensure representation of major interfacing communities. This should ensure that at least one member of the group would either be familiar with a topic of concern or know where to "start asking." The warfare specialty of the director might be selected to complement specialties already present in the group.

FIGURE V-3

CONCEPTUAL COMPOSITION OF ANFA DIRECTORATE



USN	USAF
1. Surface Line Officer	1. Bomber Pilot/Flight Officer
2. Land-Based Aviator/ Aviation Officer	2. TAC Pilot/Flight Officer
3. Sea-Based Aviator/Aviation	3. Tanker Pilot/Flight Officer
4. USMC Officer	4. Intelligence Officer
5. Communications Officer	5. MAC Pilot/Flight Officer
6. Intelligence Officer	6. Reconnaissance Pilot/ Flight Officer

Matters pertaining to roles and missions, budgeting, force allocation, etc. would be left to major command and Pentagon responsibility. ANFA would address only those problems dealing with joint force application.

Concerns of major commanders or their designated representatives on the M-JASC would be prioritized by the M-JASC and assigned to ANFA for resolution. Depending on the nature of the problem and the resident expertise, working groups would be formed consisting of ANFA members and personnel drawn temporarily from the affected communities. For example, if the problem were resolution of land-based aircraft ocean surveillance interaction problems, OSST, TSST, NISC, and patrol wing representatives might be employed for 2-3 weeks of intensive face-to-face interaction followed by a period of correspondence and concept refinement to ultimately produce a workable interaction concept. Procedural concepts recommended by ANFA would be reviewed by the M-JASC and submitted for major command approval, after which they would be implemented by action officers designed by the M-JASC. The designated action officers would be authorized direct liaison with ANFA for final product recommendations and review.

There exists, for some, a question concerning the applicability of the ANFA concept. The roles-and-missions relationship which exists between the Navy and Air Force is not precisely analagous to that between the Army and Air Force.

While the USN-USAF interface is based on collateral rather than primary roles, it is nevertheless necessary to the mutual reinforcement concept. The list of joint exercises in Table V-I is evidence that considerable emphasis presently exists on USN-USAF interaction. In that ANFA would be chartered to deal with joint procedures and applications, rather than with roles-and-missions policies, the ANFA concept would seem to be sufficiently analagous to that of ALFA to warrant implementation. As a small, intensive focal point for service interaction applications, ANFA should prove as useful to the USN-USAF interface as ALFA is to the Air Force-Army interface.

Some questions may be raised concerning creation of an ANFA Directorate because of personnel and budgeting implications. However, since ANFA would consist of from five to eight 0-4 through 0-6 officers from each service, with a minimum of military or civilian support personnel, the impact on each service should be relatively slight. The group would intentionally be kept small to ensure its flexibility and vitality. Temporary duty and travel funds might come from the budgets of participating units or from the major command level. Offices and provisions for incidental expenses would seem trivial when compared with the potential benefit of the organization. The necessary shift in personnel and the operating cost of ANFA would be a relatively small price to pay for enhanced mutual reinforcement effectiveness.

The physical location of the ANFA organization presents a dilemma not relevant to the ALFA directorate. ALFA is co-located at Langley AFB with the TAC and TRADOC commands. This facilitates face-to-face interchange among many offices and thus increases the dialogue. Since the ANFA organization would be similar in concept, but broader in scope, and since the principle participating commands -- SAC, TAC, LANTFLT, and PACFLT -- are not co-located, the choice for placement of ANFA is an issue to be resolved.

Whatever the location, representation of all commands would be ensured by the actions of the M-JASC. Liaison authority and working group composition should also help to enhance full representation of affected operational commands.

Alternative locations of ANFA might logically be areas in which there already exist representatives of both services. For example, the Naval War College -- with Naval and Air Force officers from many warfare disciplines, and with associated Centers for War Gaming and Advanced Research -- might be an ideal location for ANFA. The relatively frequent infusion of officer students from all theaters of the world would provide an additional resource perhaps not available elsewhere.

Another location alternative might be near LANTFLT or TAC headquarters. This would place ANFA near two of the major commands as well as near ALFA. Occasional dialogue between ALFA and ANFA might thus be accomplished to address major

problem areas, such as C^3 procedures for combined service operations.

