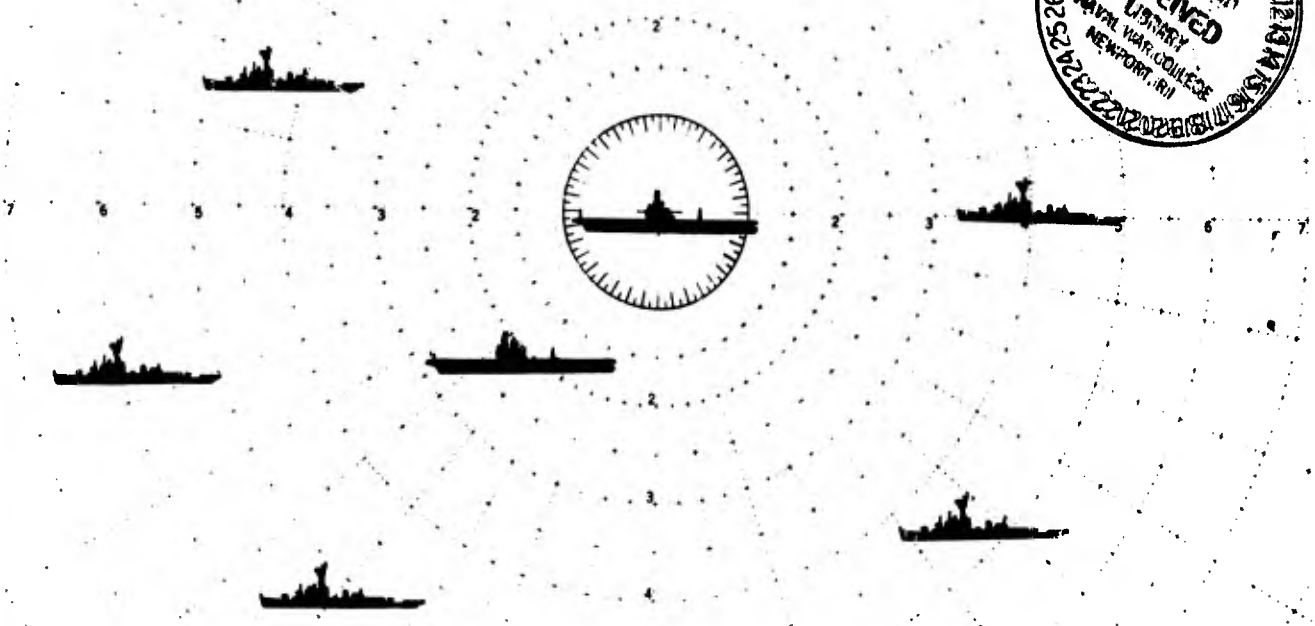
ELEMENTS OF NAVAL POWER, FORCES AND OPERATIONS

By

David G. Clark

Commander, U. S. Navy



NAVAL WAR COLLEGE
CENTER FOR ADVANCED RESEARCH
March 1979

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS N/A
2a. SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT UNLIMITED
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION ADVANCED RESEARCH DEPT.	6b. OFFICE SYMBOL (*If applicable*) 35
6c. ADDRESS (*City, State, and ZIP Code*) NAVAL WAR COLLEGE NEWPORT, RI 02841-5010	7a. NAME OF MONITORING ORGANIZATION 7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (*If applicable*)
8c. ADDRESS (*City, State, and ZIP Code*)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

10. SOURCE OF FUNDING NUMBERS			
PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO	WORK UNIT ACCESSION NO.

11. TITLE (*Include Security Classification*)
ELEMENTS OF NAVAL POWER, FORCES AND OPERATIONS (U)

12. PERSONAL AUTHOR(S)
CDR DAVID G. CLARK, USN

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (*Year, Month, Day*)	15. PAGE COUNT
FINAL	FROM _____ TO _____	79 Mar	106

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
NAVAL OPERATIONS, NAVAL HISTORY, SURFACE FORCES, NAVAL AVIATION, SUBMARINES, AMPHIBIOUS OPERATIONS, FORCE PLANNING NAVAL LOGISTICS, NAVAL TACTICS

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

Describes briefly in conversational language what the U.S. Navy is, where it fits into the international dealings of the U.S., how it operates today, what it can and should be doing in the future, and design implications if it is expected to succeed. To provide those interested in a broad view of the U.S. Navy with an easily reached base to assist their understanding of this subject.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (*Include Area Code*)	22c. OFFICE SYMBOL
PROF. J.B. HATTENDORF, DIR., ARP	(401) 841-3304	35

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

★U.S. Government Printing Office: 1985—539-012

It is sweet, when on the great sea the winds trouble its waters, to behold from land another's deep distress...because it is sweet to see from what evils you are yourself exempt. It is sweet also to look upon the mighty struggles of war arrayed along the plains without sharing yourself in the danger. But nothing is more welcome than to hold the lofty and serene positions, well fortified by the learning of the wise, from which you may look down upon others and see them going all astray in their search for the path of life...

Lucretius (Circa 60 BC)

PREFACE

The quote from Lucretius is appropriate to many of the factors contributing to this paper. It applies, in part, to the U.S. Navy viewed from the Naval War College. It is also descriptive of the isolated and comfortable American view of world affairs during our recent past. It applies as well to those policy planners who are prone to view their work as an interesting laboratory experiment which can be attempted again with different ingredients should current policies fail, and from which an astute professor or responsive fire department will protect them if the experiment explodes into conflagration. For better and for worse, the Navy is not the War College; the world is not America; and world politics are not benign.

For the past year I have had the luxury of working on the staff of the Center for Advanced Research at the Naval War College. The Center's straightforward operations reflect a mutual trust, a confidence that all are working toward common goals, and resultant face-to-face communications without administrative protectionism. This unique environment has permitted me the time to focus on what seemed important rather than what others thought was urgent--to read, listen, discuss and write to an extent seldom available outside the confines of one's study.

The major problem I have found during this effort has been a dearth of straightforward writings on the basics. Authors and speakers have a tendency to take stands strictly reflecting their positions and to speak in the sophisticated vernacular of their academic disciplines. Political scientists, economists, historians, philosophers, systems analysts, lawyers, architects, sailors, soldiers, and even moralists have attempted to state what military forces should or should not be doing. They seldom agree and quite often cannot even understand each other since their terminology tends to be more self-serving than communicative. I chose to seek a least common denominator as my language, then to attempt exposition of some personal views.

This paper attempts to set forth briefly in conversational language what the U.S. Navy is; where it fits into the international dealings of this country; how it operates today; what it can and should be doing in the future; and the design implications if it is expected to succeed. It has been written partially for personal reasons--to determine whether it could be done and to work through some ideas in detail. More than that, it has been written to provide those interested in a broad view of the U.S. Navy with an easily negotiable stepping stone enroute a suitable vantage point.

The usual disclaimer applies. While I am most grateful to the Naval War College and the Center for Advanced Research for immeasurable support, the views are my own and not necessarily those of the Center, the College, the Navy, or the Department of Defense.

TABLE OF CONTENTS

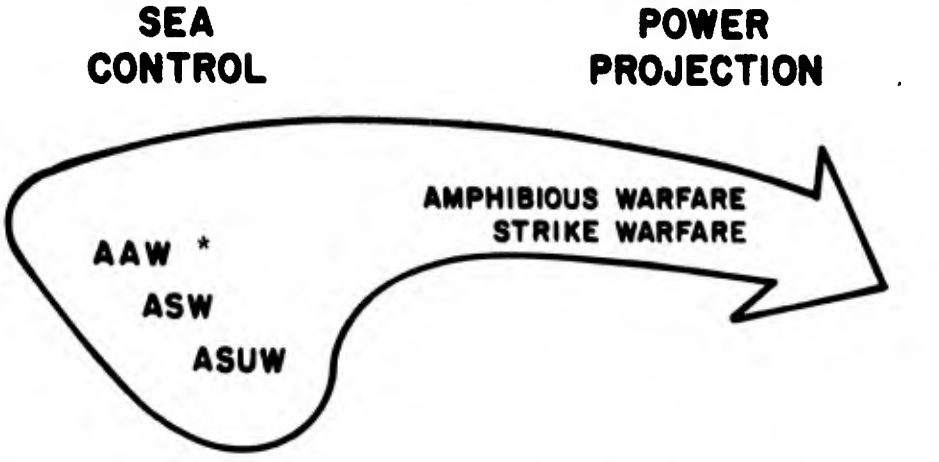
CHAPTER I

NAVAL OPERATIONS AS THE EXERCISE OF POWER

Too often, speeches and papers describing U.S. Naval forces, operations, and programs atart out as follows. "The mission of the U.S. Navy, as set forth in Title 10, U.S. Code, is to be prepared to conduct prompt and sustained combat operations at sea in support of U.S. national interests; in effect, to assure continued maritime superiority for the United States." The proponent goes on from this statement of legitimacy to cite two basic functions of naval forces as shown below, Sea Control and Power Projection. Through visible readiness to perform these functions, Navy forces deter war. Should deterrence fail, the forces must be able to fight and win.

FIGURE 1

CUSTOMARY DESCRIPTION OF NAVAL FUNCTIONS



*AAW: Anti-air Warfare/ASW: Anti-submarine Warfare/ASUW: Anti-ship Warfare

Often such precipitate use of acronyms and unfamiliar terminology has tended to confuse rather than enlighten. The two functions are neither mutually exclusive nor descriptive of all operations. Hence, I would like to fall back a little way and examine navies, especially our own, from a broader perspective.

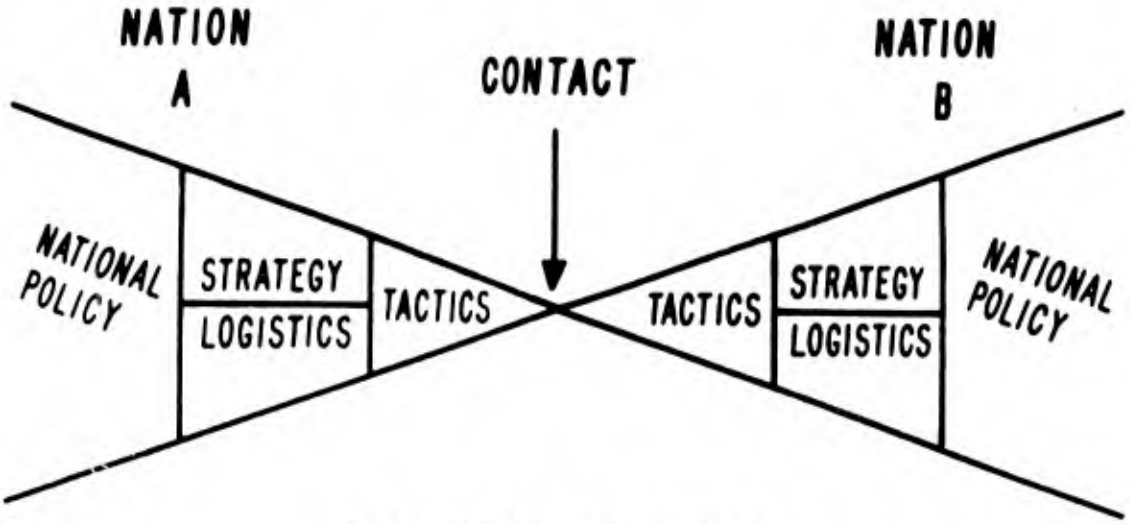
In every field of the arts and sciences there exist a few basic tenets which summarize the operative philosophies of that field. Naval strategy and tactics are certainly no different. Rear Admiral H. E. Eccles, USN (Ret.), used to commence his classic annual Naval War College lecture with a quote from Alfred Thayer Mahan:

> The search for and establishment of leading principles--always few--around which consideration of detail group themselves, will tend to reduce confusion of impression to simplicity and directness of thought, with consequent facility of comprehension.

The following pages are offered as a framework for tactical thinking, but with the caveat that no art or science can be reduced <u>in toto</u> to a few simple inclusive maxims. Such a concentration is convenient for the communication of basic concepts, but reconstitution to applicable doctrine in the face of a highly competitive opponent must be accomplished with extreme care, lest the outline be mistaken for the text or the headline for the story, just as has happened with "Sea Control" and "Power Projection".

National Power

When the aspiring naval strategist or tactician embarks on his quest for wisdom, he may first open Sea Power, the classic history edited by Professor E. B. Potter and Admiral Chester Nimitz. On the second page he would find this diagram, providing a mirror-image view of two-sided naval warfare.



ELEMENTS OF WARFARE

In other disciplines, the above model could be used to examine any of a number of forms of international conflict, and the application of power to their resolution. With help from Webster's and some other, more narrowly focused sources one could define the terms in this model as follows:

Tactics: The immediate direction of power toward attainment of specific objectives.

Strategy: The comprehensive direction of power toward the attainment of broad objectives.

Policy: A principle, plan or course of action (for the creation, reallocation or expenditure of power).

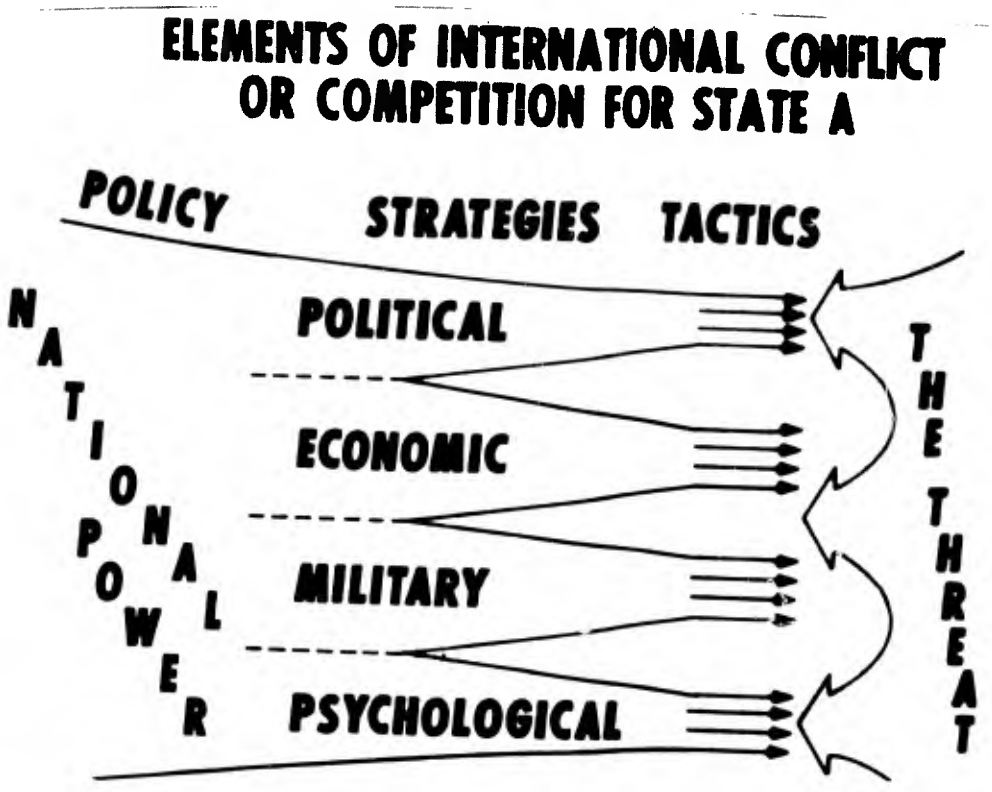
Logistics: The science of supply, transporation and maintenance (of resources and power).

