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Robert C. Rubel

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The U.S. Navy has never been comfortable with theory or doctrine at what is now known as the operational level of war. The Navy has always possessed robust ship- and formation-level doctrine—tactics—and of course has embraced the high-level sea-power theories of both Alfred Thayer Mahan and Julian Corbett. The gap in the middle either has not been needed—as has been essentially the case for most of the Navy's history except for World War II—or has been filled by adaptive practice in the form of specific campaign or operations plans. For the Navy, the old framework of strategy and tactics has sufficed since 1945. However, an emergent set of circumstances in the form of Chinese naval development, as well as a new generation of weapons and sensors, is driving the Navy into incorporating the operational level into its culture. Moreover, this development is bringing the Navy into competition, or perhaps conflict, with the U.S. Air Force over which should exert operational control of aviation over the water. Whereas this task was always presumed to be the preserve of the Navy, the establishment in Hawaii of a regional Air Operations Center (AOC) that in theory controls all air in the theater will challenge Navy assumptions and equities. The tactics of interservice squabbling aside, the Navy will need a theory of naval airpower as a foundation for its arguments to preserve operational control of its aviation.

Professor Rubel is Dean of Naval Warfare Studies at the Naval War College. Before retiring from the U.S. Navy in the grade of captain, he was an aviator, participating in operations connected with the 1973 Yom Kippur War, the 1980 Iranian hostage crisis, the TWA Flight 847 crisis, and DESERT SHIELD. He commanded Strike Fighter Squadron 131 and served as the inspector general of U.S. Southern Command. He attended the Spanish Naval War College and the U.S. Naval War College, in Newport, Rhode Island, where he served on the faculty and as chairman of the War Gaming Department, in the Center for Naval Warfare Studies, before his present appointment. He has a BS degree from the University of Illinois; an MS in management from Salve Regina University, in Newport, Rhode Island; and an MA in national security and strategic studies from the Naval War College (1986).

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An operational-level theory of naval airpower must be derived from practice—how it has been used and why it has been successful. Naval aviation is a subordinate element of American sea power and, as such, has established no separate theoretical basis for either its own justification or employment. While this theory vacuum has kept it from advancing its command-and-control doctrine the way the Air Force has, it has produced a flexibly minded organization that is very good at adapting to novel operational circumstances. In contrast to airpower theory as interpreted by the Air Force, naval aviation has never linked itself to an a priori mechanism for strategic victory or regarded itself as an independent strategic weapon. Nonetheless, as the Navy transitions to the operational-level Joint Force Maritime Component Commander / Maritime Operations Center (JFMCC/MOC) framework for its command and control (C2), a theory is needed both to guide the development of C2 doctrine and to make the case for maintaining operational control of naval aviation within Navy lifelines.

Naval aviation, for the purpose of theory and doctrine, can be divided into the following categories:

- *Carrier air wings:* the airframes, both fixed- and rotary-wing, manned and unmanned, that operate from the deck of an aircraft carrier
- *Land-based naval aviation:* maritime patrol planes and electronic-warfare aircraft
- *Organic surface-combatant aircraft:* manned and unmanned helicopters and small, fixed-wing unmanned aircraft
- *Organic Marine aviation:* fixed- and rotary-wing aircraft attached to embarked Marine units.

These categories omit much—aircraft for training, logistics, test and evaluation, etc. Such aviation elements can be thought of as infrastructural support and are not directly parts of theory.

Three kinds of naval operations have relevance to the development of naval aviation theory: seizing, maintaining, and exercising command of the sea; performing sea control; and bombarding targets ashore, to include support of amphibious and ground operations. In the early part of the Cold War, nuclear-warfare operations would have been included as a distinct kind of operation that affected theory and doctrine, but these days that burden falls on the submarine force.

The single most important concept in terms of defining a theory of naval airpower that is distinct from land-based-airpower theory is that naval aircraft are essentially extensions of ship weapons and sensors. Two key characteristics of aircraft produce their utility: the ability to see farther from altitude and the ability

to deliver ordnance beyond the visual horizon. The whole logic of naval aviation development stems from these two characteristics.

Being fused to basic naval theory, naval aviation theory is influenced by the three traditional "Fleet Rules" governing fleet operations—rules that are not, however, explicitly codified in any existing doctrine:

> *Fleet Rule 1:* Keep the fleet concentrated (strategically). If there is an opposing fleet, dispersing your own fleet (other than tactically) invites defeat in detail.[1]
>
> *Fleet Rule 2:* Do not become decisively engaged with land-based forces unless you are decisively superior in strength. Generally speaking, land-based forces can generate a greater rate of fire per unit time than naval forces of equal strength can, so the latter must compensate by bringing larger forces to bear. Moreover, air bases on land are easier and cheaper to reconstitute than sunk or badly damaged carriers.
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> *Fleet Rule 3:* Do not compromise the mobility of the fleet. At sea, striking effectively first is the key to victory. Achieving this means either having longer-range weapons than does the enemy or being able to find him first and strike before he finds you. Sacrificing mobility by tying the fleet to a geographic point increases the odds that *you* will be found and struck first.