Regardless of ANFA's location, the joint-service, high level support for its operator-level, product-oriented mission should be conducive to its success.

Summary - Resources

This section has presented an array of USN-USAF actions from those which can be applied immediately to those whose formulation might require organizational and budgetary decisions. While these resources were conceived principally to address the USN-USAF ocean surveillance interaction issue, they might also be applied to the interface for other maritime roles.

CHAPTER SUMMARY

A number of organizational issues which sometimes adversely affect the effectiveness of USN-USAF interaction for maritime roles have been discussed in this chapter. Issues related to parochialism, roles and missions, fiscal considerations, USAF capability and availability, and service interaction and cooperation were presented in the first section of the chapter.

The last section considered conceptual resources or "solutions" to some of the difficulties currently existing in the service interaction arena. Joint exercises, exchange

of personnel and information, enhanced feedback communications, and an organization dedicated to procedural problem resolution and concept implementation were considered.

The author's conclusions and recommendations drawn from this and preceding chapters will be presented in the next chapter.

APPENDIX A

to CHAPTER V

TAC REGULATION 20-2

TRADOC REGULATION 10-4

ORGANIZATION AND MISSION - GENERAL

TAC-TRADOC AIR-LAND FORCES APPLICATION (ALFA) AGENCY

(13 April 1977)

APPENDIX A

to CHAPTER V

ORGANIZATION AND MISSION - GENERAL

TAC-TRADOC AIR-LAND FORCES APPLICATION (ALFA) AGENCY

This regulation states the mission and describes the responsibilities of TAC-TRADOC Air-Land Forces Application Agency.

1. General. The TAC-TRADOC Air-Land Forces Application (ALFA), a bi-service operating agency, was established by direction of the USAF Tactical Air Command and the U.S. Army Training and Doctrine Command effective 1 July 1975. To accomplish its mission, ALFA is allocated personnel, facilities, and equipment in accordance with current manning and equipment authorization source documents.

2. Mission. The mission of ALFA is to coordinate, integrate, and manage activities associated with joint TAC/TRADOC efforts regarding improved concepts and procedures for the conduct of the Air-Land Battle.

3. Command Relationships. ALFA is a jointly manned agency of the Joint Actions Steering Committee (JASC) which is composed of HQ TAC, DCS Plans (TAC/XP) and HQ TRADOC, DCS Combat Developments (TRADOC/DCSCD). The ALFA Director position normally rotates annually between the Army and Air Force. The Air Force personnel of ALFA are assigned to the 4525 Combat Applications Squadron, and Army personnel of ALFA are assigned to the TRADOC Field Element.

4. Functions and Responsibilities. As the JASC agency, ALFA will:

a. Recommend to the JASC, studies, analyses, or projects which are considered suitable for joint TAC-TRADOC participation.

b. Initiate or supervise the development of JASC tasking directives which select participants, establish objectives, mile-stones and the scope of joint participation in studies, analyses, war games, and special projects.

c. Direct the activities of TAC-TRADOC Joint Working Groups, Joint Task Forces, and Ad Hoc Committees concerning the conduct of the Air-Land Battle.

d. Exercise supervision over joint participation in studies, analyses, or peojects as directed by the JASC.

e. Develop joint position papers on TAC-TRADOC issues.

f. Facilitate the cross-service flow of information and arrange for cross-service assistance and support as necessary to support JASC assigned actions.

5. Communications. To facilitate the execution of these responsibilities, ALFA is authorized to communicate with and request assistance from the staffs, subordinate commands, and agencies of TAC and TRADOC.

/s/
ROBERT J. DIXON, General, USAF
Commander

FREDERICK A. CROW, Colonel, USAF
Director of Administration

/s/
ROBERT C. HIXON
Major General, G.S.
Chief of Staff

/s/
C. F. BRIGGS
Colonel, AGC
Adjutant General

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

This study had as a principle objective, the consolidation of information dealing with USN-USAF interaction for ocean surface surveillance using land-based aircraft. Given the additional question of whether the current level of service interaction adequately fulfills the need for ocean surveillance, three alternatives were considered: (1) status quo; (2) decreased service interaction; (3) increased service interaction.