What are the components of this power which a nation might wield? As might be expressed in a basic political science text, a nation's power can be reduced to four elements:

- Political
- Economic
- Military
- Psychological

There are contributing factors such as geography, culture, climate, science, and technology, but national power has these four non-orthogonal elements. When permitted to view the tactics of a nation only externally, one is likely to infer some overall grand strategy and, assuming a unified national decision making body and internationally competitive desires, label the total of the opponent's actions as "The Threat".

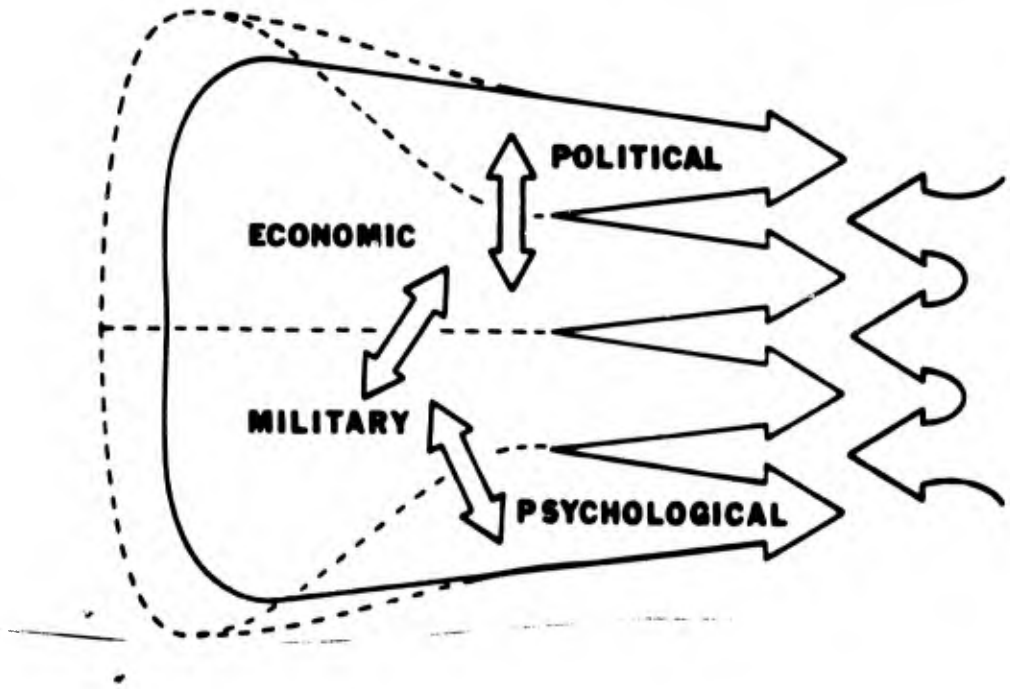
Once again, internally and externally, such a model would assume what Dr. Graham Allison calls the "rational actor" approach, with national policy being formed by a



single all-knowing and all-powerful body who selects and allocates appropriate forms of power to achieve national objectives. We may be quick to place our perceptions of other nations into such a model, however any well-read student of American government realizes it doesn't apply at home. Policy does not simply direct power outward. There are competing demands on resources. Some strategists have upheld the dominance of politics over other forms of power used externally, and over internal competition. They felt that survival of the state depended upon it.

More often today, internal economic policy seems to dominate the rest, with the external flow definitely dependent. If the existence of a state is threatened, then foreign policy must come first. At such a time, whatever the internal bureaucratic and political pressures, the salience of external threats tends to unify competing factions and force them to gaze outward. When security is less of a problem, domestic competition increases. In an interdependent world made more complex by multinational industries, nations without borders, and ethnic ties between factions and nations, even such basic distinctions as those between internal and external competition become difficult to ascertain.

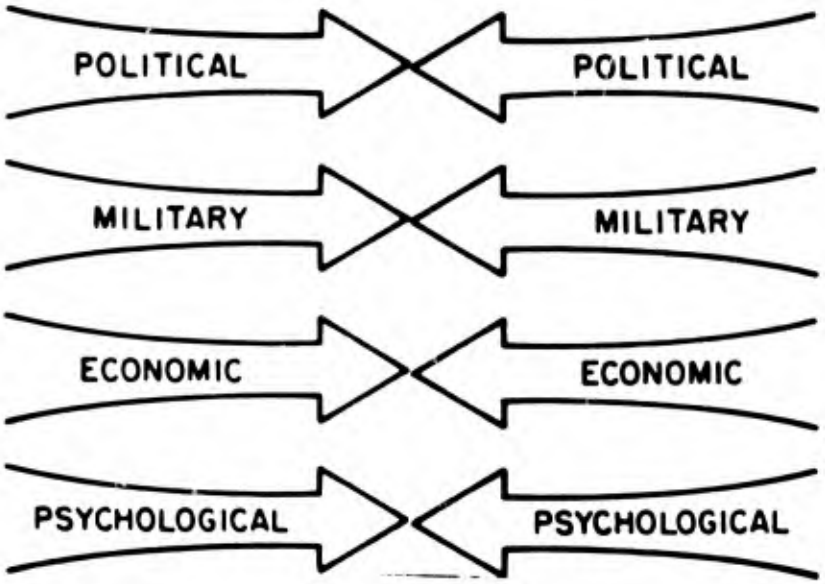
INTERNAL FLOW OF RESOURCES TO CONTROL POWER



International resource allocation causes the flow of power across internal boundaries. Dominance of any one type of power over the others is not shown since there may not be any obvious priority over time. Total national power, of course, can increase or decrease as the sum of its four parts. National policy may dictate the expenditure of several kinds of power externally, but all are linked; none can be expended alone without affecting the other three elements. Military expeditions may increase or deplete political, economic, and psychological power, depending on the reasons for their undertaking, as viewed by the nation, and their perceived success. The expenditure of economic or political power outside a nation's boundaries can increase or decrease military power--the strength and utility of its armed forces--through diverting resources from the creation of military forces while placing greater demands on its employment, or by exerting economic, moral, and political pressures to avoid the need for warfare.

Shifting for the moment from internal to international relationships, the figure below shows the simplest sort of isolated and symmetric interplay of power between two nations. If it were possible to isolate intercourse in such a manner, then the politicians and the political scientists could work solely within their field, the economists in theirs, and warfare could be left to the

IDEALISTIC SYMMETRIC OPPOSITION



generals and admirals--despite the oft-quoted politicians' warnings to the contrary.

However, the expenditure of power in opposition to another nation is not merely a divisible matter of symmetry. One nation's military power can be used in opposition the economic, political, and psychological powers of another. Asymmetric applications are given such titles as presence, strategic warfare, propaganda, coercion, and blockades. These interactions occur in peacetime as well as during wars. To use one of the buzzwords of this decade, there is an undeniable "linkage" among these forms of power. The policymaker, strategist, or tactician who is

unaware of that linkage and focuses too precisely only upon the task of the moment may find himself isolated and possibly defeated.

This asymmetry also tends to make economists and politicians out of successful generals, and to make admirals, by avocation, out of political scientists. When achievement in a chosen discipline may be measured by one's ability as a collective broker of all types of power, then a nation may find its leaders miscast, and suffer weakness as the consequence. On the other hand, some of the world's greatest leaders have been men who built a fine understanding of the efficient creation, allocation, and expenditure of the several types of power.

The use of military force against the non-military strengths of another nation has been termed strategic warfare. However, as the famous Chinese strategist Sun Tzu, noted hundreds of years ago, "the least desirable way to achieve victory is to destroy an enemy's cities; the next least desirable is to kill his soldiers; better is to destroy his alliances, but best of all is to destroy his plans and never have to fight at all." He was talking about the economic applications of force. Military power is not always the most appropriate, but the longer one waits, then the fewer other options may be available. The will to commit one division in time can prevent having

to commit several armies later. Fighting for "hearts and minds" became a catchy phrase a few years back; however success in such types of warfare is difficult to measure and does not lend itself to topographic displays. Since no progress could be shown in Vietnam, the drain on this nation's political, economic, and psychological power caused by military operations was considered to outweigh the benefits, and the cause was abandoned. At other times the flaunting of military power in gunboat diplomacy or carefully controlled limited applications have seemed to provide political, economic, and even psychological gains. Considered in isolation, the use of nuclear weapons to destroy economic power for military reasons might appear to offer an efficient application of force in a "more bang for the buck" society. However, it might serve few valid political ends today. Massive destruction of any society might also destroy the psychological power--the moral foundation--of any nation initiating such an attack as well as nullifying any possible economic and military gains. Conversely, there are, of course, many cases where attempts at employing military force have been contravened by the employment of economic, political, and/or psychological leverage. The success of these efforts has depended on the quantity and suitability of the power brought to bear, and the four-dimensional strength of each nation undertaking such intercourse.

In summary, power is multi-dimensional; no single element can be treated in isolation. One must always inquire as to the purpose for which power is to be employed and its context; only then can the proper mix be ascertained. The most efficient (politically, morally, economically, etc.) mix cannot be stated legalistically; it is a situational decision. No form of power application, even nuclear warfare, can be ruled out in advance.

Applying Military Power

Focusing on the arrow portraying military power, one other point should be made. Carl von Clausewitz is usually cited as saying that war is merely the extension of politics. The derivation of military strategy and tactics is assumed to flow downward from national political interests. Those interests, once defined by autocratic and bureaucratic processes, dictate a set of national objectives to be met by the use of power. Then, an inclusive policy for attainment of objectives is derived. Finally, military forces are funded, strategies devised and allocated to forces, and tactics employed to use military weapons in opposition to an enemy--all in fulfillment of the strategies. Each military man in the chain of command is assumed to march and countermarch smartly, executing the orders of his senior.

This linear approach to viewing the application of power as if it all flows downhill is too simple for

much utility. Lacking an extremely prescient chain of command, unlimited assets, and a national capability to convert one kind of power to another instantaneously, there is no guarantee that such a unidirectional system can succeed. In reality the system must be one of continuous questioning at each level of control; it requires participatory decisions and pragmatism. Otherwise we may find that (for example) military forces limited in size by domestic economic considerations during one decade are incapable of executing the strategies and tactics that external political policies may demand in the next. If such considerations are not made, a nation may find that resources required for meeting national objectives overseas were spent years before to create short-term domestic political power.

Through years of studying the derivation of strategy from policy and of tactics from strategy, military scholars have devised a rigorous planning process. Each step must meet three tests, those of suitability, feasibility, and acceptability.

Other disciplines might look at political suitability, economic feasibility and perhaps, moral acceptability. However, this discussion will restrict itself to military usage. In too few words the testing process is shown below. Will the course of action selected actually meet the objective? Will it get the job done? Do I have the

TESTING PLANS

TASK: MEET OBJECTIVE "A" WITH FORCE "B"

- SELECT COURSE OF ACTION
- TEST IT FOR:
  - SUITABILITY (WILL IT MEET OBJECTIVE?)
  - FEASIBILITY (IS FORCE SUFFICIENT?)
  - ACCEPTABILITY (IS IT WORTH RISK?)

---

resources to carry it out? Is it worth the risk of not using those resources elsewhere? (In economics this is sometimes called a Cost/Risk/Benefit analysis.) If each of those questions cannot be answered in the affirmative, then the plan cannot be executed and another one must be found. The staff must attempt to devise a better course of action, one which meets the objective with available resources. If there is no way to get the job done with available resources, then more of the same kind of power (in this case military force) or power of a different sort is required. If power is unavailable in forms applicable and sufficient to the task at hand, then only some lesser objective can be achieved and the strategy cannot be executed.

Assume for the moment that the objective selected is minimal and vital--that no lesser objective is sufficient. Assume also that the plan devised is the best or only one available. Then, failure to pass one of the tests

means that more and or different power is required. In this military context, it's probably too late. The use of military power is often a last resort, after moral, political, and economic methods of persuasion have failed. That leaves only the option of using more force. In the near term, that option may also be unavailable. Designing military hardware may take 15-30 years, even after the basic research has been done. It may take decades to increase military power if those building forces today are too optimistic. On the other hand, expenditures on military hardware are irretrievable investments and usually quite large; the costs and risks of building to excess are immense. It may be too late for today's tacticians if the strategists and force planners of 10-20 years ago made the wrong estimates of the proper allocation of power to maintain national strength.

During the Vietnam years this nation mortgaged many future capabilities to fund day-to-day operations. It is now in the process of rebuilding in the face of demands to increase the other forms of strength that the war absorbed. It is impossible to reorient force structure with sufficient immediacy to solve all today's problems; such changes are investments in the future, at a definite cost in current resources and contemporary power. The obvious ways for today's decision makers to correct current deficiencies fall into near-term, mid-range and

long-range activities:

1. Develop the most effective tactics and maintain the highest readiness possible to employ the forces on hand.

2. Be openly candid with superiors when even the best tactics with the most efficient existing or forecast force mix will not meet the objectives and fulfill the strategies stated.

3. Ensure that the forces designed for future use represent the most efficient use of those resources allocated--considering their tactical employment in opposition to all four types of power, before and after attrition, during shooting, and non-shooting conflicts.

The critical point here seems to be tactics. Before the military man can state that the policies he is asked to execute, and the strategies resulting therefrom, are inadequate due to unsuitability, infeasibility, or unacceptability, he must be on firm ground tactically. Before a military or civilian planner can do his job effectively, he must estimate the tactical utility of his work over a spectrum of possible conflicts in years hence. He must look at the cutting edge. The following chapters provide the foundations necessary to conduct such an examination.

CHAPTER II

CONTEMPORARY NAVAL FORCES

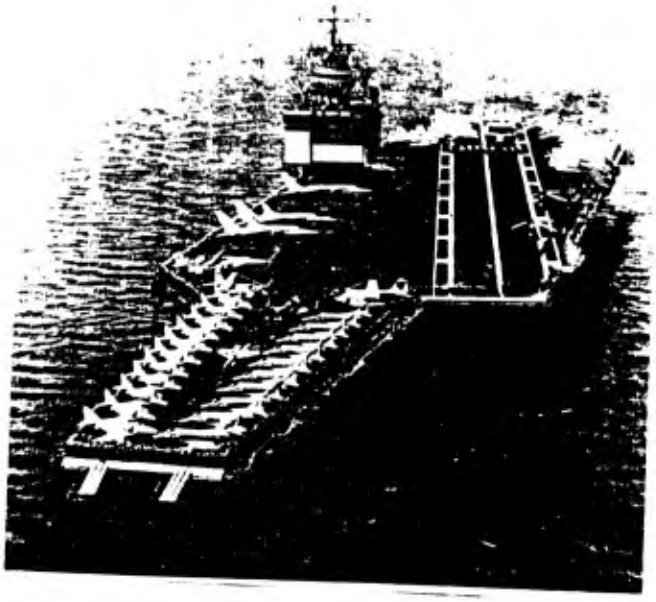
Prior to examining the employment of naval forces in combat one must grasp at least the few critical characteristics of these weapons systems. Several existing publications provide detailed characteristics, but do not often attempt to lend meaning to them. The tactical utility of a ship, submarine, or aircraft can be more readily comprehended in terms of mass, mobility, and firepower than it can simply by listing systems, size and shape (See Chapter V). However, that utility may vary greatly as a function of employment. For example, a small ship bristling with guns may be invaluable for supporting or countering economic and political power at close range, while useless in an open-ocean battle.

Aviation Forces

In December of 1941 the Imperial Japanese Navy demonstrated the immense mobility and firepower of carrier aviation. The fact that they destroyed most of the U.S. Navy's battleship force in that attack turned the virtues of sea-based air power into necessities. Within two years U.S. carriers were pre-eminent. Since World War II, the aircraft carrier (CV) and her planes have been the *sine qua non* of the U.S. Navy.