Any of these rules may be broken or ignored if conditions allow, but breaking them when there is significant opposition is a recipe for losing ships. All of these rules have applied to everything from fighting sail to aircraft carriers, but in the case of carriers they result in a particular structure of logic. From these rules, in part as manifested in the Pacific in World War II, we can identify four levels of at-sea aviation capability.

Level 1: An Air Fleet

At a certain level of aggregation, naval airpower becomes an air fleet. In World War II this meant at least six aircraft carriers operating together, such that there were over four hundred aircraft available. A force of this size had two key characteristics not shared by a smaller grouping:

- It could multitask. Whereas a smaller force would have to make risky mission trade-offs, a carrier air fleet could mount a robust defense at the same time it was conducting robust offensive strikes. It could search and have a strong strike package at the ready at the same time.
- It could stand and fight against strong land-based air forces, whereas a smaller group would be forced to conduct hit-and-run raids.

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The number of today's aircraft carriers needed to create a naval air fleet is not known, but it is liable to be a function of the opposition arrayed against it. The United States grouped four carriers in the Persian Gulf for DESERT STORM, but there was no opposition, and their sortie numbers were dwarfed by those of the Air Force. The effectiveness of a large grouping of carriers against Iran is one thing, against China quite another. (It may even prove to be the case that against a modern anti-access/area-denial [A2/AD] array—one that includes antiship ballistic missiles, numerous submarines, and dispersed surface craft packing three-hundred-nautical-mile antiship missiles—the concept of a naval air force is irrelevant.)

The air fleet obeys Fleet Rule 1—strategic (and operational) concentration. It is this concentration that allows the air fleet to comply with the "decisively superior" provision of Rule 2 and therefore be able to break Rule 3 with acceptable risk, as did the U.S. Fifth Fleet in the Marianas and at Okinawa in World War II.

Level 2: Carrier Strike Force

At numbers below those of an air fleet, carriers essentially break Fleet Rule 1, which makes breaking the other two rules risky, if not suicidal. This was precisely the case for the Japanese Kido Butai at Midway. Four carriers were not enough to strike Midway, search effectively, defend the force, and be ready to strike American carriers if they showed up unexpectedly, all at the same time. The Japanese broke Rule 3, by linking themselves to Midway, and disaster resulted.

The carrier strike group, consisting of one carrier and its escorts—or its variant the strike force, consisting of two or more carriers and their escorts—has been the staple of U.S. Navy operations since the end of World War II. A theory of naval airpower at this level of aggregation (or dispersal) requires an examination of the mission roles that aircraft carriers perform.

Role 1: Eyes of the Fleet. In the early years of naval aviation, aircraft performance was insufficient for carrying meaningful bomb loads for meaningful distances. However, aircraft could spot the fall of rounds from major-caliber guns far more effectively than could sailors high in the upper works of battleships. This role morphed into organic scouting as the carriers became strike platforms. The scouting function remained active with respect to the escort carriers that populated the hunter-killer groups covering the mid-Atlantic gap unreachable by land-based patrol planes during the Battle of the Atlantic in World War II. After the war, the scouting function was subsumed by the other roles the carriers performed.

It should be noted that this role might resurface for aircraft carriers. Instead of going forward into waters covered by A2/AD systems, carriers might support surface and subsurface operations from the outside by operating long-range, high-endurance unmanned aircraft to conduct search and, perhaps more

importantly, provide electronic relay to support line-of-sight communications if satellites are taken down.[2]

Role 2: Cavalry at Sea. After the Pearl Harbor attack the United States did not have the wherewithal to mount a concentrated attack on Japan. That had to wait for the arrival of new-construction ships, which would not start arriving in numbers until 1943. From May to November 1942 the carriers fought cliff-hanger battles that so depleted both sides that by the end of November the American and Japanese navies were each reduced to one fully operational carrier. Between these engagements the few available U.S. carriers in the Pacific were employed in hit-and-run raids. The Doolittle Raid was the most famous of these. They were in no position to stand and fight against the Japanese navy or even island air bases; since they could not concentrate, they had to observe Fleet Rules 2 and 3 scrupulously. In this sense they were used in a way not unlike the Civil War operations of the Confederate cavalry general Nathan Bedford Forrest.

Role 3: Capital Ship. In World War II, carriers fought for command of the sea and thereby replaced the dreadnought as the true capital ship. They have retained that role to the extent that they are deployed around the periphery of Eurasia to help enforce the international order.[3] In this role the carrier must obey the three Fleet Rules if there is any opposition at sea. The utter absence of even potential opposition since the fall of the Soviet Union has generated the illusion that American carriers are all-powerful. The danger is that the illusion could be crushingly shattered if the U.S. Navy, out of habit, breaks the rules in the face of, say, the Chinese navy. The effectiveness of the modern aircraft carrier as a capital ship in an age of nuclear submarines, antiship missiles, space, and cyber has not been tested. This fact should be respected.

Role 4: Nuclear-Strike Platform. The Navy adopted this mission in the late 1940s in response to Air Force assertions that the B-36 and nuclear bombs had made the Navy irrelevant except for convoy escort. By the mid-1980s this mission had faded out for naval aviation as the ballistic-missile submarines came online, along with nuclear-tipped cruise missiles. Meanwhile, as nuclear-strike platforms, carriers operated outside the framework of the three Fleet Rules. They dared not concentrate; their sole imperative was to survive long enough to launch their nuclear strikes.