Conclusions

In considering the choice of alternatives, the author has drawn the following conclusions:

1. History. The history of USN-USAF interaction for maritime roles, including ocean surveillance, has been one of mixed cooperation and competition. Peacetime rivalries before WWII were substantially overcome as the war progressed. Post-WWII legislation has resolved many roles and missions issues, but the concepts of collateral functions and mutual reinforcement require continued Air Force participation in the maritime roles.

2. USAF Aircraft Suitability. A number of USAF aircraft are well suited for some ocean surface surveillance roles; some are conceivably more capable than USN surveillance

aircraft; others are less capable. Principle attributes are refueling capability and resultant range, electronic countermeasures capability, and speed. Principle shortcomings are poor relative fuel economy, radar, navigation, photography, and weapons limitations.

3. USAF Aircraft Availability. In reasonably conceived notional situations, USAF aircraft will be available for maritime surveillance tasking. The degree of availability is scenario dependent, but as intelligence needs increase, and as USN surveillance aircraft are employed in ASW roles, the value of individual USAF aircraft will increase; for this reason, even a relatively small percentage availability may be significant. Exploitation of variable or sporadic availabilities will require considerable coordination and advanced planning.

4. USAF Crew Capability. Presently, USAF surveillance crews are not performing to the limit of their potential. Their ability to employ their aircraft in the ocean surveillance role is limited by training and experience; however, their ability is also limited by inter and intra-service procedural disconnects which restrict the exchange of information and critical feedback.

5. Implementation of Interaction Programs. Organizational competition and rivalry degrades the effectiveness of the USN-USAF interface for maritime roles. Historical

rivalries and conflicting budgetary interests have resulted in dysfunctional organizational perceptions.

6. Resources for Problem Solution. Whatever the work situation -- peace, tension, or war -- there are a number of actions which can be taken by decision makers to enhance the effectiveness of Air Force crews in ocean surveillance roles; however, considerable advanced planning is required. Continued emphasis on joint exercises, as well as encouragement for exchanges of personnel and information may produce significant improvements. In addition, improved institutional methods for solving service interface problems should be considered; the "Air-Naval Force Application (ANFA)" concept appears to be a reasonable option.

Recommendations

In the face of the foregoing conclusions, the status quo alternative does not appear to be a reasonable choice. Progress has been made in ensuring Air Force capability in maritime surveillance roles, but present expertise, which is a product of the status quo, does not measure up favorably. If one accepts the validity of this statement, he is left with alternatives of decreasing or increasing interaction relative to the status quo.

A decrease of interaction seems unreasonable in the face of personnel and fiscal limitations, increasing Soviet naval capabilities, and the resultant need for mutually supportive

employment of all U.S. forces. In addition, the relative capability of certain USAF aircraft, when available, should not be overlooked.

The author therefore recommends that USAF-USN interaction for ocean surface surveillance be increased. This recommendation is qualified by the fact that restrictions imposed by DoD Directive 5100.1 limit the extent to which the Air Force can participate in any maritime role. It is believed, however, that within the bounds of current mission requirements, actions can be taken at little or no expense to improve joint service effectiveness.

Specific recommendations offered for consideration follow.

1. Perception. The concept of mutual reinforcement should be strongly reiterated in a major policy note which leaves no uncertainty in the minds of staff and operators that service cooperation is essential to national defense. Such a statement should specifically encourage inter-service cross-training in areas of potential mission interface.

2. Ocean Surveillance Training. USAF crews who might be tasked with surface surveillance missions should receive direct exposure to the USN experts in the surveillance field at the operational level.

In-house USAF ocean surveillance training programs as well as training programs for other maritime missions should be reviewed for adequacy. Incorporation of references available

from Navy training programs as well as coordination of SAC, TAC, MAC and other assets should be stressed to ensure not only unilateral competence, but also combined-organization effectiveness.