Today's carrier represents the largest combination of mass and mobility that has ever been seen in a single warship. Yet, since the carrier herself has little or no firepower, it is more organizationally than technologically or tactically complex. The CV is a floating airport operating 60-90 aircraft; providing the facilities to repair, maintain, and arm this air group; and housing the thousands of personnel required to support itself and its planes. Its survivability is increased by armor to reduce damage from bombs, missiles, and torpedoes; by air defense and missile defense systems; and by extensive damage control measures. The mobility of four U.S. carriers has been vastly increased by generating the steam for their turbines with nuclear reactors rather than oil-fired boilers. These CVNs have the capability to operate for years without refueling, rather than slowing to take on fuel every few days and being restricted in movements by a slower logistics chain. By operating in international waters they provide a highly mobile quick reaction capability, worldwide, without the political constraints and economic burden of reliance strictly on land bases.

Most arguments voiced today about aircraft carriers center around their combined size and procurement cost (especially the CVN) and a perceived vulnerability to the large supersonic cruise missiles carried by enemy



USS ENTERPRISE (CVN-65)

ships and aircraft. While there are certainly reasonable limits to the number of large warships that any nation can afford, such arguments must be kept in perspective. Any airport that can handle modern jet aircraft is large and expensive. The explosion of several thousand pounds of TNT in the vicinity of any airport's runways, hangars, or terminals, would certainly disrupt its operation. Adding defensive systems to prevent such disruptions, and forcing the airport to house and feed all those who work there, at sea for months at a time, of course, add to the cost. However, aircraft have grown in size to a greater extent than have the carriers provided for them. A carrier is the cheapest, safest, and often the only means for bringing to bear a credible quantity of firepower in the majority of the world's oceans and littoral. It is the least vulnerable of any surface ship.

USS INDEPENDENCE (CV-62)

In a ship the size of a CV, nuclear propulsion is a peacetime convenience, but may be a wartime necessity. Proponents of oil-fired boilers are betting that fuel will always be available wherever and whenever it is required to support sea-based air power over the next 30-50 years a carrier designed today must operate. The most valid argument against buying few CVNs, compared to more CVs, is founded in strategy. If the U.S. Navy were permitted to put the same level of air power to sea on more ships than the few large carriers it is now permitted--to disperse its capability--then it would obviously be prudent to gain that flexibility. Rather than 90 aircraft on each of two CVNs, it would be desirable (for example) to put 60 on each of three smaller carriers or even 45 on each of four. Such a move would hedge against attrition in major battles

and provide the capability to be in more places at once for lesser contingencies. Unfortunately, any of these alternate force mixes would cost more than the CVN, if aircraft reliability and unit survivability were maintained.

U.S. AIRCRAFT CARRIERS

	CV	CVN
Displacement (tons)		
Standard	61,000	81,600
Full Load	80,800	93,400
Length (ft)	1,048	1,092
Draft (ft)	36	37
Aircraft	80-85	90-95
Propulsion:		
Power	8 boilers	2 A4W Reactors
Shafts	4	4
Horsepower	280,000	260,000
Men	5,400	5,800

The contribution of the carrier to naval warfare stems from its air wing's firepower, each aircraft specialized to provide certain critical portions to the detection, classification, localization, and neutralization process against certain types of targets. Each aircraft must be specialized because the demands of each task on the aircraft's maneuverability, endurance, and weapon systems are so different and because of practical size limitations. Aboard each aircraft carrier one will find planes specialized for surveillance, attack on aircraft, attack on

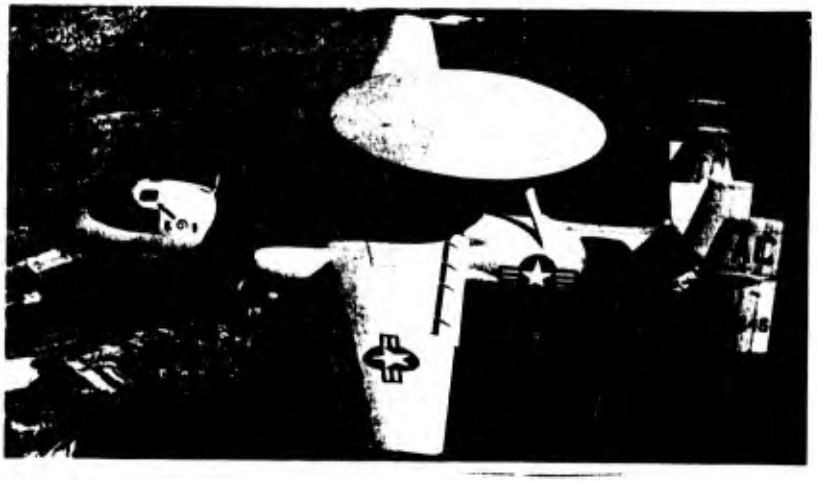
surface and land targets, attack on submarines, and utility work such as logistical support and search and rescue.

TYPICAL CARRIER AIR WING

Surveillance:	
E-2C	4
Fighters:	
F-14A	24
Attack:	
A-7E	24
A-6E	9
Antisubmarine:	
S-3A	10
SH-3H	8
Electronic:	
EA-6B	4
Tankers:	
KA-6B	3
Utility:	
C-2A	1

Long range high-endurance surveillance aircraft work in concert with the sensors on surface combatants and the carrier herself to collect, and process information on other units coming within range, especially missile-armed enemy bombers. This mission does not require the weapon load nor the speed and maneuverability of combatant aircraft. The propeller-driven E-2 with its powerful radar performs this function as well as some electronic

work, data processing, and command and control functions.



E-2C HAWKEYE

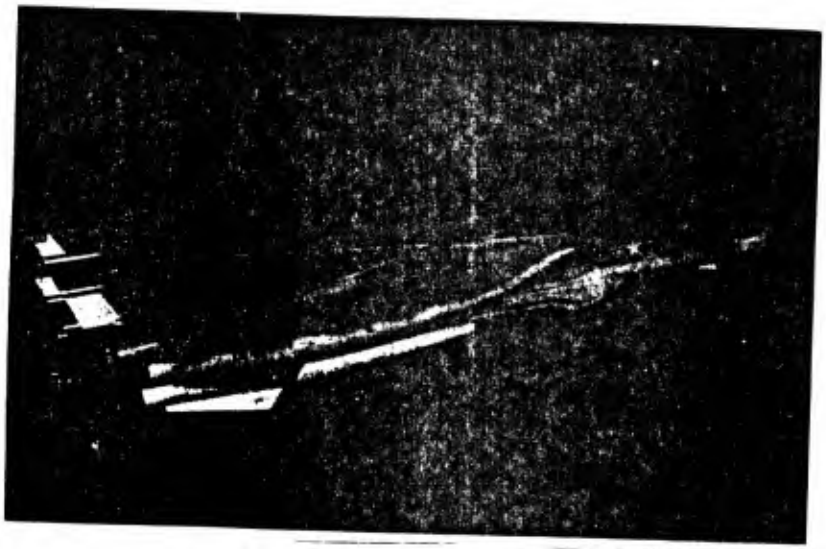
Aircraft intercept missions are assigned to fighters (VF). Such aircraft - the F-4, F-14, and F-18 carry passive and active homing missiles controlled by a sophisticated computerized system. They are designed to shoot down enemy aircraft or anti-ship missiles from 10 to 90 miles away. In earlier days when fighter armament consisted of guns and short-range rockets, speed, and maneuverability were more critical to fighter performance than today when long range missiles and a high-speed approaching enemy have resulted in fighters like the F-14, which trades off kinetic performance for weapons capability. After an approaching raid is detected by the E-2, a

surface ship or other means, the fighters are directed to intercept.

Prior to detection of targets, fighter aircraft can be kept airborne as combat air patrol (CAP) at some point between the center of the formation and the threat area. Or they can be staged on deck in readiness for a deck-launched intercept (DLI). Today, the threat can develop rapidly from any point of the compass, arguing for circumferential protection. Fighters consume large amounts of fuel while "loitering" on CAP station. Hence, attempts to keep too many fighters airborne risk their having insufficient fuel for intercept and attack when the enemy approaches.

In addition to air defense of the carrier and her task group, fighter aircraft also can be used to establish air superiority over a target area ashore or at sea, while other aircraft or ships are accomplishing offensive missions. Their presence permits the attack aircraft to carry mainly offensive weapons and concentrate on the strike mission.

Today's carrier borne attack aircraft (VA), primarily the A-6 and A-7, constitute the offensive striking power of the air group and are employed against ships at sea and targets ashore. Today's attack aircraft are sufficiently sophisticated that they do not have to see the target for weapon delivery. Some of the attack aircraft are



F-14 TOMCAT

F-4J PHANTOM II

often armed with suppression devices to combat enemy defenses while the remainder of the strike delivers weapons. The mix of aircraft launched is a function of the expected threat environment in the target area, just as is the mix of VF and VA embarked on the carrier.

The CV and its task force must defend against missile and torpedo firing submarines as well as against

A-6E INTRUDER

A-7E CORSAIRS

missile-carrying bombers. It carries antisubmarine aircraft (VS) to search for, localize, classify, and attack submarines. The only type now in use is the S-3A Viking. Its primary means of detecting the enemy are expendable sonobouys, dropped in patterns covering many thousands of square miles of ocean. These acoustic listening posts are monitored by radio to detect the sound radiated by

a passing submarine. After detection, the submarine is localized using more buoys and attacked with torpedoes dropped by the aircraft. Both active and passive bouys are required for detection since a submarine could speed up or slow down to combat either type if used singly. Passive bouys simply listen; active bouys emit bursts of sound and listen for echoes. Antisubmarine aircraft are computerized to assist in navigation and contact prosecution. They also carry devices such as radar to locate nearby surface targets and a magnetic anomoly detector (MAD) to determine precisely when the submarine is within weapon range and assist in classification.

Supporting aircraft aboard the carrier include the electronic support planes (EA-6) for jamming radars and tankers (KA-6), both modified VA aircraft, plus a light transport for logistic support and communications (C-2). The CV also has several helicopters for search and rescue, short-range ASW, and other utility work wfor the CV and for other units in the task group.

The major advantages in a carrier and her air group are mobility, flexibility, and firepower. She can transit to any ocean area where air power is required, quickly bring that power to bear, then withdraw to be used again elsewhere. This is not true with land-based aircraft which depend on fragile basing rights and cannot be used until that base is built within range of the battle area.

EA-6B PROWLER

SH-3H SEA KING

Once built, the base cannot be easily removed. Our withdrawal from Vietnam also showed the political dependence inherent in land bases. Our bases there and the equipment on them were turned over to the South Vietnamese, then lost to the North Vietnamese. Carrier air power is still in friendly hands.

The flexibility and power of the aircraft carrier come not only from her size but from the fact that she

and her planes can be quickly modified to prepare for the expected threat. Within some limitations the mix of aircraft carried can be altered by flying off one type and flying on another. The weapons carried on each plane can be altered to make the aircraft suitable for air superiority missions, land attack or surface ship attacks. No other military force can accomplish such a variety of missions.

No discussion of naval air would be complete without mentioning land-based maritime patrol aircraft (MPA), the current model being the P-3, Orion. These turboprop aircraft are designed to search for submarines out to about 1,000 miles from their base. As was mentioned in discussing the S-3A, they search using sonobouys and other sensors, aided by a sophisticated computer, then classify using active and passive bouys or MAD and neutralize with torpedoes. Designed for endurance, MPA are not capable of self defense by maneuver or weaponry unless armed with missiles. MPA are often touted as a cheap alternative to carrier based ASW aviation. However, they

cannot provide the range of capabilities available in a carrier's air wing, nor can they reach the majority of ocean areas where an enemy might elect to sever our supply lines. Their employment near bases frees our few carriers from the need to perform ASW missions in those areas.

New Aircraft Designs

All the carrier-based aircraft described above are designed to be catapulted with a steam-driven "sling-shot" for takeoff, and arrested by hooking tensioned wire cables on landing. Only by these devices can today's large sophisticated planes be operated from floating air-fields. This catapulted/arrested style of launch/recovery has been termed conventional takeoff and landing--or CTOL, and it has been "conventional" for sea-based air operations since the advent of jet aircraft.

Two factors have combined to force examining other ways of doing business. Limited budgets and the procure-ment costs for carriers large enough to support high-volume CTOL operations have driven force levels contin-uously downward. The need for aircraft to defend against enemy use of long range missiles has grown. In the future, naval task forces may be formed without a carrier nearby for support. Yet, at least some level of air power may be critical to their survival. Some of this

capability will be provided by the LAMPS helicopter (LAMPS meaning Light Airborne Multipurpose System) on surface combatants, but a greater capability is most desirable. When it became apparent that the Navy could not develop suitable aircraft to operate from smaller decks concurrently with funding R&D (research and development) on CTOL planes, the entire focus shifted to VSTOL aircraft--planes capable of Vertical or Short Takeoff and Landing. On smaller ships such as destroyers and frigates, only vertical operations (VTOL) could be conducted. Short rolling takeoffs and landings (STOL) would require larger flat decks. Neither would require catapults or arresting gear since the aircraft provides its own acceleration.

AV-8A V/STOL AIRCRAFT

Although technologically feasible, capable VSTOL designs will take years of R&D, especially if they are expected to fulfill the functions of today's CTOL aircraft. There are penalties to be paid for making each plane catapult and arrest itself rather than consolidating these functions into the carrier. On the other hand VSTOL aircraft need not be built to withstand the stresses of rapid acceleration, and carriers designed for VSTOL only can be built without the costly equipment required to operate CTOL. Most judgments based upon comparing one to the other will have to wait until current R&D provides some sample hardware for evaluation.

Surface Warfare Forces

Today's surface navy cannot be examined in isolation nor can it be compared ton-for-ton against any foreign navy without realizing the severe impact that carrier aviation and geopolitics have had on its design. A ship that is designed to steam 2000-3000 miles and then fight is, of necessity, a different creature than one which is to be operated close to a base for most of its lifetime. Surface combatants designed to operate close to bases and not to spend months on deployment can sacrifice crew comfort, fuel capacity, weapon reload capacity, and capabilities for rapid underway replenishment--all these can be compromised for weaponry. The U.S. Navy must support national commitments thousands of miles away for extended

periods of time. These considerations combined with the capabilities and expense of carrier air power have led to a surface navy primarily designed for defensive or, at best, supporting and complementary missions.

Contemporary U.S. surface combatants can be divided into four categories:

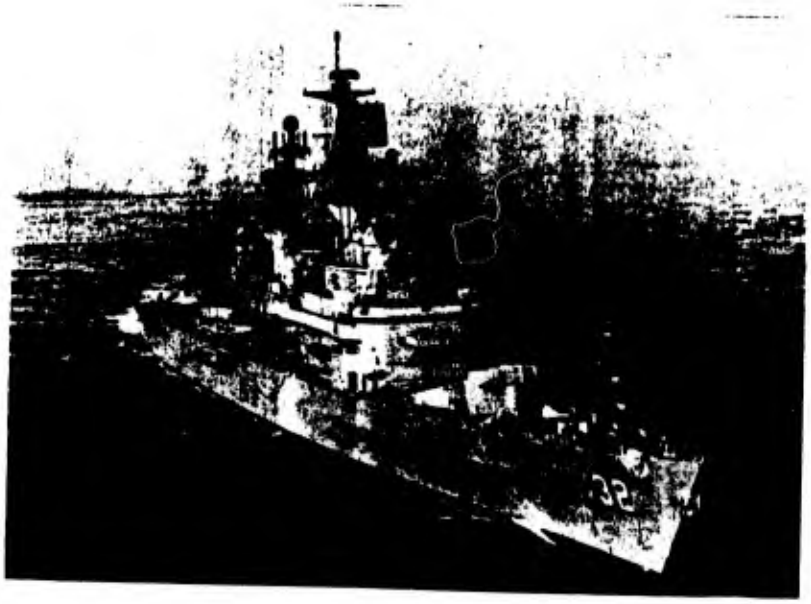
- Cruisers at 7800-14,000 tons
- Destroyers at 3400 to 8900 tons
- Frigates at 2600 to 4100 tons
- Combatant craft to include all smaller units.