Role 5: Airfield at Sea. When the North Korean army invaded South Korea in 1950, the only weapons at the immediate disposal of General Douglas MacArthur were several aircraft carriers, which saved the day by launching interdiction sorties until the Army and Air Force could show up in strength. Carriers served in the same way—first on station, ready on arrival—in DESERT SHIELD and the first

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Afghanistan campaign. Essentially those carriers functioned as airfields at sea. By definition this role requires the breaking of Fleet Rules 2 and 3; moreover, because of the strategic circumstances of the Cold War and after, adherence to Rule 1 was unfeasible. Thus if a carrier is to function as an airfield at sea, no threat can be tolerated. U.S. carriers have functioned in this role frequently and with impunity since World War II. Institutional complacency about this state of affairs led to the disregard of war-at-sea capability, a disregard for which the Navy almost paid in 1973, when the Yom Kippur War erupted. The Sixth Fleet's carriers found themselves confronted in the eastern Mediterranean by a numerically superior Soviet fleet that possessed both antiship missiles and a doctrine for using them.[4] The U.S. carriers had neither suitable weapons nor viable tactics for antiship engagements.

The dangers of trying to employ carriers as airfields at sea when there is an appreciable threat must be understood and taken into account. Whatever roles they are performing, carriers are inherently capital ships and should not be risked unless command of the sea is at stake, which is almost never the case when support for land operations is the mission.

Role 6: Geopolitical Chess Piece. Aircraft carriers have a glorious battle history; they are big, powerful, and glamorous. All of this makes them exceptionally useful for various forms of naval diplomacy, both friendly and coercive. Moreover, uniquely among U.S. forces, they are ready on arrival to conduct combat operations without the buildup of logistics. American presidents can move them around the seas like queens on a giant chessboard. Without getting into the effects of such moves, we can say that the acceptable risk profile is much the same as that of the airfield-at-sea role. All three Fleet Rules usually must be violated, but especially Rule 3, violation of which is inherent in the role. As with the airfield role, the United States has become accustomed to its carriers performing this function with impunity, so much so that it has become habitual, and perhaps worse, the assumption of impunity has become embedded in the Navy's corporate culture.

Level 3: Aviation-Capable Ships

Aviation-capable ships are generally those with flight decks that run the length of the ship (i.e., "through decks"), allowing them to operate a wing of helicopters and short-takeoff/vertical-landing jets. The U.S. versions are the large amphibious ships that embark Marine Corps aviation units. The specialized function of these ships and wings is to support Marine expeditionary operations. Thus these ships are built to perform a miniversion of the airfield-at-sea role, and that role's acceptable-risk profile applies. Other navies have added ski jumps forward to allow added takeoff weight, and some have arresting gear, to avoid the performance

penalties of vertical landing. Countries building such ships call them "aircraft carriers," but an analysis of their capabilities reveals they are only marginally, if at all, capable of performing any of the six carrier-mission roles. Their limitations are such that they are classed here as aviation-capable ships rather than true aircraft carriers.

Having identified the limitations of the ship type, we must nonetheless also acknowledge its potential strategic utility in certain defined circumstances. First, by calling these ships carriers countries can claim membership among the naval elite, thus serving the cause of naval nationalism. True carriers or not, they are powerful sources of pride, as evidenced by the Chinese public's enthusiasm for the People's Liberation Army Navy's *Liaoning,* a refurbished Russian aviation-capable ship. More objectively, the aviation capability of these ships makes them flexible and more broadly capable than a surface combatant or amphibious ship without a through deck. They can provide instrumentality in everything from disaster relief to gunboat diplomacy. Since even these ships are very expensive to build and operate, countries will only have one or two, making their employment beyond their home waters rare and episodic.

Included in this category are the recent classes of Japanese "destroyers" that have through decks. The destroyer description was adopted for political reasons, but does suggest that the primary function of the embarked air wing (helicopters only at this point) is antisubmarine warfare (ASW) and sea control.[5] In this sense they are first cousins to the old Soviet *Kiev* class of aircraft-carrying "cruisers," so called to sidestep the strictures of the Montreux Convention (which prohibits the passage of aircraft carriers through the Dardanelles and Bosporus, linking the Black Sea with the Aegean). Indeed, since the Soviets were unable to build an even modestly capable vertical-takeoff-and-landing jet, the only viable use for those ships was ASW. However, a through deck, ski-jump bow or not, provides the potential for operating a few tactical jets, if they have the required performance. Whatever the basic utility of doing so, however, these ships are limited by their inability to operate fixed-wing early-warning aircraft, having to rely instead on helicopters equipped for the role—a far inferior solution.

Level 4: Ships with Helicopter Decks

Most modern combatants feature decks aft from which they can operate an embarked helicopter or two or with which they can serve as "lily pads" for visiting helicopters. Either way, this aviation capability greatly increases the ship's reach, security, and ability to stay at sea. The advent of unmanned aircraft further extends the aviation potential of surface combatants, in a sense reprising the catapult-launched floatplanes that were found on battleships and cruisers in World War II. The small Scan Eagle unmanned aerial vehicle (UAV) has become almost

ubiquitous on board U.S. destroyers and has proved extremely useful in scouting and surveillance. However, this organic aviation capability on board surface combatants does not elevate those ships into the arena of naval aviation theory; their flying machines simply make them more capable surface combatants. Having said this, if aircraft flying off surface combatants were to be networked into the operations of carrier air wings, their relevance to theory might change.