3. Organizational Changes. Formation of an Air Force-Navy corrolary to the TAC-TRADOC Dialogue should be given serious consideration. A relatively small, institutionalized organization such as that presented as the conceptual "Air-Naval Force Application (ANFA) Directorate in Chapter V of this study could facilitate effective procedural implementation of interaction policies.

Consideration of this concept and its initial implementation should be closely coordinated with the current, successful ALFA organization to ensure inclusion of corporate lessons-learned and applicable procedural techniques.

Other Observations; Area for Further Analysis

Due to the scope of this study and the resources available for its pursuit, there are many areas which could bear further research. However, three observations seem particularly relevant and are noted below.

1. Aerial Refueling Tankers. Tanker management and availability were concerns frequently expressed by USN and USAF officers interviewed for this study. Non-availability of tankers was cited as the principle reason for no aerial

refueling capability in P-3s; availability of tankers was mentioned as a critical factor in sea-land based air scenarios in northern NATO; competition for tankers by SAC, TAC and MAC aircraft in an intense employment situation was cited as a potential problem.

A critical look should be given to the many ramifications of USAF tankers in joint service employment. Availability, management, capability, vulnerability, alternative sources, etc., should be addressed.

2. Surface Ship Identification. Besides responsiveness, weapons delivery, and oblique photography capabilities, land-based aircraft have an advantage over satellites in that they permit reading of the ship's name or pennant number. By international agreement, ships bear identifying information on the bow and stern of their hulls, and on their bridge -- all of which are near vertical and thus difficult to discern from overhead photography. It might be appropriate to explore the possibility of an agreement for display of ships' identities on a horizontal surface that would allow identification by increasingly capable overhead photographic systems.

3. Other Surveillance Capable Assets. Other platforms not addressed at length in this study can have an effect on the ocean surface surveillance picture. SR-71, U-2, E-3, satellite, and like assets should be incorporated into the integrated surveillance program discussion. The E-3 AWACS

is a particularly likely platform for further study in the joint service maritime arena.

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5. R. H. Smith, "Notes on Our Naval Future," U.S. Naval Institute Proceedings, April 1946.

6. Caldwell, p. 32.

7. G. C. Marshall, H. H. Arnold, and H. H. King, The War Reports of the Chiefs (Philadelphia: J.B.Lippincott, 1947), p. 334.

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11. "Defense Merger in Progress: Compromises by Both Services," The United States News, 3 January 1947, p. 24.

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15. Ibid., p. 13.

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CHAPTER IV

1. U.S. Naval Forces: The Peacetime Presence Mission, Congressional Budget Office Background Paper, Washington: December 1978.

CHAPTER V

1. E. R. Zumwalt and W. H. Bagley, "Navy Enters New Shipbuilding Era," Navy Times, 29 January 1979, p. 15.

2. R. J. Dixon, "TAC-TRADOC Dialogue," Strategic Review Winter, 1978, p. 46.

3. The basic guiding documents are Title 10 of the U.S. Code, DoD Directive 5100.1, and JCS Pub 2. The 1975 CNO-CSAF Memorandum of Agreement provided guidance pertaining to Collateral Functions Training.

4. R. N. Ginsburgh, "A New Look at Control of the Seas," Strategic Review, Winter 1976.

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6. Functions of the Department of Defense and its Major Components, DoD Directive 5100.1, 31 December 1958.

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8. During a visit to the merchant ship shop at NISC, the author inferred that the largest supplier of mership photography, Navy P-3s, is not supplying a uniformly excellent product. Differences in camera system capabilities, procedural technique, and motivation account for most shortfalls.

9. From a report titled "Navy Brunswick Visitation" from USAF Capt. S.D. Harper to 8th AF/DOTO, January 1977.

10. R. J. Dixon, "TAC-TRADOC Dialogue," Strategic Review, Winter 1978.

11. These and other publications are either the direct product or the result of major inputs by ALFA.

12. Malcolm R. Currie, quoted in R. J. Dixon, "TAC-TRADOC Dialogue," Strategic Review, Winter, 1976, p. 51.

13. From a prepared briefing by the TAC Directorate of Joint Forces (XPJ). Briefing deals with XPJ's history, organization, and function. Slide 6.

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