The overlapping tonnage spectra reflect a type of "inflation" which has caused designs for units of the same name to double in size over 25 years. Most of today's cruisers, for example, rather than deriving their armor, armament and mission from earlier cruiser concepts, are large destroyers which were designed as destroyer leaders, then redesignated cruisers to reflect the realities of their size compared to ships of other nations.

At the top-of-the-line are the navy's nuclear powered cruisers, designated CGN with G denoting their main armament of missiles and the N, nuclear power. They are intended to defend aircraft carriers and other high value ships against all enemy units that may penetrate the carrier's aircraft screen. They also contribute to battle group command and control and conduct air/antiair coordination in support of the battle group. Their

nuclear propulsion plants permit them to form highly mobile groups with the nuclear carriers and to provide military presence or offense anywhere in the world either may be required, without the need for staging oilers to refuel.

Within the past few years the navy has attempted to procure a nuclear-powered cruiser designed for offensive operations without a carrier task group. The CSGN, or strike cruiser, was to carry Harpoon and Tomahawk cruise missiles for use against seaborne and land targets, as well as being armed with anti-air missiles, guns, and ASW weapons. The proposal was denied due to cost. Efforts to build more CGNs have met the same fate.



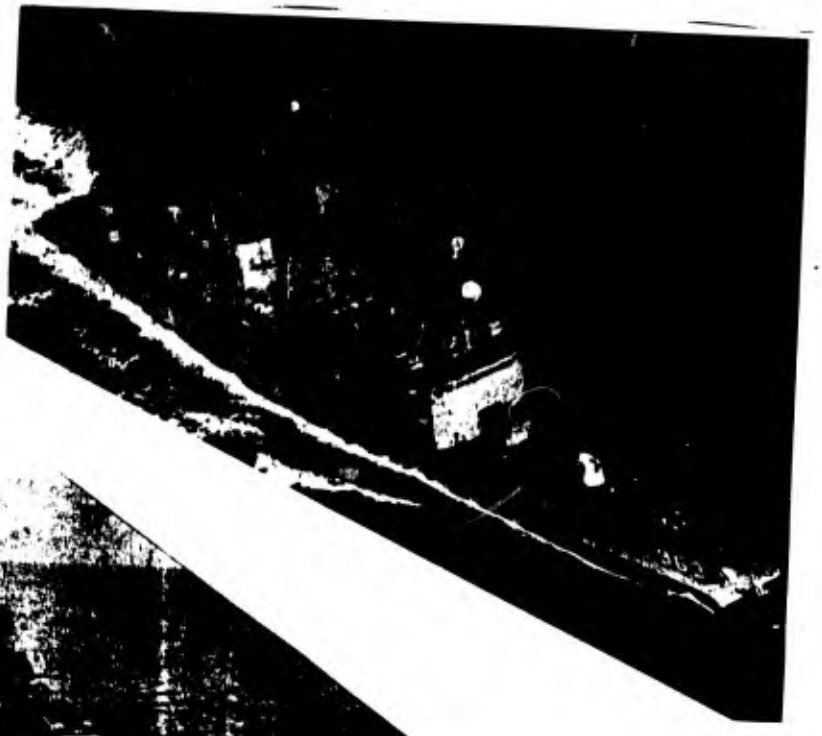
USS WILLIAM H. STANDLEY (CG-32)

Conventionally (petroleum) powered cruisers (CG) have essentially the same firepower as do the CGNs, but are lighter without the reactor and shielding, and have an endurance (range) on the order of 7000-8000 nautical miles. These ships perform the same missions with carrier groups as do CGNs. Additionally, they are extremely valuable to non-carrier task groups for the long-range air and antimissile defense their missiles provide.

In the early 1900s a class of ship called destroyer (DD) was designed to combat the high-speed torpedo boats that were difficult targets for a battleship's weapons systems, but carried long-range torpedoes capable of placing the battleship out of action. Traditionally, destroyers have been armed to combat such smaller craft and also to perform some of the torpedo boat's missions against larger combatants. While destroyers in other nations' navies have retained this combination offensive-defensive mission, those in the U.S. Navy have been economized into AAW and ASW defensive roles on the assumption that sea-based aircraft would provide the offense. The development of Harpoon and, hopefully, that of Tomahawk may reverse this trend.

The two types of destroyers in today's U.S. Navy are those designed primarily for ASW (DDs) and those having medium range guided missile systems for AAW--the DDGs. Generally smaller than cruisers, the DDGs do not

USS SPRUANCE
(DD-963)



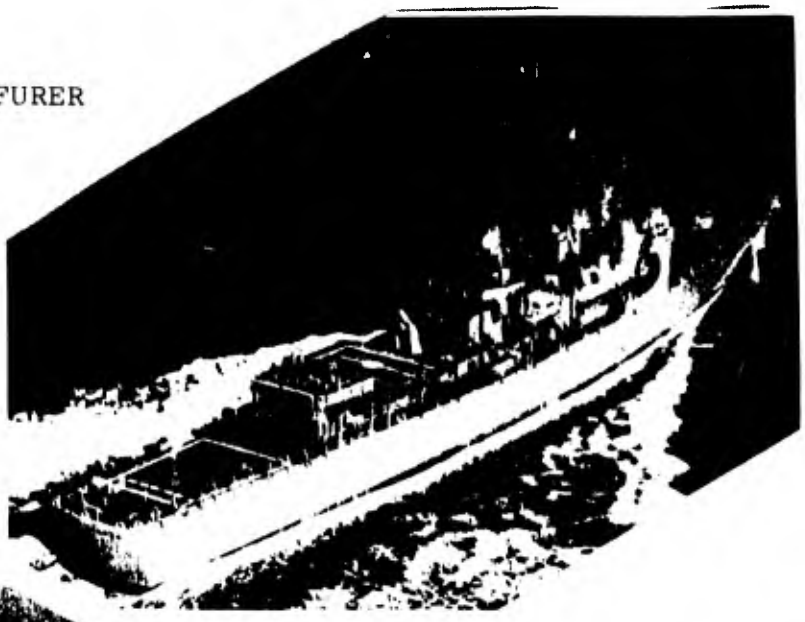
USS BENJAMIN STODDERT
(DDG-22)

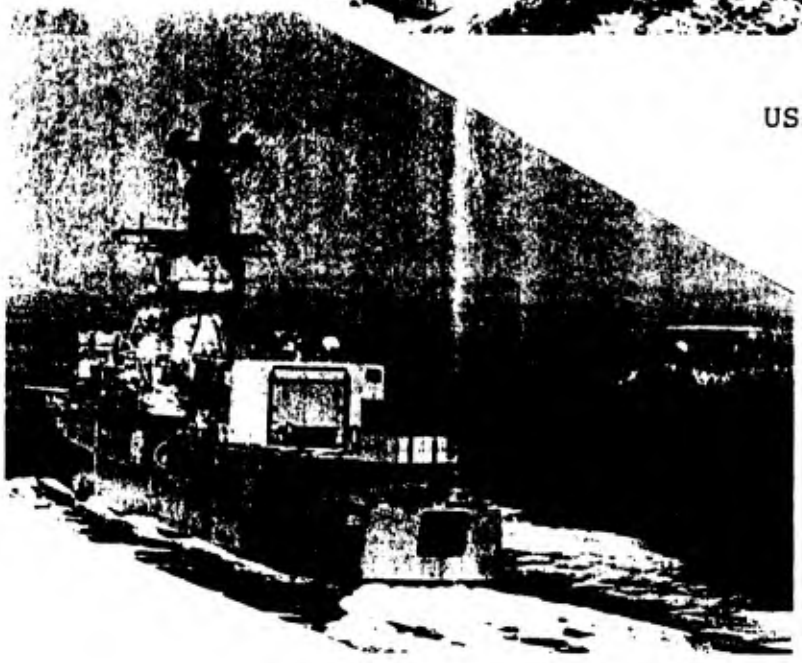
have the endurance, firepower, nor sophisticated command and control equipment of their larger sisters. They have two engines and screws, giving them top speeds in excess of 30 knots and a redundance for reliability. Those designed primarily for ASW employ rocket-launched torpedoes (ASROC) and helicopters to prosecute submarines. All carry deck-launched torpedoes. Some have short-range missiles for self defense. They also are armed with guns

for coastal bombardment (naval gunfire support, or NGFS) and for missile defense. The DDG designs give up some gunnery and/or helicopter capability to make room for medium range guided missile launchers and their associated systems.

The majority of surface combatants in the U.S. Navy for the foreseeable future will be frigates (FF) and their guided missile version, the FFG. Evolving from the destroyer escorts which protected logistic and merchant convoys in World War II, these units have essentially the same type ASW and AAW suites as do the DDs and DDGs, but in smaller quantities. Frigates generally lack the redundancy found in destroyers and cruisers. Although larger than the destroyers of a generation ago, frigates have only half a destroyer propulsion plant and a single screw providing maximum speeds of about 27 knots. Their large size reflects the weight and volume of contemporary weapon systems and greatly increased habitability, permitting today's sailor much more in the way of comfort than was available to his predecessor. They can be used in support of a carrier or amphibious group operating in an intense warfare environment, but are better suited by design to defend the vital underway replenishment groups and logistic convoys which any warfare overseas will demand.

USS JULIUS A. FURER
(FFG-6)





USS HAROLD E. HOLT
(FF-1074)

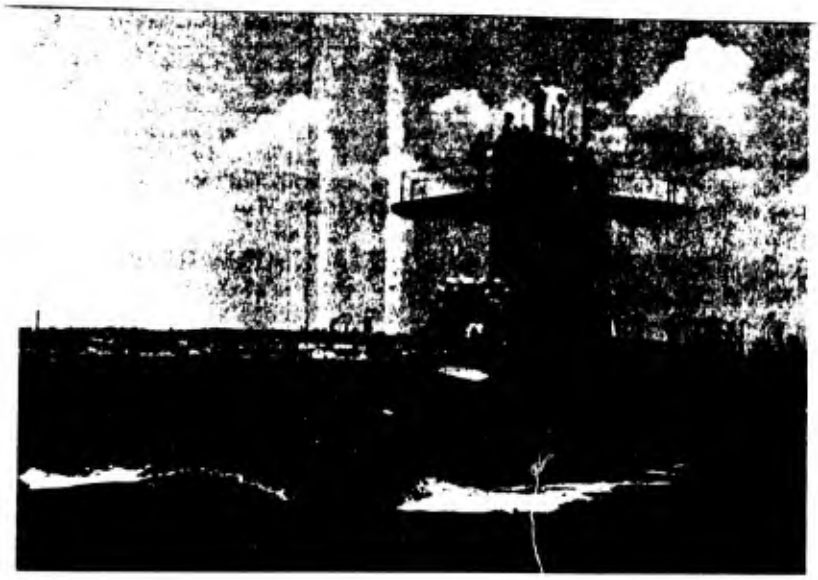
Many foreign navies focus on operations within restricted bodies of water having bases close by. Ships and boats designed to operate in such an environment do not require supplies and habitability for transoceanic endurance, or stability for heavy seas. They can be weaponized with large missiles and torpedoes to pose a severe threat to any major combatant approaching their domain

and be given high-speed maneuverability, making them difficult to combat. Since the U.S. Navy is designed to steam across an ocean then fight without reliance on bases, it does not have any quantities of such craft. A few hydrofoil patrol boats are being built for employment in the Mediterranean. The small combatant craft operated by possible opponents pose a special problem in regions where the navy may be tasked to venture within range of their missiles, while the boats are masked by land or weather.

Submarine Forces

The U.S. Navy's submarine force can be divided into two distinctly different types. Both are nuclear powered. Contributing to the triad providing this nation's strategic deterrence are the SSBNs. They carry ballistic missiles. They are large (8000 tons for the majority and nearly 19,000 tons for the new Trident class) and designed for long-range quiet covert patrol for 2-3 months at a time carrying 16 or 24 missiles each with 14 or 24 nuclear warheads. Their mission is to remain undetected within range of their assigned targets, and fully alert and prepared to launch ballistic missiles if directed by the National Command Authority.

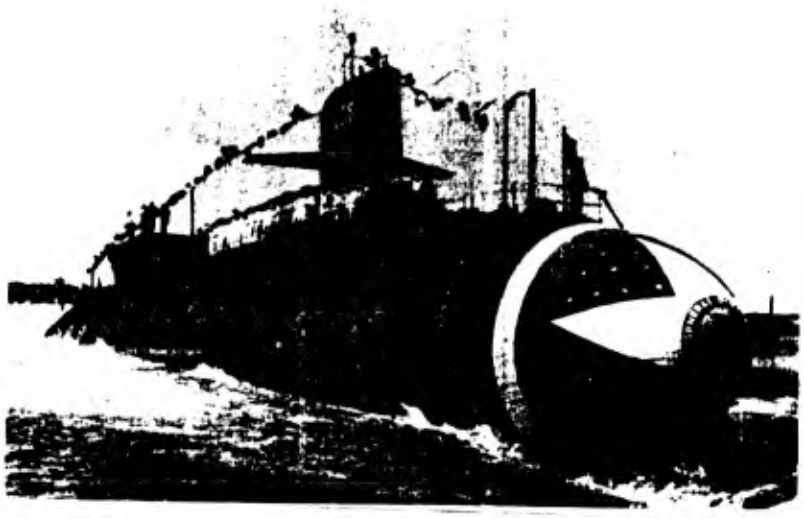
Of more importance in a discussion of tactics is the nuclear attack submarine (SSN). For 20 years nuclear powered submarines have been given priority over other combatants by the Navy, its administrators, and the



USS ETHAN ALLEN (SSBN-608)

Congress. No expense has been spared to make the U.S. submarine force the quietest and most capable in the world. The systems required for safe, efficient and quiet operation of nuclear plants for months underway; the sophisticated navigation, weapons, and sensor suites; and the controls to operate a large high-speed ship totally submerged, combine to make attack submarines among the most demanding and most capable of warships.