Land-Based Naval Aviation

Taken as a whole, most naval aviation in the world is land based—aircraft functioning either as scouts or as virtual extensions of coastal artillery. Their purpose is to exert control over the seas over which they can fly. This was their key mission in the Battle of the Atlantic in World War II. In the Pacific, the United States used long-range aircraft to scout the seas looking for Japanese naval forces, supplementing or replacing carrier-based scouts, depending on the situation. Both the Japanese and Americans also used land-based medium bombers and tactical fighters to find and destroy enemy ships. While imposing attrition on the enemy is a desired goal at times, the real effect of land-based aviation is to create "no-go" zones for capital ships. In this they are behind the rationale for Fleet Rule 2.

For all the real and potential ability of land-based naval aviation, there has always been a disconnect between it and embarked naval aviation. Part of the reason involves "tribal" differences in culture, and part is in the dichotomy in missions. However, there have been occasions on which the two aviation arms should have worked in coordination. The 1980s Maritime Strategy provided for moving an aircraft carrier northward into Vestfjord, in Norway. It was supposed to find sanctuary there from Soviet air-launched antiship missiles, as the hills of the long seaward peninsula would disrupt radar seekers. However, if it was to get up to Vestfjord without falling prey to a lurking Soviet submarine, there had to be an antecedent area-ASW effort—mounted by patrol planes flying out of Iceland. The Soviets, analyzing the problem, assigned the long-range Su-27 Flanker fighter to the campaign as a patrol-plane killer. When the need for providing fighter protection for the patrol planes was raised in the U.S. Navy, the carrier fighter community refused to entertain the idea, not wanting even to talk to the patrol community. Fortunately, the Vestfjord scheme never had to be activated.[6]

THE THEORY OF SCOUT BOMBING

At first glance, scout bombing seems an obsolete concept, right out of World War II, and out of place in this discussion. However, this element of theory provides important insights into the potential dynamics in the application of naval aviation in a war-at-sea situation. Scouting has always been a critical function in naval war fighting, from frigates in the age of sail to floatplanes operating from battleships

in World War II and the Scan Eagles of today. In lieu of an ability to identify ships on radar returns or from space, human eyes must be employed to build a picture of surface traffic in a specified section of ocean. Normal Navy practice has been for land-based patrol planes, embarked tactical aircraft, surface combatant helicopters, or UAVs to fly out and identify radar contacts. In peacetime this is a benign and routine procedure, if somewhat inefficient. However, in crisis or in wartime it becomes scouting, and a particular logic attends its practice.

In an era of long-range antiship missiles, it is imperative that a battle-group commander have a complete and accurate picture of surface activity, perhaps out to three hundred nautical miles or more from the carrier. Although satellite-based information of various kinds can be enormously useful for cueing, it cannot produce the kind of detailed information that a set of human eyes on the scene (in person or via UAV sensors) can and that is needed for a positive identification. Getting positive identifications necessitates dispersal of aircraft widely—and singly. If a hostile or potentially hostile combatant is detected, scout-bombing logic comes into play.

Let us first assume a situation in which hostilities have commenced and the rules of engagement allow preemptive attack on enemy units. If the air-wing doctrine requires a coordinated antiship strike involving four to eight aircraft, word must be passed from the scout making the identification, a decision to strike made (perhaps in the context of an ongoing battle group defense), and either a strike force (of aircraft waiting on deck on alert) launched or aircraft already airborne assembled. Depending on the distance to the target, there may be up to a half-hour's delay before the strike arrives. This is enough time for the enemy to react or prepare in a number of ways. But what if the scout aircraft carried its own antiship missiles? These would have to be short-range and relatively light, so they could be brought back on board the carrier without incurring too great a fuel penalty for the aircraft. *By definition,* if the scout is still alive to identify the enemy at, realistically, a maximum of about eight miles, it can get off a shot. The shot may not sink or disable the enemy ship, but it might do enough system damage to make it less of a threat. Of course, if the ship has surface-to-air missiles, the minute the scout breaks the radar horizon—at, say, thirty nautical miles if at low altitude—it becomes vulnerable to these systems. Magnifying optical or infrared systems on the scout may shorten this vulnerability window by allowing identification not long after it breaks the radar horizon. In such a case the aircraft is functioning as a true extension of ship sensors and weapons.

A major advantage of this arrangement is that it fuses the sensing, identification, and attack functions, so the "observe, orient, decide, act" loop is very quick. Second, it meets international-law requirements on two counts: positive

identification of the target and a human (a moral agent) to make the firing decision. In addition, such delegation reduces the decision-making load on the battle group's Composite Warfare Commander (CWC), its chief tactical officer.

In a crisis in which, however, adversary units have not been generally designated as hostile, the issue becomes one of control. To what degree can firing authority be delegated to aircrews? Of course, the basic posture would be to require permission from the CWC to fire, unless the enemy unit fires first. There are many possible variations, and there is always the question of the adequacy of communication between the scout and CWC. However, risk in this kind of situation can be managed by issuing tactical doctrine telling aircrews what to do if a potential hostile unit is identified—perhaps to retreat immediately over the horizon, shadow the adversary, and await orders. Even in this case, the option of instant strike remains available.

A coordinated strike of any kind is predicated on the idea that one aircraft either cannot get through enemy defenses or cannot carry sufficient firepower to produce the desired effects. Neither of these things applies in the case of scout bombing. The logic of coordinated strike is antithetical to the logic of local sea control, where dispersal for coverage is the most important factor. Conversely, in an age of antiship missiles, achieving a coordinated-time-on-target salvo from different directions suggests dispersion of firing units. The difficulty of shooting down modern antiship cruise missiles places a premium on disrupting the salvo at its source. This again suggests scout bombing, especially in a brink-of-war situation. A robust scout-bombing posture might even have deterrent value—at a minimum, the enemy's hand will be tipped if it shoots at a scout bomber. This logic was the basis for Sixth Fleet "bird-dog" tactics used in the standoff with the Soviet fleet during the 1973 Yom Kippur War, in which carrier aircraft orbited above Soviet units, watching for missile launches from their decks. Interestingly, the increased endurance, stealth, and enhanced electronics of the F-35 Lightning II suggest it would be good in this role. Perhaps even better would be a form of the X-47 unmanned combat air vehicle; its high endurance and stealth, coupled with its carrying no crew, might make it an excellent scout bomber if equipped with the right kind of short-range missile. Of course, the difficult parts would be connectivity and an autonomous rule set.

The idea that modern war at sea will be like carrier battles in the Pacific in World War II must be discarded. American carriers will not be fighting a counterpart fleet of carriers but rather an array of land- and sea-based missile platforms. The United States has no choice but to concentrate naval airpower in large nuclear-powered aircraft carriers, but their air wings, for sea-control purposes, will need to spread out as much as possible. Attempting to saturate defenses with aircraft is, given the relatively small numbers of naval fighters available, precisely

the wrong approach. Each fighter must have the capability to disable or disrupt one surface unit.

As newer, more capable sensors and weapons enter the fleet, they might change the whole equation with an ability to get positive identifications against noncooperative vessels (perhaps actively trying to look to nonvisual sensors like merchant ships) at greater ranges, and at the same time to carry long-range antiship missiles. At that point fixed-wing tactical aircraft may not be needed at all to exert sea control but could be used for other functions, perhaps easing the opportunity-cost dilemma that has always attended carrier flight operations at force aggregations below the level of an air force at sea.

THE THEORY OF FLEET DEFENSE

In the Cold War, the Navy developed for defending carrier battle groups against Soviet air attacks a robust doctrine called "vector logic."[7] It established a circular grid, not necessarily centered on the carrier, within which fighters could be moved like chess pieces. The premises of this doctrine were, first, that the sky is big and fighters are few, and second, that it is far more effective to shoot down bombers before they can launch their antiship missiles than to try to stop the missiles later. The details of this doctrine need not be examined to understand that it was inherently tactical. Fleet defense is a broader matter than just protection of the aircraft carrier, but that element is central if carriers are present.

If we go back to the Vestfjord scheme, we can see how the matter of fleet defense takes on operational-level overtones. Recall that patrol planes operating out of Iceland were to sweep the Norwegian littoral of Soviet submarines, allowing the carrier to move up to its bastion without being torpedoed. But the patrol planes themselves were at risk and needed fighter cover. Cascading requirements set the dimensions of a major naval operation, one whose effects were intended to be strategic. Ultimately, naval air strikes on the Kola Peninsula would take down Soviet air defenses, paving the way for Air Force B-52s. They, in turn, were supposed to force the Soviets to divert forces from their offensive in the "Central Region"—that is, against Western Europe. As for the early step of defending the patrol aircraft clearing the way for the carrier steaming north to its haven, since land-based NATO air forces in Norway would presumably be occupied with other requirements and in any case not trained to conduct protection of an air ASW effort, U.S. Navy carrier fighters would be needed. Thus an operational concept would have to be developed that included the initial carrier positioning and fighter-stationing schemes to support the patrol planes. The point here is that in this case fleet defense was an operational-level matter, requiring planning and oversight by an operational-level staff. Fleet defense, be it tactical or operational, is always a prelude to and facilitator of naval offensive operations.

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Of course, Aegis cruisers and destroyers are arrayed around a carrier to conduct hit-to-kill defense. They are very capable, but modern antiship missiles are getting harder to intercept, and magazine sizes are fixed. Tactical soft kill in the form of chaff and jamming will play an important role, but from an operational-level perspective, the goal would be to avoid having to fight a tactical defensive battle in the first place. That means, ideally, keeping the carriers unlocated or at least untargeted. Satellites, cyberspace, cell phones, and over-the-horizon radars, on one hand, and the need for the carrier strike group to radiate detectable emissions in order to fight, on the other, make this goal challenging to say the least. In the Cold War, operational deception via maneuver was a tactical matter; U.S. carriers routinely utilized such methods as "sprint and drift" to dodge Soviet satellites to show up unexpectedly somewhere. In today's interconnected world, operational deception, especially for a carrier battle group, will require operational-level planning at the regional and perhaps global levels, leveraging emission control, deceptive emissions, and cyber-based disinformation. Air operations will be fed into this fabric, but their role will not be anything like it was in Cold War practice.