Attack submarines rely primarily on acoustic sensors for prosecution of enemy units and are armed with homing torpedoes and rockets for neutralization. Soon SSNs will be armed with cruise missiles to provide them a submerged launch weapon capability against surface targets at even longer ranges. Soviet nuclear and conventional submarines have been armed with supersonic missiles for some years now--missiles capable of attacking surface targets on land or sea hundreds of miles away. Those submarines



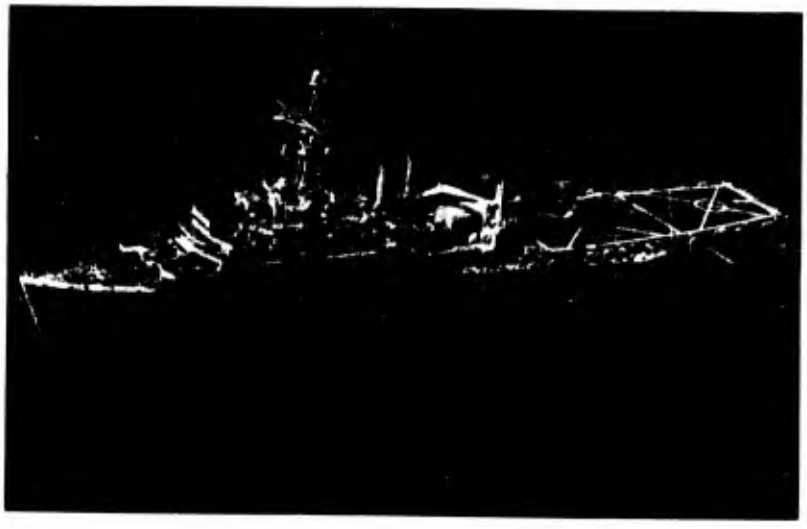
USS GLENARD P. LIPSCOMB (SSN-685)

whose primary capability comes from their missiles have been labeled SSG or SSGN depending on their propulsion plant. Since the missiles to be carried on U.S. submarines will be fired interchangeably with torpedoes from the same tubes, the designation of SSN will be retained.

Amphibious Warfare Forces

As strategists have pointed out for years, naval forces and air power can affect the outcome of a war, but victory with any sense of finality demands forces ashore where the opponent's armies, people, and government are located. Also, many weapon systems threatening the navy are launched from, fired from or controlled by installations ashore. The need exists for deployable troops which can be rapidly embarked on ships and moved ashore against opposition anywhere in the world. This force is the Marine Corps; the ships designed to carry the

marines and their supporting equipment constitute the amphibious forces.



USS CLEVELAND (LPD-7)

Amphibious warfare ships reflect the same impetus toward fewer, more capable but more expensive, units as do other naval types. For example, the newest class amphibious assault ships (LHAs) combine the personnel care capabilities of a hospital ship, the V/STOL aircraft handling capabilities of a small carrier, the amphibious craft launching capabilities of an older amphibious ship, and others to support a reinforced battalion. A few amphibious warfare ships carry guns to provide limited support of troops ashore and all have short-range self defense systems for protection against aircraft and missiles.

Logistic Support and Service Forces

No discussion of naval forces today can ignore the ships that carry fuel, food, ammunition, and spare parts, to support the combatant forces. The U.S. Navy prides itself in its capability for sustained operations in hostile waters far from logistic land bases. This capability requires an extensive force of support ships. Again, capabilities have been combined and ships have become larger as the nation cuts back its spending on defense. A generation ago ammunition was carried on AEs, fuel on AOs, and stores on AFs. While a few large single purpose

USS DETROIT (AOE-4)

ships are still in the fleet, the trend is toward such ships as the fast combat support ship (AOE) carrying fuel, ammunition, provisions, and freight; and the smaller replenishment oilers (AOR) carrying fuel, munitions,

and some freight. Their distinguishing features are their large cargo and fuel transfer rigs which permit rapid transfer of goods to combatants while in transit. Many also carry helicopters so that supplies can be transferred without restricting the maneuverability of the two ships by steaming them alongside with cables connecting them.

Weapons and Their Supporting Systems

In Chapter III there is a description of the basic combat process: detection, classification, localization, and neutralization--the functions required of a foot soldier, aircraft, tank, ship, or submarine. To comprehend naval warfare today requires at least a conversational familiarity with the hardware involved in carrying out this process. When a ship or aircraft is referred to as a "weapons platform", the term is not meant to be derogatory, but merely to acknowledge that it is actually the weapons which provide combat capability and that they can be changed over time.

Using complexity, capability, and cost as measures, there exists a spectrum of naval weapon types ranging from mines to missiles. To be effective a weapon must be controlled and kept safe by friendly forces until the desired time of use, then move or be moved from the controlling unit to the enemy and detonate in, on or near its target.

The process of locating a warhead on target is called fire control and the calculations required to ensure that this occurs are described in the term, fire control solution. The number of functions that a weapon performs on its own (firing, propulsion, navigation to the target, fuzing, etc.) determine its size, capability, complexity, and cost. Platform requirements are inversely related to those of its weapons. That is, a hypothetical weapon that can detect, classify, localize, and neutralize an enemy target on its own demands only that its platform transport it.

At one end of our spectrum one would find naval mines which are dropped on or anchored to the ocean floor and require that the enemy blunder into them. They may be detonated by physical contact, by an external electromagnetic command from some controlling party or by the disturbance to the acoustic, magnetic or pressure environment caused by a passing unit. Mines are the simplest of weapons because they require no fire control at all--only that a target wander into their effective radius and destroy itself.

"Iron bombs" would fall next in line since they must be delivered by aircraft, but after release are influenced only by gravity and the wind until they explode prior to impact as a function of time or altitude, at impact in a surface burst or after penetration of the target as a time

delay after impact. Warheads on many weapons have similar options available for selective detonation.

Next in the list would come gun-type weapons. The firing platform performs all the fire control functions to include computing aim point for the gun--estimating the future position of the target at the precise time a round will impact. The firing unit also provides propulsion for the projectile and all its control. A basic rocket is similar to a gun projectile in that it is not controlled after firing; however, the rocket provides its own propulsion while the shell does not.

In recent years a few mines, bombs, and even bullets have been "modernized" and made more effective by adding sophisticated technology. The CAPTOR mine contains an enCAPsulated TORpedo, which is released when certain detection and classification criteria are met then propels and guides itself to the target. Some bombs have been given controls and a seeker such that an airplane may "shine" its LASER "flashlight" on a target. After release the bomb maneuvers during its gravity glide to impact on the point being illuminated. Rocket, bullet and guidance technology have been combined to provide more effective longer range capability to guns.

At the upper end of the weapon spectrum one would find missiles and torpedoes. Today's homing torpedoes and precision guided missiles need only be launched toward

the vicinity of a target. They propel and guide themselves and sometimes even engage in classification process prior to arming and deciding to attack. Torpedoes could be classed as even more sophisticated, since (depending on type and pattern) they can perform damage assessment and decide to reattack on their own, if the target was missed on the first attempt. Missiles gain their precision in the terminal phases of flight by following signals from the target itself. A passive missile could home on radiated energy such as light, sound, heat, or electromagnetic transmissions. A semi-active missile homes on energy that is aimed at the target by the firing platform or a third party then reflected by the target. A fully active missile transmits energy itself then homes on the reflected echoes.

Some of the most complex of weapon systems combine characteristics of all the above weapons, since the launcher must first determine precisely its geographic position, then after firing, the weapon records its position relative to the launcher or a third party. The weapon may then use geography again and finally control terminal homing by determining position relative to a moving target. Obviously, the more functions a weapon performs on its own, the more expensive it is to procure and maintain, and the smaller the quantity that can be economically fired. No military force could long sustain a battle if precision guided munitions (PGMs) were

expended at the same rate as bullets and bombs have been in the past. The most sophisticated and complex system is the human being. As planners cut back on steel weapon systems, the likelihood of expending quantities of manpower becomes greater, as well.

Supporting the weapons fired, launched, dropped, or laid by a platform are the navigation, detection, and tracking systems required for weapon delivery. As mentioned, in general, the more complex the weapon then the simpler can be its supporting systems. A surface ship, for example, needs air search and surface search radars and sonar for self protection and navigation. If it is armed only with guns, then it must carry precision radars for determining current target position and damage, and the computers for estimating future position and aimpoint. Theoretically, if the ship were armed solely with active missiles, then many of the supporting systems would not be needed and the missile simply fired into the vicinity of the target and left to its own devices. Also supporting the weapon systems are the various defensive devices which contribute to mass by countering the enemy's weapons: jammers that blind his sensors, decoys that provide him false targets to draw the attack away from the firing ship, and armor plating to minimize damage should all else fail.

Familiarity with the above items of hardware, and realization that they have evolved over time to operate

with existing ships, should provide the reader with a better understanding of the enormous variety of ships, aircraft, submarines, and systems available to the naval tactician who must carry out his mission with units that range from the most modern to some over thirty years old.

CHAPTER III

COMBAT FUNCTIONS OF NAVAL FORCES

At its most basic, warfare involves finding and identifying one's enemy, then computing exactly where he will be when your weapons get to him, and firing weapons until you ascertain that he is destroyed or damaged as desired (offense). The four steps of that offensive sequence are termed detection, classification, localization, and neutralization. At the same time the warrior must prevent his enemy from carrying out the same series of operations in return (defense). On offense all four are required. On defense the denial of one is sufficient. That is part of the reason why defensive forces are usually cheaper.

The operations conducted are essentially the same whether one is examining the work of a single foot soldier, a brigade of infantry, an aircraft, or task force of ships. A set of devices is required to conduct these operations. The foot soldier may detect and classify by eye and ear, localize mentally using "Kentucky windage", fire with a rifle, and determine neutralization again by eye. The effectiveness of such a "system" may be quite high, up to a hundred yards away against targets which are slow, visible and unprotected. If the target is to be engaged further away, and is faster, larger, and fortified; then

larger, more complex, and more powerful devices are required. The problem of seeing, identifying, computing aimpoint, firing, correcting, and firing again generically remainss the same.

Detection requires that information about an object be passed to an observer. The radiation which carries this information may either be generated by the target (for example, heat, noise, light, or radio transmissions) or it may be reflected by it. The reflected radiation may be originated in nature (sunlight), or generated by the searcher as in the case of radar and sonar, or even generated by a third party. A system which radiates energy then searches for reflections from a target is called an active system. One which merely attempts to intercept radiations emitted by a target are passive systems. A ship steaming in peacetime would have surface search radars scanning to the horizon, about 20 miles, and air search radars searching above the horizon to detect objects ten times that far away. A surface combatant would also be scanning in all directions for submerged objects by transmitting sound beams underwater with its sonar and listening for echoes. Simultaneously passive systems above and below the surface would be listening for radiated energy.

The frequency of radiation employed for searching varies because the characteristics of the medium through

which the information must pass cannot support every type radiation equally well. Nor can the same level of detail be carried on all frequencies. It would be desirable to a searcher if, for example, sea water was more transparent and could transmit light. Were that so, submerged objects could be observed in detail. However, light only penetrates sea water to a few feet, and the searcher must transmit sound and listen for its reflection as well as listening for the sound emanating from underwater objects such as fish, shellfish, and ships' machinery. The sounds reflected by many kinds of objects are similar, as are those radiated by the machinery of several types of units. This similarity, and the fact that sound traveling underwater does not proceed in a straight line, makes detection of submerged objects a very complex process.

Just as the sonar of a ship listens for the sounds generated by objects underwater, so sensors in the superstructure listen or watch for radiations by equipment on other units or land stations. Transmissions by an active radar can be received at almost twice the distance that it can effectively detect targets. Radio communications can be received hundreds to thousands of miles away. Hence, a searching ship or aircraft need not always radiate energy and make itself detectable, when other units are radiating. In time of war, combatants must be very

judicious in employment of their active sensors, weighing the value of the information they may collect against the cost of being detected passively in return.

After detection has occurred, the second portion of this chain of events, identification or classification, consists of collecting sufficient information about a detected object to decide whether to fire a weapon. The difficulty of this is a function of range. It may involve risking the radiation of more sensors or even closing to within the enemy's weapon range.

Step three, localization, is the process of refining information on a target to the point where weapons may be launched or fired. If the weapon is purely a ballistic one (i.e., if its path cannot be changed once it has been fired), then the exact current position and motion of the target during time of flight must be calculated, as must such other factors as the motion of the firing unit and the effects of wind and earth motion. Weapons designed to "home", to find the target on their own, require less precise calculations at close range. However, the weapon itself must go through its own detection, classification, and localization process while in flight, then maneuver itself to intercept.

The final step in this sequence is that of neutralization of the opponent. Neutralization was not chosen as a pleasant euphemism for killing; rather it is

descriptive of the options available. The term includes employing weapons or countermeasures to take the other unit out of action, or, depending on the circumstances, to avoid or evade it. If the decision is made to disable the opposing unit with weapons, then damage assessment becomes a problem. A single shot may be insufficient; yet the scarcity, value, and cost of weapons argue for their conservation. On the other hand, the opponent's detection - classification process is solved for him once a weapon is employed or active search radar turned on by the platform intending to launch the weapon. Should he be armed with larger or longer range weapons, remaining close enough to assess damage may be a risky process. Again, depending on the circumstances, an opponent may be neutralized by decoying him away from a friendly unit with some sort of subterfuge, or even passing by information on him to other units.

The above discussion examines one unit opposed by a single unit. More often a "team" composed of several units or systems is searching for an opposing task force or group. For example, initial detection might occur when a satellite or shore station intercepts a transmission and informs units afloat of the general location of some unspecified enemy units. After a matter of hours or even days, the units afloat may relocate the opponent by long range intercept, again of a radiated signal. An aircraft

may be sent to determine the precise location of the force and to start the classification process. Missiles (including torpedoes) fired from ships may then be used to neutralize. The missiles may be guided by the firing ship, by aircraft, or by themselves.

Each step in the above process, detection, classification, localization, and neutralization is also used by the opponent. For this reason countermeasures are employed to deny him sufficient timely information to complete the neutralization process first.

To inhibit detection, emission control (EMCON) is employed to limit the amount of detectable radiation emanating from a unit. Broadly interpreted this would include proceeding at lower speeds to reduce machinery noise and wake. Submarines have an obvious advantage in counter-detection in that they can submerge in addition to having all the measures available to other units.

To prevent classification, ships can limit the number of sensors used to those common to many types. They also can steam in company with other units and employ decoys to emit spurious data. Localization is countered by maneuvers such as zigzagging and by various camouflage measures. Neutralization is countered by increasing mass--protecting ships with armor, carrying systems which can

destroy or decoy weapons after they are fired--and by using firepower to counterattack.

There is even a set of procedures known as counter-countermeasures. For example, one defense or countermeasure employed against the tracking radars which direct missiles to their target is jamming--radiating energy into the radar to blind it. Some sophisticated systems now have the capability, when jammed, to shift to a passive mode and guide missiles to the jamming device. Definitions of exactly which systems constitute measures, which countermeasures, and which counter-countermeasures quickly becomes moot, as well as a function of which side one happens to be on.

Missions and Functional Tasks

The mission of the U.S. Navy is specified by law (see Chapter I); however, naval warfare is usually classified in three ways, first by function, second by the platform conducting the operations and, last, by the target of concern.

For completeness it can be stated that each function and each platform-oriented warfare area is composed of pieces of each target-oriented item from the list on the right. Conversely, each target type can best be combatted by combining warfare areas and functions from the lists of the left.

CLASSIFICATION OF NAVAL WARFARE

BY

FUNCTION	PLATFORM	OPPONENT
Sea Control	Submarine Warfare	Antisubmarine Warfare (ASW)
Power Projection	Air Warfare (Sea-based & Land-based)	Antiair Warfare (AAW) *
	Surface Warfare	Anti-Surface Ship Warfare (ASUW)
	Special and Supporting Warfare	Strike Warfare (Land Targets)
		Amphibious Warfare

* Due to its unique character, Anti-Ship Missile Defense (ASMD) is often included with AAW.

This fact leads to a matrix of warfare types as shown in the table below.

DIVISIONS OF NAVAL WARFARE

FUNCTIONS:	SEA CONTROL			POWER PROJECTION	
	AAW	ASW	ASUW	STRIKE	AMPHIBIOUS
Submarine Warfare	?	1	2	3	?
Air Warfare	4	5	6	7	8
Surface Warfare	9	10	11	12	13
Other	?	?	?	?	14

The 14 most easily distinguishable subsets are numbered. The question marks note areas where there may be some

interactions of a supporting nature but where the distinctions are not as clearly defined. Each of the 14 cells represents a developed discipline requiring considerable focus for gaining expertise.