In the future, operational-level fleet defense will be focused on preparing the joint operations area in such a way that the carrier is able to perform the specific mission role required at an acceptable level of risk. Some roles will require more extensive preparation than others. The objectives will be to blind and confuse the enemy and, depending on the situation and rules of engagement, destroy his capability to shoot. Carrier fighters may work in conjunction with submarines and surface "flotilla" forces (about which more below) to do this. In this sense, operational-level fleet defense can be preemptive and offensive. It should be emphasized at this point that such operations, like almost all naval war-fighting operations, will involve the integration of subsurface, surface, and air capabilities—on both sides. This characteristic distinguishes naval warfare from its counterpart over land. As in the Vestfjord example, coordination between land-based and carrier-based aviation will be necessary, as will coordination of both with surface and undersea operations. The JFMCC will be the appropriate authority to make all of this happen.

Operational-level fleet defense also involves preparation of potential battle spaces in peacetime, which is why electronic-warfare aircraft patrol certain areas. It is one thing to gather information, but the idea of battle-space preparation can easily extend to a variety of peacetime operations designed to shape potential-enemy perceptions and expectations such that the fleet is set up to maneuver successfully in either crisis or war.

The logic of operational-level fleet defense extends to amphibious operations. If opposition to a planned assault is possible, it is the mission of carrier aircraft

to prepare the amphibious operations area (AOA) in accordance with the previously discussed provisions of operational-level fleet defense. A key characteristic of amphibious operations is that they break Fleet Rule 3 by tying at least part of the fleet to a geographic point. Very little opposition can be tolerated at force levels below that of the air fleet. The limited sorties available from aviation-capable amphibious ships will be mostly involved with support of troops on the ground; wider security and defense of the AOA will have to be provided by carrier aircraft. This general framework applies to both amphibious operations across the beach and those involving deeper aerial insertion. Special operations, by their nature, cannot accommodate the same kind of area preparation, but at times robust air support must be available to cover extraction if plans go awry.

There is emerging in American naval thought the concept of "flotilla" operations, the use of an array of smaller combatants along with other manned and unmanned forces in a littoral wherein the threat level precludes the presence of high-value units. These forces cannot operate effectively, at least for very long, if subjected to enemy air attack. Thus, in a way similar to the Norwegian Sea airborne-antisubmarine-warfare dilemma of the 1980s that we have discussed, flotilla forces must be provided some degree of air support. This may emanate from carriers or, possibly, from small, movable land-based detachments of Navy or Marine air. This point recalls the original logic of aircraft carrier operations—to provide air superiority over the fleet and protect forward scouts that were spotting the fall of shot in battleship gunnery. The mission will be air superiority—or perhaps the disruption/prevention of enemy air superiority—at a distance.

COMMAND AND CONTROL

In the summer of 1990, before Iraq invaded Kuwait, the USS *Dwight D. Eisenhower* (CVN 69) battle group was sailing placidly through the Mediterranean. Its commander got a message from Sixth Fleet requesting a campaign plan against a certain country. This was simply a professional exercise, and its scenario was supposed to involve only two carrier air wings. After several weeks of effort, the commanding and executive officers of the squadrons in *Eisenhower*'s air wing produced a logistically feasible plan. However, in the process of planning a gap was discovered—that there existed within the CWC structure no command-and-control capability that could direct an extended and progressive air campaign. The existing CWC apparatus was designed for defense of a battle group, not offensive air operations. The air wing could plan and execute one-time strikes, but it could not monitor or assess progress over time or exert real-time control. This gap existed because the Navy had not conducted an air campaign since Vietnam, and even in that war air operations had been conducted on the basis of "route

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packages," meaning that naval strike operations had been simply a series of discrete strikes directed by higher authority.

This problem came home to roost two months later when *Eisenhower* moved into the Red Sea in response to the Kuwait invasion. As the Navy dispatched additional carriers to the scene, the Air Force stood up its Air Operations Center and asserted control over all air operations. The Navy was unhappy about this but had no countervailing C2 structure or underpinning theory of naval airpower. As the air-war phase proceeded, Navy battle-group staffs in the Persian Gulf became frustrated that their target nominations to the AOC, targets chosen to prepare the way (as a matter of operational-level fleet defense) for a putative amphibious assault in Kuwait, were being rejected. They started to nominate primary targets they knew the Air Force–dominated AOC would approve but attached secondary targets that were their real objectives. After launch, Navy aircraft would inform the airborne control cell they were switching to their secondary targets. This need to subvert the targeting process highlights the problem—the naval aviation staffs instinctively focused on supporting the Marines (not knowing, of course, that the landing was a feint), but there was nothing in Navy theory or doctrine to support an argument for their priorities.

Today, Navy operational C2 is shifting to the Joint Force Maritime Component Commander with Maritime Operations Center structure, the better to coordinate with, but also compete with, the Air Force AOC. Thus far, the Navy has focused on the mechanics of MOC operations and has not yet developed a theory equivalent to that governing U.S. Air Force airpower. The issue will come to a head in the Pacific, where the Air Force has a theater JFACC (Joint Force Air Component Commander) / AOC. Because its theory states that airpower must be under centralized command, the Air Force has contended that the maritime domain does not include the air over the water. The matter has been settled in the Navy's favor for now, but it is likely to resurface in the future. Even if the Navy establishes a theater JFMCC (which it is doing), it is possible that, absent an underpinning theory of naval airpower explaining why naval aviation should be commanded by the JFMCC, the Air Force will subsequently revisit and win the argument and get operational control of naval aviation, at least in the Pacific theater.

What would constitute a theoretical basis for keeping naval aviation under JFMCC control? The first and perhaps most compelling argument emanates from the theory that has been previously described—that naval aircraft are essentially extensions of ship weapons and sensors and are therefore too integrated with the fleet to be regarded as parts of the general pool of airpower. While it is true they have been fed into the JFACC Air Tasking Order (ATO) for certain over-land operations, over water the JFMCC is the competent authority, and, unlike ground forces, tactical aircraft are organic to surface units. To appeal to another element

of naval airpower theory that has been discussed, naval embarked tactical aircraft may be controlled by the JFACC only if the carriers are operating in the role of airfields at sea. In the other roles, control of carrier aircraft must be held either by the JFMCC or the battle group commander. This argument reveals the utility of theory.

The other argument against removing the air dimension from the maritime domain is the unity of the fight, as manifested by the Composite Warfare Commander. The threat being composed of subsurface, surface, and air elements, an integrated tactical C2 structure is essential. This logic of three-dimensional interdependence and integration scales up to the regional level, and in this regard the JFMCC rests on the same theoretical basis as the CWC. This dimensional integration trumps airpower theory that says airpower is a unity, must be used economically, and therefore must be controlled by a single headquarters, commanded by an airman. While that claim is true over land if there is an opposing air force, over water the situation it envisions does not exist and the theory must be challenged.

Certainly, the proliferation of intermediate-range ballistic missiles and long-range cruise missiles presents the problem of integrated air-missile defense (IAMD). Defense against missiles is both a regional and local matter. At the theater level, with regard to the allocation of scarce ballistic-missile-defense assets and engagement of longer-range missiles, the theater AOC is the competent authority. However, IAMD is not the same thing as a fight for theater air superiority; rather it is more on the order of an artillery duel. Unlike a theater air campaign, the IAMD fight will have local manifestations that must be controlled by local commanders, and in these cases IAMD becomes part of the integrated naval battle.

The theory of naval-aviation C2 is a function of the integrated nature of the subsurface, surface, and air naval-warfare environment and the doctrinal roles of aircraft carriers. We can see that the CWC structure, while sufficient for battle group defense and local sea control, lacks the capability to oversee extended operations or campaigns at the operational level. The JFMCC is the headquarters where this function must reside. Naval engagements, operations, and campaigns do not unroll smoothly or progressively over time the way such things tend to do on and over land. Therefore, the ATO approach to controlling air operations is unsuitable for naval operations; it is insufficiently responsive to emergent conditions. Local conditions will govern how many and what kinds of sorties individual carriers can launch. A real-time regional picture will allow the JFMCC to direct mission orders to carriers such that coordination with submarines and other elements of fleet operations is achieved. External U.S. Air Force assets are best handled through tactical control by the JFMCC.

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To this point we have essentially drawn a picture of the theater of operations in which there are two principal "bubbles" of air—that over land, controlled by the Air Force JFACC, and that over water, controlled by the Navy JFMCC. Superimposed on both is the functional matter of IAMD, which in some aspects is controlled even over water by the JFACC. However, the seam between JFMCC and JFACC air bubbles deserves some scrutiny. This seam is the littoral. The Department of Defense defines the littoral as comprising "two segments of operational environment: 1. Seaward: the area from the open ocean to the shore, which must be controlled to support operations ashore. 2. Landward: the area inland from the shore that can be supported and defended directly from the sea."[8] This definition implies that in certain circumstances the JFACC can control airpower operating over water and that, conversely, in certain cases the JFMCC can control airpower over land. This is hazy enough to imply some grounds, at least, for U.S. Air Force contentions that—because, by extension, all naval operations are ultimately intended to support operations ashore—the air domain should include all air over the ocean. Here, the theory of the integrated fight can help, to the extent that amphibious operations are involved. If the Marines are operating as a single-service unit and there is no established Army Joint Force Land Component Commander—say, during disaster relief, noncombatant evacuation operations, etc.—then an integrated maritime operation is under way and the JFMCC should have control of associated air support. This kind of air support can go very deep inland indeed, as the initial U.S. Navy and Marine Corps operations in Afghanistan illustrated.

A final argument against JFACC control of naval aviation is that of competence to control. Just as Air Force doctrine asserts that an airman must be in charge of the theater air fight, the same logic suggests that a sailor be in command of the naval fight. This was manifested when in World War II the Navy formed the Seventh Fleet under Admiral Thomas C. Kinkaid to fight under General Douglas MacArthur but kept the fast carriers always under Pacific Fleet command. The fear was that General MacArthur and his staff would subject them to inappropriate risk at inappropriate times. A more modern case occurred in DESERT STORM of 1990–91. *Eisenhower,* which had been deployed since early spring of 1990, was one of the first two carriers on scene in August after Iraq invaded Kuwait. As more carriers showed up in the theater, *Eisenhower* was sent back to the United States to refit. Apparently, General Norman Schwarzkopf, commander of U.S. Central Command, was unaware of this, and when he learned of it—when *Eisenhower* was two days out of Norfolk—he exploded, saying every unit should be in the fight until the end. This reflected a lack of understanding about the nature of U.S. naval power in that era. The carrier could not stay at sea indefinitely, because of maintenance requirements and personnel tempo. After

the war, when the Army and Air Force redeployed to the continental United States, the Navy would have to have carriers available to replace those that had fought the war, as a continued U.S. naval presence in those waters would be necessary.