The three major line officer communities in the U.S. Navy reflect the above platform-oriented classifications. From commissioning onward in his career the aviator, submariner, or surface warfare officer receives specialized training in his platform and tends to view warfare with a certain amount of natural parochialism. It is the rare but priceless tactician who can master a sufficient number of them to operate a modern task group at its maximum effectiveness.

As simplistically used today and shown above, the term Sea Control would include AAW, ASW, and ASUW. However, it may include actions against the bases ashore which support enemy units. Power Projection generally is taken to include all actions against land targets, and considered more offensive in nature. Just as an infantryman must be sure of his ground, his flanks and his rear prior to advancing, so Sea Control is a prerequisite to Power Projection. The next few paragraphs will describe briefly the platform-oriented warfare areas, drawing on the previous discussion of combat functions and their counters, and comparing the strengths, weaknesses, and mutually supporting attributes of each area.

Submarine Warfare

Submarine warfare has three major advantages over other forms. Simply by submerging the submarine becomes essentially invisible, thus drastically complicating an enemy's detection problem by forcing the opponent to hear rather than see it. In a medium where sound is the primary phenomenon available to the senses, a submarine has the advantage of mobility within the ocean's layers to achieve the best operating conditions either for search or detection avoidance. The submarine constantly measures its environment and can sense changes immediately, while those surface, air, and land-based forces searching for it must rely (at best) upon sampling at discrete periods of time. Lastly, today's nuclear submarines have a distinct advantage over non-nuclear surface or air opponents who must rely upon a logistics chain for replenishment every few hours or days. On missions which do not require a heavy rate of ordnance expenditure the submarine's time at sea is usually limited only by crew fatigue.

The three major disadvantages of submarines as combat ships are their reliance on sound for their primary sensor--far less discriminating than higher frequency transmissions such as radar and light, the fact that a submarine will cost substantially more than a surface ship with the same offensive load, and lastly the

inability of a submarine to interact offensively with aircraft.

Historically submarines have operated most effectively when given autonomous missions. As each active transmission by a submarine (whether for detecting other units or for communications) increases the risk of its being detected, and since even the submarine's maneuvering to receive or transmit many forms of communication also increases that risk, operations demanding too large a degree of coordination are not desirable. For example, during World War II the large German submarine fleet was carefully controlled by higher command ashore. Communications to and from the subs were subject to intercept and intelligence collection; their communications were subject to direction finding and localization which assisted the Allied task groups seeking to find or avoid the submarines. More recently, when realization of the submarine's excellence as an antisubmarine platform has brought the subs closer to maneuvering task groups in escort roles, the demand for communications has again lessened their natural covertness.

Air Warfare

The three primary advantages of aircraft over other systems are their long-range sensor capability granted by altitude, their speed and maneuverability, and the large

amount of firepower carried for the cost of procurement. That is, an aircraft can carry sufficient firepower to destroy a ship or submarine while costing only 5-10% as much as its target. Their kinetic capabilities permit a tactical commander to concentrate or disperse his force very rapidly as the situation demands, and make each aircraft a difficult target to destroy. The greatest weakness of aircraft as weapon platforms is their high fuel consumption, the resulting limited endurance, and their constant dependence on a base nearby for support. As is evident by the ongoing debate about the construction of aircraft carriers, when the cost of sending aircraft includes the cost of their base, the system becomes much more expensive.

Surface Warfare

Surface warfare, although it is the traditional form of naval engagement, now reflects the severe compromises caused by the technological advances in aviation and submarines over the past 30 years and their cost. At least within the U.S. Navy, surface combatants designed since World War II have reflected heavily their defensive anti-air and antisubmarine missions at a cost in anti-surface ship capability and offense. They also have been compromised in capability due to the assumption that in any major engagement allied tactical aircraft would be

the vicinity to assist. The evolution of Soviet surface combatants exhibits what this genesis might have resulted in without that assumption.

While surface combatants do not provide the quick-striking small unit, maneuverable firepower of an aircraft, or the relative invulnerability of a covert submarine, they have several advantages over either. Surface warships have a staying power not available in aircraft which must return to a base for fuel every few hours. Compared to submarines, surface combatants offer a greater breadth of capabilities, especially in anti-air and command/control missions. The presence of surface ships is critical to the coordination of any operation involving units from all warfare areas as they can most readily communicate with units above, on or below the surface as well as combatting the enemy's forces in all three environments.

This final point becomes most important when it is realized that both economic survival at home and the prosecution of any battle overseas demand that vast quantities of material be carried on the ocean's surface. This seaborne cargo must be protected from anyone who might profit from severing these lifelines. Only surface warships can economically provide around-the-clock defense of maritime trade and logistic reinforcement at any location against all the various types of forces that any

enemy may send. The continuous presence of tactical aircraft near each merchant or military support ship would demand many more aircraft in the pipeline for rotation and more carriers and land bases than we can afford; to accomplish this would demand VTOL aircraft aboard the surface combatants or the escorted ships.

The final category, special and supporting warfare has been included to cover the many tasks performed by the navy that cannot be related directly to a single platform, either because they cut across the above warfare areas, employing some from each, or because they are entities unto themselves, e.g., the SEALs (Sea-Air-Land Commandos). The use of mines in warfare is often treated as a separate warfare area, but it should not be, since mines are merely one of the weapons available to each of the groups listed. With these details out of the way, one can proceed to examine naval warfare.

CHAPTER IV

TACTICAL USE OF FORCES

Background

When naval warfare was conducted from galleys, the usual tactic was to form into a line abreast--oar-to-oar--exposing bow rams to the enemy ships until the front rows could engage. If the submerged ram did not sink the enemy, then the battle was carried with hand-to-hand fighting. When propulsion moved from oars to sails, the sides of naval ships were armed with cannon. The standard fighting formation became the column or line. Ships-of-the-line exposed their broadsides to the enemy. Aggressive tacticians chose the weather gage so that the wind was setting them into the enemy. Those more interested in defense at sea formed to leeward, giving them the option of retiring from the battle when desired. Tacticians in the age of sail attempted to mass more firepower on the enemy then he could return, the ultimate being "crossing the T" where the broadsides of several ships could be brought to bear on the largely unarmed bows of enemy units without exposure to the enemy's own broadsides.

Modern naval warfare started its emergence about one hundred years ago. Steel hulls combined with steam propulsion (first from coal and then from oil) to clear the entire topside area of ships for weapon systems.

Traversing turrets permitted direction of fire without maneuvering the ship to bring a battery to bear. Within limits, firepower could be massed rapidly and several targets engaged quickly when required. Formations of ships could be massed and dispersed as the tactician desired.

At about the turn of the century naval warfare took another step forward as "the flotilla acquired battle power". Ships had been classified previously into three categories, ships-of-the-line or battleships, smaller and faster cruisers, then a large group including all the remaining ships and craft (frigates, corvettes, etc.). These were termed the flotilla. The invention of the Whitehead torpedo gave smaller craft the ability to carry a weapon capable of sinking the largest ship of any enemy, often from outside the larger ship's gun range. This was the predecessor of the missile age. The same principles which made torpedoes effective at several miles and at speeds equivalent to those of fast small craft, have done even more for missiles which can be launched hundreds of miles away and attack at several times the speed of sound. As the torpedo boats evolved into submersibles, and then into fully capable submarines armed with missiles as well, tactics were developed to combat them.

Principles of War

Over the years there have evolved nine agreed principles of warfare studied by apprentice tacticians and strategists throughout the world. They are mentioned here to provide a small glossary of terms to be employed in the following pages. Obvious analogies exist in other competitive fields of endeavor. Any military operation must:

1. Have a clearly defined and attainable OBJECTIVE on which to focus.
2. Take the OFFENSIVE if victory is to be attained.
3. Concentrate superior combat power, or MASS at the decisive time and place.
4. Employ ECONOMY OF FORCE to attain the objective without wasting resources.
5. Employ MANEUVER to create mass and attain the objective.
6. Establish a clearly defined UNITY OF COMMAND with adequate lines of communication.
7. Realize that SURPRISE can shift the balance of combat power by denying the enemy time to concentrate sufficient mass.
8. Retain SECURITY to deny the enemy vital intelligence and prevent being surprised.
9. Employ sufficient SIMPLICITY that most men can comprehend the operation.

The reader will note that while each of these principles is obviously desirable, some are contradictory. Victory or defeat as a function of fate often decides which principle should be dominant. The hindsight of historians will acclaim a victorious raid for its surprise, economy of force, and maneuver. Should it fail, the commander will be criticized for applying insufficient mass and with undue haste which weakened his unity of command. Too great a mass cannot be maneuvered for surprise. Fascination with maneuver may cloud the objective and destroy simplicity. Finally, as all military commanders realize, superiority of force can compensate for a multitude of tactical inadequacies. Nevertheless, as points of reference, these nine principles should be kept in mind throughout the following discussion.

The Defensive Formation

The fact that ships transit in groups is no military oddity. Many species congregate (create mass) for mutual protection. Take a basic case exhibiting the defensive employment of mass. Penguins discovered safety in numbers years ago during their migration from land to water. At the ocean's edge resides the sea predator which thrives on formally-attired fowl. Penguins can evade their enemy in the water and he will not venture far inland, but at the shoreline he poses a terminal threat. Besides being sharp dressers, these birds discovered generations ago

that to file by at their leisure permitted them to be slaughtered sequentially and consumed as desired--not the best of solutions. Thus when the birds migrate from solid ground to the water, they form a large flock and hustle by en masse. Their enemy may grab one or two to complement his fishy diet, but the majority survive. However, as long as the threat can be bounded in space and time, the "Penguin Theory" of saturating the enemy's offenses still applies.

Of course, there are disadvantages as well to forming convoys of merchant ships. There is some risk from maneuvering cumbersome cargo ships over long distances at close quarters. A sufficiently large (e.g., nuclear) weapon could eliminate several ships at once if they were too tightly grouped. The flow of goods may be slowed while ships wait at marshalling points and for offloading space, and because each ship in company must proceed at the speed of the slowest.

There is another advantage to convoying which complements the Penguin Theory. It permits massing of defensive forces as well. Collection of vulnerable but valuable assets within fortifications for protection has often been common practice for centuries. If sufficient weapon systems are available to combat the expected threat, then the convoy can be escorted--the walls of the fort can be built and manned. Ideally, the defenders should

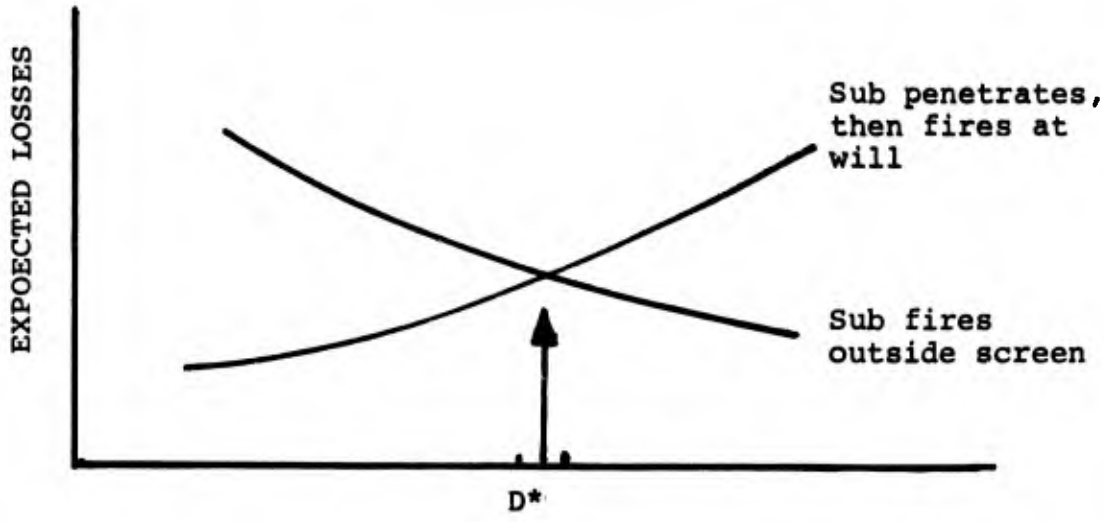
be able to drive off any attacker, but even a token level of credible defense can serve to reduce losses, increase the survivability of convoyed units, and perhaps convince skeptical owners to risk their ships when otherwise they would not accept the possible attrition.

The Traditional Screen

During World War II, screen placement to defend against submarines was analyzed and optimized, then reduced to a set of tables which became doctrine for more than twenty years. The ranges of the enemy's torpedoes determined a danger zone around the convoy to which entry was to be denied the submarine. The speed advantage of the convoy over the submerged submarine determined that area of the danger zone on the flanks and ahead through which it was possible for the submarine to penetrate. The number of escorts available and their acoustic detection capability as a function of water conditions determined the placement and density of the screen. An approaching submarine captain could choose to fire from outside the screen, if he thought it was sufficiently close to the main body and dense. Alternatively, he could attempt to penetrate the screen with his sub, then fire at the escorted units from within. The screen was placed at that range ahead and to the sides of the convoy such that the submarine would be equally likely

of success (and of failure), whichever course of action he chose. Screening units patrolled randomly in the vicinity of their assigned stations to make the problem of penetration between units as difficult as possible for the submarine attempting that course of action.

TRADITIONAL SCREEN PLACEMENT



D* = Distance of escort screen from center of group.

Contemporary Screening

While the above solution worked in World War II after sufficient escorts were built, it cannot be applied as strictly today. The firing range of missiles which might be launched at convoyed units is many times that of torpedoes. The close-in (direct path) detection range available with sonars has not increased commensurately. That range cannot be extended greatly due to geometric

limitations on the paths sound may travel in water. Submarines are now capable of speeds in excess of those of the convoy; thus the sector through which the submarine may approach to fire now extends most of the way around the perimeter of the formation and the convoy cannot run away before all weapons are fired. Maintaining past levels of screen density would require building more and more escorts as weapon range and submarine speed increase, an economic impossibility since the range of weapons can be increased far more cheaply than escorts can be built. The problem of defending a formation is also more complex today because technology permits early detection of masses of ships and prepositioning submarines. Today a single merchant ship may carry as much as did a whole convoy 30 years ago. Tactics for defending lightly protected units must be constantly changed to meet various situations. Screens today extend well outside the perimeter and employ aircraft and submarines as well as escorts.

There has never been an impregnable fortress. There will never be a screen devised for a formation of warships or merchant ships that cannot be penetrated should the enemy commit sufficient assets to that task. The closer that an escorted formation must operate to the enemy's bases, then the greater will be his ability to

mass against it. This proximity also decreases warning time and increases the degree of danger that the formation poses to the enemy. As a result, the likelihood that he must choose to challenge its presence is also greater. No ship or formation is invulnerable, yet national interests demand that some U.S. Navy units be "forward deployed", nearer to the bases of potential enemies than to support. All units are vulnerable depending on where they are deployed and how they are employed. Statements that some unit is too vulnerable in itself, or that some new weapon or system will provide guaranteed success, and cheaply, are specious.

In the final analysis wars are won or lost on land, for that is where the people dwell who must decide when their cause is lost. Sometimes seaborne mass must be employed to physically displace enemy mass. Land-based weapons can threaten fleet operations at sea. For these two reasons at least, one offensive and one defensive, naval forces must have the capability to operate against forces ashore. Carriers provide that capability. Given that we must have air power to perform our tasks at great distances from friendly bases anywhere in the world--whether those missions happen to be labeled sea control, power projection, strike warfare, or something else, then the seagoing mobile air base is a critical requirement. Each of the carrier's aircraft and escorts may

be expendable, but unless the war turns tragically against us, the carrier is not.

For the above reasons, a Battle Group Commander would no more steam his carrier force headlong into waters possibly controlled by enemy submarines and missile-carrying bombers than would a general order his troops to march directly into a possible minefield. It would be too costly a method for determining enemy strength. The commander would station his aircraft and escorts in a disposition such that he learns the most he can about the enemy while risking the least.

Active sensors, those transmitting energy and searching for its reflections from targets, provide the most certain means of detecting any enemy units (as well as neutrals, allies, and any other target in range). Thus, the commander's immediate inclination might be to energize all systems and collect as much information as possible, even if the enemy is not cooperating by radiating. However, any electromagnetic radiation can be "heard" by a receiver at a much greater range than the reflections it creates can be perceived by the transmitting system. With the exception of situations where the transmission of energy is limited by boundaries such as the horizon or thermal layers in the ocean, the above represents an undeniable law of physics.

Furthermore, a quiet opponent with the proper type of receiver cannot only detect a transmitter at a distance greater than he can be detected, but by analysis of the signal received, he may be able to discern the type of transmitter and from that, determine the unit he has encountered. If a commander orders his units to radiate their active sensors, he must be willing to give up this classifying information on the radiating unit to his opponent, a risk to be carefully calculated. Depending on tactical necessity one or all units may radiate depending on their value to the force, the value of the intelligence they may collect, and the information their radiating gives away. For example, if an enemy intercepted radiation from airborne search radars outside the range of land-based aircraft, he could conclude rather logically that a carrier was nearby.

The protection afforded to naval formations is a function of the force available, the expected threat and the relative value placed on the formation by both sides--not necessarily the monetary value, but the tactical and strategic value. Whether the formation consists of a Battle Group (with or without a carrier), an amphibious or underway replenishment group, or a convoy, the protective screen is deployed using the same tactical philosophy. The screen should deter the enemy from attacking

and attempt to prevent him from "succeeding" in an attack, even if success is taken to mean extracting the highest possible price from him during his attack. The sequential combat functions of detection, classification, and neutralization were discussed earlier in this paper as they apply to single platforms. The strengths and weaknesses of each platform type were also mentioned. The tactical commander must select the best defensive formation considering the combat functions being performed by his formation as a group, exploiting their strengths and covering the weaknesses. As in all forms of warfare, he must attempt to gain the most while risking the least at every step in the sequence of functions.

Every decision made by the tactical commander represents a compromise, considering the cost, the risk, and the benefits. When sensors are activated, the certainty of short-range detection increases, but the range at which the radiating unit can be detected and classified increases as well. Every pound of fuel burned by aircraft loitering overhead is unavailable for pursuit or evasion. Every mile that an escort is moved ahead of the formation to provide early warning reduces close-in "last ditch" defense. Every fighter embarked on the carrier reduces the number of VA or VS or support aircraft. The list can easily be extended.

To build the best defense a tactical commander must estimate the number of combat functions his opponent has already accomplished and operate to minimize the chance that each remaining one occurs. For example, if the formation has been undetected, some level of stealth can be employed to prolong the time until that event occurs and gain surprise. If he feels that detection has occurred (or that it cannot be avoided) then his actions should concentrate on making the remaining functions as difficult or costly as possible for his enemy. Classification can be complicated by selecting "unmilitary" formations and restricting radiation of distinctive sensors and communications equipment. Localization can be complicated by maneuver. Since the enemy may also be using different systems to accomplish the various functions (e.g., a satellite to detect, a different satellite to classify, an aircraft to localize and a surface ship and its missiles to neutralize), his problem can be made more difficult by disrupting the communications that are necessary for him to coordinate these systems and pass information from one to the other.

In line with the preceding discussion, it should be obvious that actions taken to inhibit the enemy at one stage may have the opposite effect at another. While it may be very logical to steam around with no sensors

radiating when one has not been detected, it would be foolhardy to be caught blind and deaf when missiles and torpedoes are fired. Probably at some time during the mission of the force being defended, the enemy will know of its presence, if not its precise location and composition. Therefore, there must come a time when all active sensors are radiated and subtlety is cast aside to provide the strongest defense against attack that can be formed. If the enemy is deemed incapable of challenging the task group, then that time might come as the group departs homeport. For years naval ships steamed around in distinctive formations with all sensors radiating; no one could pose a credible challenge. If, on the other hand, the commander believes that his opponent knows his position, composition, and destination, then again he might as well "turn on the lights". At either situational extreme, there is no need for subtlety.

In creating his defensive disposition the commander must also consider his desired formation when the shooting starts. He may desire dispersal until weapon release, but require concentration in a citadel for mutual support at short notice if the situation worsens. He would prefer a disposition which can combat the enemy's firing platforms prior to their attacking, but must have a formation which can combat the weapons and counterattack, should the enemy succeed in penetrating to firing range.

Short-range defensive systems for soft kill and hard kill may be carried on the escorted ships, but they contribute only marginally to the defense of the group as a whole, and will not be mentioned further, since their employment is usually a last-ditch action of the ships' commanding officers and not the tactical commander.

In deploying and employing his forces, the tactical commander must consider which of the possible threats may develop with the least warning and present the greatest immediate danger. Usually that threat would come from homing cruise missiles fired from any of a number of platforms. If the launching of missiles by an enemy provides the commander's first knowledge that the war has started, or that the enemy is present, then he must have as many systems as possible along the missiles' line of flight to combat them. He also needs a residual capability to counterattack to prevent reloading and reattack. Not all formations will have carrier aircraft available, since we have too few carriers. Hopefully, the task groups without aircraft will have at least one cruiser in company to provide anti-air defense at longer ranges and to benefit from their larger command and control facilities. An enemy might desire to target only the valuable escorted units with his missiles, or he might desire to "roll back" the escorting force, hitting them one by one around the perimeter with missiles, then

penetrate the weakened screen to attack the escorted force with torpedoes. For him to classify some ship in a formation may demand that he approach close enough to identify the units visually. In attempting to do the most damage while risking the least, the enemy may launch his weapons at longer ranges and have them targeted by a smaller (more expendable) platform (e.g., a surveillance aircraft) which is within its own sensor range. This communications link may be the easiest element to combat in the system.

If the tactical commander estimates that, due to the absence of targeting platforms his primary threat comes from enemy ships and submarines which must themselves close sufficiently to target, then he may choose to open his formation from an anti-missile citadel to an ASW/AAW disposition. Again he must compromise, since no single unit of his screen could credibly combat an approaching group of enemy surface combatants or submarines. As the threat develops, mutual support may be required. Organic aircraft on the escorts (now LAMPS helicopters, later perhaps a fixed-wing VTOL aircraft) may provide some of the quick-reaction support, but other surface ships may also be required.

In defending his formation against an approaching enemy unit, the opponent's problems must be considered. If an enemy submarine detects the formation in transit

and determines that it is near the projected track, then it can loiter quietly and lie in wait. If the submarine determines that its target is passing by or moving away, then it must increase speed to close within classification and firing range. In light of this the tactical commander may choose to zig-zag to hide his direction of movement. He may also concentrate his best active sensors ahead in the van to detect the slow and quiet targets, while placing his best passive sensors on the flanks or astern where they can detect a high speed target prior to weapon launch. His decisions become more difficult when the same units that he desires near his protected units and ahead for antiair protection and ASMD, also have the best passive systems which he would prefer to place at some distance on the quarter.

When the commander has aircraft and submarines available to defend his formation, the same principles and compromises apply. The addition of airborne sensors greatly increases the range at which enemy units can be detected and engaged. The presence of fighter and attack aircraft permit a much more rapid massing of firepower when the threat is ascertained. The range at which the enemy can be attacked without risking surface ships is greatly increased. In short, several new dimensions are added to the enemy's problem. Any tendency to stage too many aircraft at too great a distance from the carrier

(for early warning and intercept) must be balanced against the fact that continuously manning an airborne station requires several planes rotating every few hours with possible course and speed changes by the group for each launch and recovery of aircraft. While a submarine may be the best antisubmarine platform available, careful consideration must be given to its loss of mobility and covertness when it is tied to the varying courses and speeds of the task group. In the heat of an attack, the nationality of submarines is indistinct at a depth of several hundred feet; a careful command and control procedure must be established for adequate safety. Communications doctrine must be established which leaves no question which information will be passed from the submarine to the tactical commander and at what times. This will minimize the increased detectability of all units while communicating.

Perhaps it is for the best that no closed form doctrinal "optimal" solutions exist nor does any set of simple cookbook recipes for formation tactics. Since forward deployment in support of national interests and allies will demand that task groups steam long distances into the vicinity of enemy bases time and time again, formations borne of unproven doctrine could be disastrous. Predictability is a weakness which can be exploited by an observant enemy. If all tactical commanders were

to use the same formations from the same book, countering tactics could soon be devised. Commanders irrevocably wedded to outdated cookbook doctrine would be hard pressed to create innovative responses.

Taking the Offensive

No satisfactory termination to any future war can be foreseen that will not demand the navy take the offensive and fight its way back to regain ground lost during initial phases or to open new fronts. The expanding Soviet empire gives them large quantities of other peoples' lives and real estate with which to pursue their historical strategy of trading space for time in warfare. Our "chivalrous" granting of the first salvo cannot but give them even more space and at no small cost.

Even in operations conducted short of declared warfare visible offensive capabilities are essential. A boxer capable only of defending himself by parrying an opponent's blows cannot persuade anyone. A naval task force concentrating strictly on defending itself cannot affect the situation in the enemy's area of operations, afloat or ashore. In such a hypothetical case, the enemy--especially if he were relatively self-sufficient land power--could simply choose not to engage. Visible offensive capabilities provide a task group or fleet with assertive sea power that must be reckoned with and cannot be ignored.

By design, the best offensive units in the U.S. Navy are its carrier-based aircraft and nuclear powered submarines. As mentioned previously, the addition of Harpoon and Tomahawk cruise missiles to surface combatants as well as submarines is critical for expanding the navy's offensive capabilities. Amphibious forces, of course, have an offensive mission as well, but their employment extends beyond a discussion of purely naval tactics. A major benefit in offensive operations is that gained through advanced planning and taking the initiative. The side on offense may select the time and place to fight and (within the constraints of his intelligence resources and security) control to his advantage the level of forces committed. One must realize that, even with surprise on his side, it may take superior mass or firepower to beat an enemy with a good defensive alignment, the tactical commander may select to concentrate on only one portion of the enemy at a time with a "guerrilla" raid similar to the rollback technique discussed under defense. Many offensive options, in fact, should have become apparent during the discussion of defense. The major difference to be found in discussing possible U.S. Navy tactics comes from the asymmetry of force structure existing between our navy and its potential adversaries.

In offensive operations as well as in defensive the goal is to accomplish the most while risking the least--to exploit estimated enemy weaknesses and vulnerabilities with friendly strengths--to avoid enemy strong points until they can be handled. If, in the commander's estimate, his assigned mission will demand the commitment of all his forces, then his decisions center on how and when to use them to meet his objective. If he has more than sufficient forces, then the principle of economy of force advises assigning only those sufficient to do the job. He must select from among the units available which ones to send, keeping in mind that the enemy's defenses must be overcome before his "mass" can be engaged.

In assembling a force to attack an enemy formation or base, several options are available to be used separately or in combination. The commander must have sufficient forces to offer these alternatives. Otherwise his enemy can know exactly what forces to prepare for. The options should range from blatant and obvious brute force to stealth. For example, he could choose to attack a land base using forces ranging from a multi-carrier task force down to a few saboteurs. At the extremes, the enemy's defenses can be either overwhelmed or subverted, his base can be destroyed by tons of bombs or a few well placed demolition charges. By concentrating

(in time and place) a large raid of many "small" maneuverable weapons (e.g., aircraft), only a few of which are sufficient to eliminate mass, the enemy's defenses can be saturated--an offensive variant to the "Penguin Theory". Against other sorts of targets the commander might select an attacker similar to the target to "slug it out" as in the old-time ship vs. ship duels. Submarines with long-range missiles and torpedoes could be assigned to penetrate the defenses or to go over them with missiles. Ideally the offensive maneuver should have the options of going over, under, around, or through the enemy's defenses to achieve the objective.

If it is impossible to find a course of action avoiding defensive systems, then the commander must balance his offense between suppression and strike. At higher levels this might mean selecting the mix of fighter, attack, and electronic warfare aircraft embarked on a carrier prior to combat, and the number and kinds of escorts furnished. In the operating area, balancing suppressive and supportive tasking against weapon delivery might mean selecting antimissile or antitarget weapons for aircraft loading, and choosing between retaining a cruiser near the carrier for defense or sending it nearer the target for air control and to combat enemy fighters.

After the offensive mission and the force to accomplish it have been selected, squadron and unit tactics come into play. The same principles apply at these levels; hence the discussion of the many tactics available to various units and combinations of units will not be pursued for the sake of brevity. Luck weighs heavily in every outcome. Caution, which has won accolades and promotion for some admirals has brought disgrace or even death to others. Aggressive pursuit of the enemy despite heavy losses can be deemed noble, or futile, or foolhardy, or stupid, or all four. In today's environment, rapid communications may cause brilliant innovative tactics to become fatal dogma in a matter of hours.

Creative, lucky pragmatism may be the best answer, and whatever works may provide the best tactics. Astute tacticians are not born; they are developed through years of experience in their profession that creates instinctive familiarity with capabilities, and a capacity for rapid adaptation to changing circumstances. In peacetime, priorities often force the study of tactics to be secondary to other needs such as material readiness and administration. Only by constant study of allied and enemy systems, thinking through the way they might interact, and experimentation on the game floors and at sea, can sufficient tactical awareness be maintained for success in naval warfare.

CHAPTER V

FACTORS AFFECTING FORCE DESIGN

The Basic Connections

The problems facing a seagoing tactical commander are ones of employing and deploying the forces he is assigned. The force planner, on the other hand, must construct forces and structure the combination of forces procured to provide the future naval tactician with the most capability possible, within a budget that is uncertain and restrictive, and in the face of many contradictory influences on his decisions. The tactician must employ hardware that was designed years previously and manpower that was trained as the result of previous planning and budgeting. He is often frustrated in attempting to influence the quality and quantity of men and machines he has available because, as noted in Chapter I, it takes decades to design and procure new modern weapon systems and years to train the men to operate them. The force designer, at the other end of the system, must remain critically aware of the various tasks and tactics his new units may be asked to perform in the future. If he does not consider tactical utility over a range of possible missions, then the planner has not done his job. If, out of frustration with the time it takes to change

existing weapon systems, the tactician does not initiate change by forwarding lessons learned or generating SORs (Specific Operational Requirements), then he also is remiss.

Considering tactics during force design is not always popular and never simple. Yet, it is critical to building successful systems. When a system cannot reach the seagoing navy for 5-10 years after it is conceived, and when it must last for 20-40 years thereafter, conceptualizing realistic tactics for employment against a threat that is also barely sketched out may be a very difficult task. The major trap into which some recent planners have fallen has been to make facile assumptions on the form of future warfare for the sake of simplifying their task of the moment and to justify reducing current expenditures on hardware. Procrastination in spending is a rewarding endeavor in our bureaucracy, and can be justified for many noble sounding reasons:

- Dollars should be spent to help people, not to kill people. War is immoral.
- We will never fight that kind of war; no enemy would start such a campaign.
- A newer, fancier technology is just over the hill which will make this one obsolete.
- Potential benefits cannot be proven quantitatively.