There is no independent theory of victory associated with the theory of naval airpower. It is always a contingent means to a contingent end. The theory of naval airpower is also necessarily linked to a larger naval theory that involves command of the sea, sea control, power projection, and maritime security. The larger naval theory is operative in both peace and war and is therefore linked to national grand strategy. In naval airpower theory, there are no a priori claims of effectiveness—only guidelines for managing risk and insights linking the nature of the operational environment with command-and-control arrangements. Accordingly, it is more practical and flexible than traditional airpower theory and presents fewer impediments to joint coordination.

It is well known that naval officers have a cultural aversion to theory and doctrine, at least at the operational level. However, the increasing ranges of weapons and sensors have driven the Navy to adopt a regional approach to command and control, in the form of JFMCC/MOC. As this construct overlaps the equally regional JFACC/AOC construct, theory and doctrine are needed to establish the case for naval war-fighting imperatives. As has been demonstrated here, this need can be met without rigid rules or a priori assertions. The fundamental characteristic of naval aviation is its flexibility, so its theory and doctrine must follow suit.

NOTES

This is the eleventh article I have published in the *Naval War College Review,* and it is perhaps fitting, as I end my tenure at the Naval War College, that it deals with naval aviation. I joined the Navy to fly, and as I matured professionally over the years I became less concerned with how to fly and more concerned with why to fly. In a sense, this article is a bit of a capstone on that thinking. I have been blessed to have had the opportunity to serve the Navy and the nation as a faculty member of the College; otherwise, I doubt that I would have been able to pursue any such thought process. I am most grateful for the array of colleagues here who have mentored me, argued with me, and, most graciously and professionally, pointed out errors in my logic. Compliments do not improve one's thinking. Special thanks go to Dr. Cary Lord and his predecessors since 1995 (the year of my first article in these pages) and Mr. Pel Boyer for their unfailing patience and support as I attempted to collect, organize, and articulate my thoughts.

1. This is perhaps an overly simplistic articulation of a naval warfare dynamic that is in fact complex. Alfred Thayer Mahan advocated strategic concentration of the U.S. fleet. Sir Julian Corbett spent considerable space in his 1911 *Some Principles of Maritime Strategy* specifying caveats regarding when and where concentration would be appropriate and explaining that naval concentration included—in fact, demanded—a certain amount of dispersal. Professor Wayne Hughes at the

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U.S. Naval Postgraduate School suggests that the best way to characterize the rule is to "find the best way to fight in mutual support. If there is an opposing fleet, this fleet is your objective and a coordinated long range strike is the means"; Wayne P. Hughes, Jr., *Fleet Tactics and Coastal Combat* (Annapolis, Md.: Naval Institute Press, 2000), chap. 4, esp. pp. 94–95. Hughes discusses the matter in generally tactical terms (which can have strategic implications when capital ships are involved), but there are additional permutations at the operational and strategic levels. This is all grist for a separate article or book. For the purposes of this discussion, the author has elected to go with the simplistic characterization.

2. See my "The Future of Aircraft Carriers," *Naval War College Review* 64, no. 4 (Autumn 2011), pp. 13–27.
3. In this sense the carriers *exercise* command of the sea. For an explanation and analysis of this concept see George Modelski and William Thompson, *Seapower in Global Politics 1494–1993* (Seattle: Univ. of Washington Press, 1988), pp. 16–17.
4. For a good discussion of this event see Lyle Goldstein and Yuri Zhukov, "A Tale of Two Fleets: A Russian Perspective on the 1973 Naval Standoff in the Mediterranean," *Naval War College Review* 57, no. 2 (Spring 2004), pp. 27–63.
5. For a Japanese view, arguing that such ships are *not* aircraft carriers, see Yoji Koda, "A New Carrier Race? Strategy, Force Planning, and JS *Hyuga,*" *Naval War College Review* 64, no. 3 (Summer 2011), pp. 31–60.
6. This section is based on discussions by the author with Russian naval officers and on personal experience during his tours as executive and commanding officer of Strike Fighter Squadron 131.
7. For a good description of the context and logic of vector logic, see Mark N. Clemente, "'Who's Got the Grease Pencil?!': What Cyber Security Can Learn from the Outer Air Battle" (paper submitted to the 15th International Command and Control Research and Technology Symposium, June 2010), available at www.dodccrp.org/.
8. U.S. Defense Dept., *DOD Dictionary of Military and Associated Terms,* Joint Publication 1-02 (Washington, D.C.: Joint Staff, as amended through 15 December 2013), available at www.dtic.mil/, citing U.S. Defense Dept., *Joint Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace,* Joint Publication 2-01.3 (Washington, D.C.: Joint Staff, 24 May 2000).