- The unknowns and imponderables are just too great.
- Some service mismanaged a similar program in the past.
- If the service is more tactically innovative it should be able to accomplish the same task with cheaper systems.
- etc.

Force planners, both military and civilian, are a transient lot and thus sometimes prone to seeking short-term gains. Dollars not spent today create instantaneous rewards from a bureaucracy striving to stretch scarce resources. Spending those dollars, albeit wisely and on hardware critical to solving future tactical problems, may bring no immediate rewards to the planners and will improve capabilities only in the distant future when the planner has probably moved on in his career or been forgotten. Assumptions of limited defensive strategies and benign intentions on the part of possible enemies serve to support decisions which save current dollars at a cost in future capability. Without sufficient true capability, the most imaginative of future tactics become only empty gestures.

A Broader Perspective

It may seem redundant to keep harkening back to World War II in a discussion of modern tactics, but many

of today's tactics find their roots in that era; all of today's tacticians were greatly influenced by the warfare of 1942-1945; and the combined political, economic, military, and psychological strength of the United States may have been at its zenith in the mid-1940s--drastically affecting contemporary views of what should be. The thirty years hence have seen a progression of occurrences culminating in the Nixon (Guam) Doctrine and crises in natural resources which have reflected a return to a lesser place among nations. We have not yet fully absorbed and reacted to the many implications of this reality. This nation keeps searching for means of regaining the old or at least retaining the present without too great an expenditure of resources--dollars, lives, ego, forces or time. After each war there is a rush to demobilize--to get back to the many benefits of life in a free country. It was once hoped that the proven abomination of nuclear war would make all wars impossible. Later it was assumed that forces and tactics designed for modern variants of World War II, which we understood, could easily handle any minor conflagration (which we didn't)--using primarily leftover assets. Later it was assumed that our obvious goodness, a few items of high technology, and blatant lack of aggressive intentions would prove sufficient to permit the U.S. to continue its lifestyle

without resort to violence. All of these assumptions have proven false. Many of today's assumptions and estimates about the probability of retaining our current way of life on the cheap will also prove invalid. There are too many others in the world who desire a similar quality of life. There are not enough resources to go around.

This situation is worsened by the Soviets' obvious desire to enhance their own power in the world. Nowhere is this more evident than in the expansion of the Soviet Navy. That Navy was designed not only with tactics but with a Mahanian strategy in mind. It was designed not to confront the U.S. Navy head-to-head with carriers, but to confront it from above, beyond, and below with nuclear submarines, long-range, land-based aircraft, and cruise missiles. The following quote by Admiral Gorshkov makes his concept of a superior navy quite clear:

> The effect of naval warfare on the course of the war as a whole will be manifested primarily by the degree to which the Navy's capability to destroy land targets and to undermine the strategic nuclear potential of the enemy at sea is realized.
>
> ...in general, a stronger (in total displacement and numbers), but less balanced fleet can be inferior in overall operational capabilities to a numerically smaller, but correctly balanced fleet...the problem of the complete balancing of a navy depends to a decisive degree on that complex process known as the scientific management

> of building it. The solution of the problem of balancing a navy requires great material expenditures, because actually this amounts to building a navy which meets the needs of a given state.

This point of view contrasts markedly with the changing U.S. perception of what is now possible, plausible, and permissible. While the U.S. Navy has continuously cut back, the Soviet Navy has spiraled outward with great centrifugal force over the past 15 years, expanding from a role strictly in continental defense. It has added sea denial roles in open ocean, and now is undertaking political and diplomatic persuasion while threatening the free world's critical commercial lifelines. The U.S. Navy, in contrast to an expanding spiral, can be viewed as a diminishing number of fortified maneuvering enclaves each with a carrier or land base at its center and at the ends of a fragile support line extending from North America. Analogies to the tenuous situation preceding a guerrilla war are obvious. Identical political and strategic analogies also could be made. We stand the risk of seeing that expanding spiral bypass and envelop the fortifications and sever the supporting cords. The risk will increase greatly in wartime as the lines are stretched, the volume and criticality of flow increased, and the threat worsened by requirements to operate in the vicinity of enemy bases.

The United States' side of that asymmetric force relationship has resulted from a combination of decisions which placed peacetime costs above wartime value. Both the Soviet Navy and the U.S. Navy are pyramidal in structure. However, the Soviets, building from a continental strategy, have a stable pyramid pointed upward and outward, with long-range surface combatants at the peak supported by increasing numbers of other units. The U.S. Navy's pyramid stands balanced on its point--a few deployed carriers--with much of the remaining forces at sea dependent on those for survival. Luckily, the U.S. submarine force has not been compromised to fit into the pyramid and can stand alone. However, it may not have sufficient residual conventional firepower to threaten Soviet mass for an effective non-nuclear offense to be mounted after the initial stages of a war. In this situation an initial battle could drastically weaken and destabilize U.S. forces while the Soviets are relatively unaffected.

Cost effectiveness

Why has the U.S. Navy evolved into fewer more heavily defended enclaves? Tactically, a defensive posture requires fewer forces than are required for offensive actions. Uncertainty as to the time and place of the attack leads to heavier fortification of those few vital assets. The economics of fixed and variable

peacetime costs (disregarding a possible offense and attrition) lead to fewer, more capable platforms, placing greater firepower at sea for a given expenditure of funds. Compromising individual unit capability by assuming synergistic benefits from the proximity of other units reduces cost. Each of these actions--focusing on defense, concentrating force on fewer platforms, and cutting capabilities that are available elsewhere--reduce tactical flexibility and wartime post-attrition effectiveness. A force that is obviously designed for a limited number of missions or for a limited number of responses to offensive actions is thereby more predictable and much easier to combat.

Although the U.S. Navy today has a "slim margin of superiority" in those scenarios most vital to national interests, as stated by the Chief of Naval Operations, the forces programmed today compared to those being built for the Soviet Navy leave no room for optimism in the future. They are insufficient. The only hope for success if the Navy is expected to fight and win with inferior forces will be ingeneous tactics. Even that may not be enough. More ships and aircraft are needed and those must be designed for efficient defensive and offensive missions both in battle groups of all compositions and sizes and alone. Recent designs have

emphasized mass over mobility and firepower; that trend now needs to be balanced.

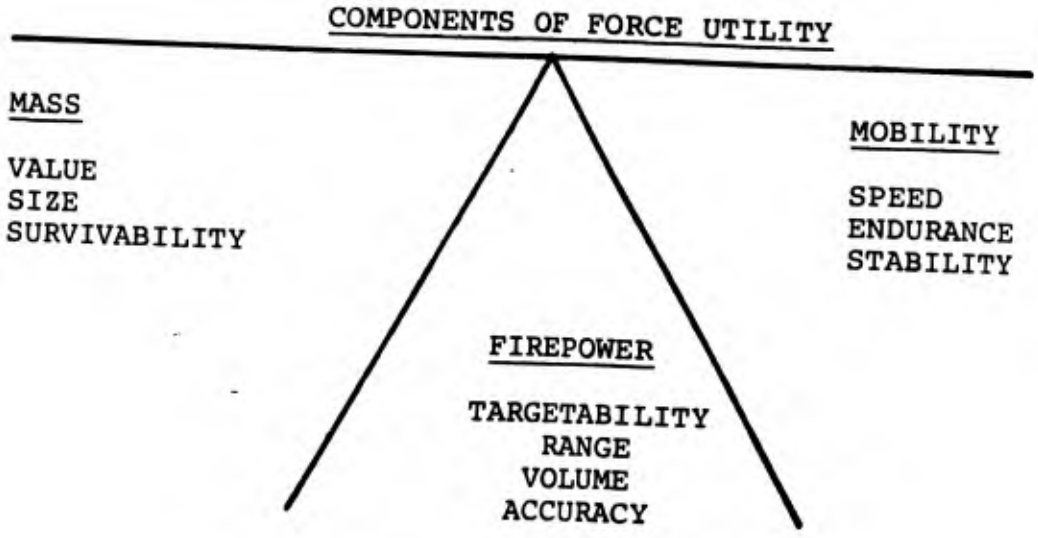
A few years ago the above arguments were expressed in different terms. The principle underlying what came to be known as the "Hi-Lo Mix" was that, while we need a few large powerful ships, there is also a critical need for many ships of admittedly lesser capabilities permitting tactical and strategic dispersal. This principle, which derives from Lanchester's laws of combat, was limited by force planners to strictly defensive applications, relabeled "design-to-cost", and espoused as a budget-cutting device. Dispersing capability does not save procurement money; just the opposite is true. It is cheaper (for example) to put two missile systems, two ASW systems, and two guns to sea on one large destroyer hull rather than on two frigates. The benefits of the two over the one come in conflict at sea, not in budget conflicts in Washington. Arguments about three conventionally powered carriers each with 60 aircraft being more effective than two CVNs having 90 apiece are specious, if to save money only one carrier of either size will be built. Two 50-foot ropes might be "tied" together ingeniously to cross a 100-foot chasm; no 100-foot rope can cross two chasms at once; no amount of ingenuity can make just 50 feet do either job.

Over the past 15 years attempts also have been made to reduce cost by employing a "systems approach" to analyze warfare and design forces. These have led to the realization that, in coordinated operations by a task group, each of the requisite combat functions need not be performed by the same unit. The U.S. Navy reflects a symbiosis--a synergism--in force structure that gives more firepower at sea per dollar spent. However, this situation may also lead to serious weaknesses in open warfare if one of the links in the system is weakened or destroyed. In one example, the carrier relies on logistics ships and surface combatants for local sea control. The surface combatants and support ships require aircraft to handle the air and surface threat. And the aircraft, of course, require the carrier for support. This system is joined by links of command, control, and communications. Such a structure is economically and tactically efficient in peacetime, but may prove vulnerable, if individual unit capability is insufficient should battle damage disrupt too fragile a system.

The Critical Components

There are three critical contributors to tactical utility, whether the platform is a tank, an aircraft, a ship or a task group. These are mass, mobility and

firepower. There is an obvious overlap with the established Principles of War. Mass reflects the size, survivability and strategic contribution of a unit. Mass can be varied in combat by concentration, dispersion, and by command/control/communications. It can be varied during design by changing size, armor thickness, volume allocation, defensive systems, and independence. Mobility provides the capabilities to maneuver and create mass, to bring firepower to bear or to avoid superior enemy firepower. Firepower is the output of mass--designed to damage enemy forces; it reflects the size, quantity, and variety of targets which it can destroy, and at what range.



It would be conveniently neat for analysis if there were a precise rock-scissors-stone relationship

between these components (or better, were a symmetric arrangement possible) so that the total utility of possible opposing forces could be readily measured. There is not. Firepower depends upon friendly mass and mobility, and is targeted against enemy mass and mobility. Mass defends itself against enemy firepower, projects own firepower, and relies upon mobility for each task. Comparisons of mass to mass and firepower to firepower are misleading. That's one of the reasons why assessments of net capability demand much more than a simple comparison of relative tonnage or numbers of ships.

In designing naval forces which will add to existing quantities of ships and aircraft, and replace them as they become inefficient due to age and tactical obsolescence, one must work within the nearly orthogonal three-dimensional space of Mass, Mobility, and Firepower. He must also be willing to compromise among them, as constraints he cannot change may dictate. However, balance is essential if the force is expected to perform many functions, some unforseeable, over decades, and worldwide. Some examples may clarify the point. Torpedo boats had long-range firepower and were capable of speeds but suffered from only short-term mobility and a very fragile mass. Battleships had firepower and mobility, but insufficient defensive mass to contend with the firepower of saturation air raids in 1941.

After the addition of defensive AAW guns to the battleships, they became awesome in a variety of roles in the later years of that war. Attack aircraft have firepower and mobility, but relatively insignificant mass. Cruise missiles, compared to those aircraft, reduce mass almost to zero and thus become nearly pure weapons. Land bases have firepower and mass but no mobility. Support shipping adds mass and mobility (logistics for endurance) to a force, but no immediate firepower. Communications are essential to mass, since they permit the command and control necessary for coordinating and unifying the actions of many units. To withstand the Soviets' threatened "battle of the first salvo", the U.S. Navy must have sufficient mass and mobility to combat enormous firepower, and the resilient mobility to regroup. To counterattack, it must have sufficient mobility to engage or avoid, and firepower that can combat not only the Soviets' expendable navy, but critical targets ashore as well.

Also of great value in force design is consideration of the aforementioned Principles of War. By focusing on a defensive rather than <u>offensive</u> postures and relying on a reactive strategy rather than setting an <u>objective</u>, the U.S. Navy has been forced to build fewer separate units of <u>mass</u>. Thus it loses some capability to <u>maneuver</u> and cannot employ <u>economy of force</u>,

because the mass cannot be divided into independently capable pieces. Other principles are violated often by those who breach security by going public for their debates, which in turn reduces any opportunity for surprise.

As for simplicity, the principle that things should be understood by an many of the participants as possible, in this age of sophisticated technology, simplicity is of more value than before. Both in the Vietnam War, which we lost and World War II which we won, the victorious side entered the war with greatly inferior technology, yet prevailed. Fascination with fancy hardware to the detriment of warfighting capability can be very costly. Simplicity in weapon operation and maintenance is critical in view of today's long and distant deployments, the high costs of manpower, and projections of shortages. A ship, aircraft, or system too sophisticated to be handled by the sort of sailor who may volunteer in 1990, over a long deployment, on rough seas and in combat, should not be procured or designed today.

The Bottom Line

A U.S. Navy of sufficient quality and size--sufficient mass, mobility, and firepower--to meet any or all of a number of contingencies, worldwide, even if the on-scene commander is not an astute tactician, would be suitable

(by definition), but not feasible. An annually compiled document of the Joint Chiefs of Staff, the Joint Strategic Objectives Plan, or JSOP, provided the force levels with which military leaders could feel confident of accomplishing whatever tasks might be assigned. No administration for years has felt that this nation could afford such a high level of expenditure on defense, while so many other competing demands for federal funds existed. Unless something precipitous occurs to reorient this nation's perceptions of the priority of its needs, that situation probably will not change.

Retaining tactical and strategic stability and superiority for future naval task forces requires that conventional offensive power, against all sorts of targets, be spread over as many ships as possible. They need the firepower to destroy whatever mass is critical to the enemy and the mobility to attain and remain in firing position. These characteristics must be residual even after the task force receives damage which reduces its unity of command and forces independent actions.

A force planning policy which would lead to an asymmetric parity and some sort of "mutually assured destruction", in a naval sense, will not be sufficient for a nation relying on the seas for economic and political survival. What is needed is a navy built and deployed for

assured survival of the initial battle, which favors the side shooting first. Then that navy must be able to take the offense and prevail, using a variety of tactics and strategies, not just against the enemy's navy (although that may be a first step), but against more influential mass as well. If this nation is to retain a capability for influencing the world affairs which affect its people, then it must have the will to create and exercise all four types of power: political, economic, psychological, and military. Naval forces, and the tactics by which they are deployed and employed, are visible evidence of commitment to allies and deterrence to opponents. In the future, when this nation attempts to exercise power it may find that the resources provided by today's planners are inadequate, no matter the tactical ingenuity of that era's politicians, economists, generals, and admirals. As shown even in the simple terms of this paper, modern forces and tactics are a complex topic. The future world in which they must succeed is not clearly defined. One thing is clear. A commitment to sufficient and balanced forces for exercising power in the future is critically required today.