NAVAL AVIATION NEWS

Special / 50 YEARS OF CARRIERS

MARCH 1972

NAVAL AVIATION NEWS

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U.S. NAVY RECRUITING COMMAND

COVER. *R. G. Smith's Golden Anniversary painting of Langley and Nimitz, which we like to call, "The Fastest and the Mostest," is available in lithograph form, suitable for framing. Write to: Douglas Aircraft Company, 3855 Lakewood Boulevard, Long Beach, California 90801, Attn: G. C. Gilman (Code 35-99).*

THE STAFF

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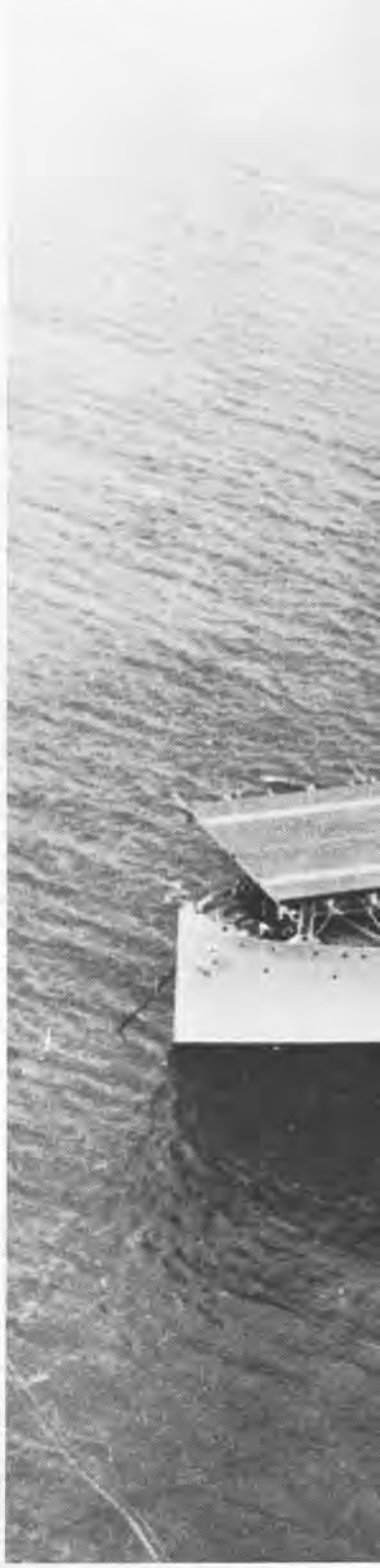
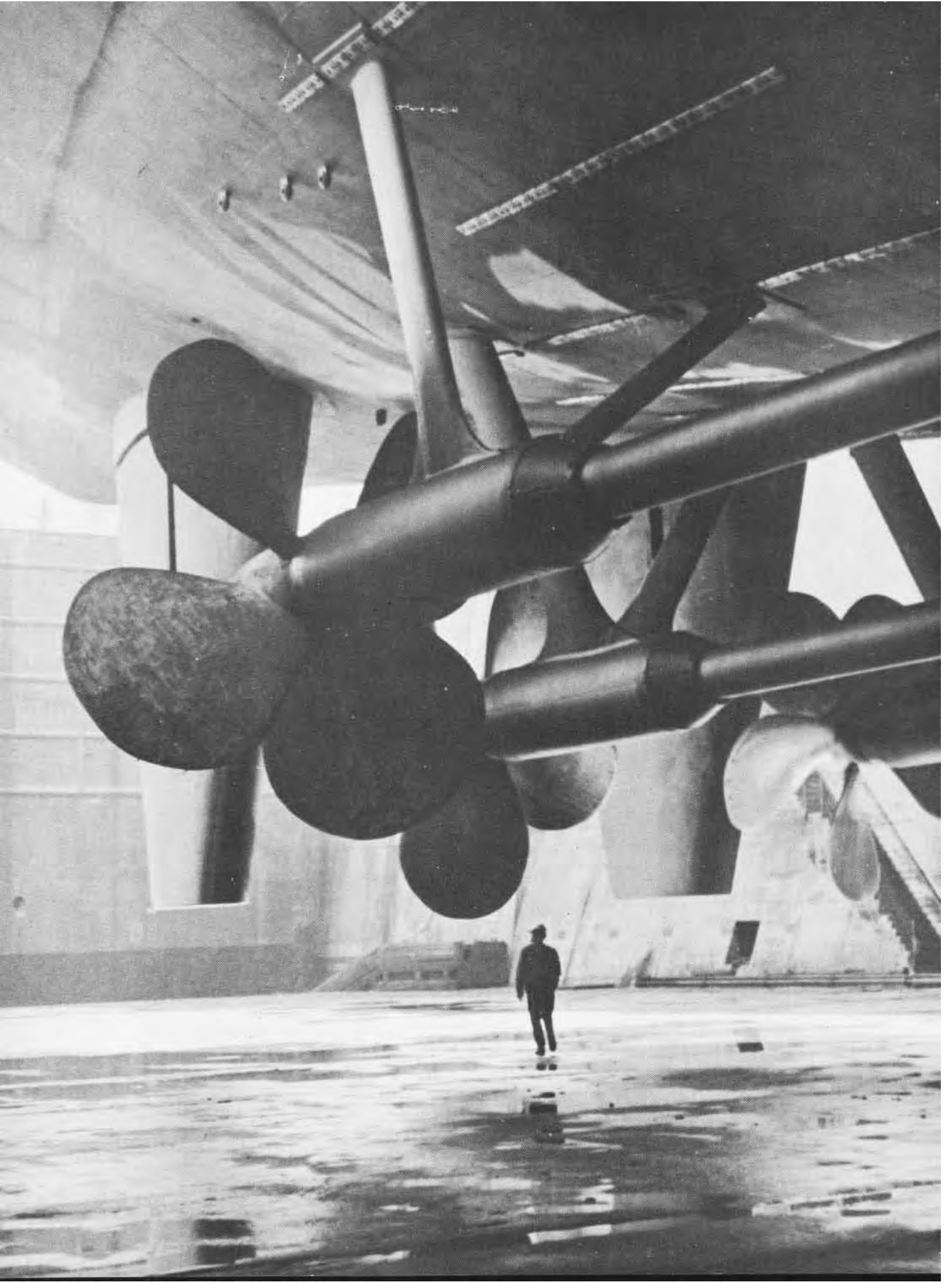
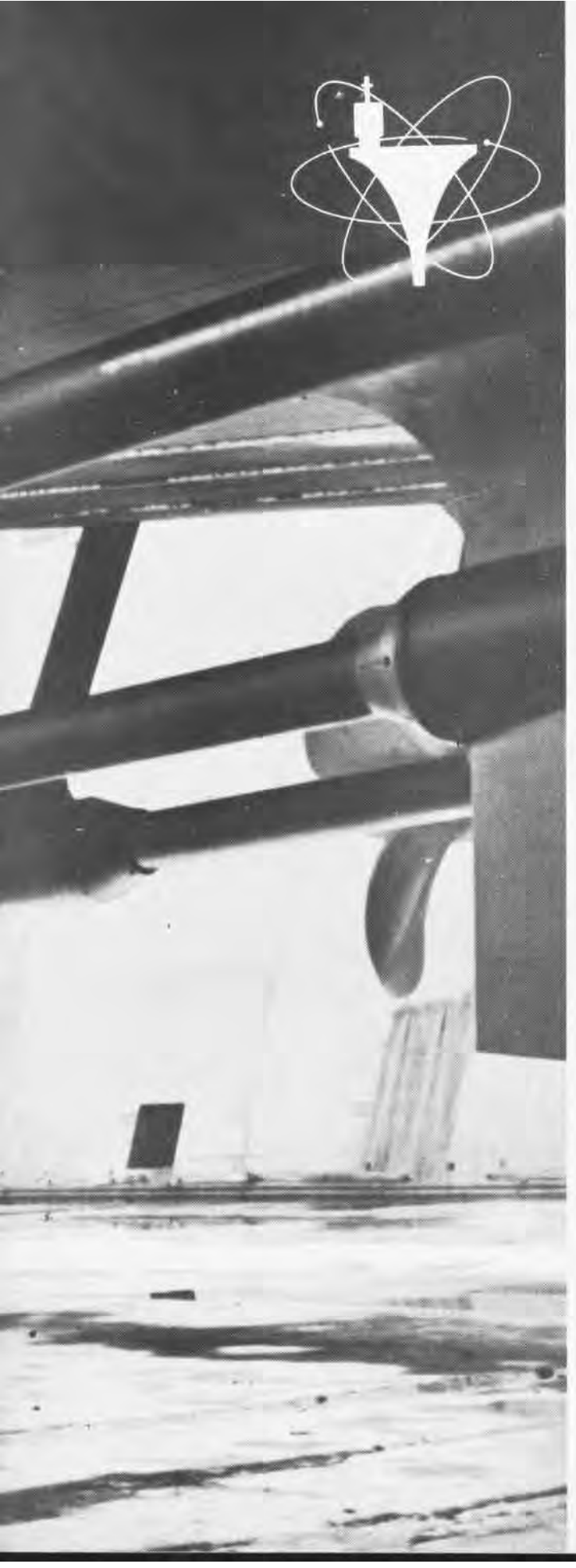


In the half century since Langley was commissioned, U.S. attack carriers have successfully implemented the national policy in three shooting wars and in a score of crises which but for their presence could well have developed into wars. The dramatically distinctive silhouette of the aircraft carrier has become an international symbol of naval power, comforting to our friends, worrisome to our adversaries, respected by all. Perhaps not in all the long history of seafaring has a single class of ship come to stand so clearly for the might of the right. Our nation and our allies around the world owe a mightly debt of gratitude to the sailors and airmen of the great ships which have helped to keep them free. That debt will not be lessened as we move through the dangerous decades of the nuclear era into the third century of our nation's history with the attack carrier still on watch along the sea frontiers of freedom.

John H. Chafee

Secretary of the Navy





YEAR OF THE CARRIER

Aircraft carriers.

Different things to different people. A college student recently told this writer he had seen pictures of those "big ships" but he had not realized the Navy had its own air arm to fly off them!

Times have changed. During the Thirties, Forties and even the Fifties, there were movies, books and magazine features about the "Flattops" — and their men. Because of that exposure, you *knew* Naval Aviators were the best. They were better trained, had higher standards and did more difficult work. Each was a crackerjack navigator who knew radios, engines, guns and everything else inside out. They wore gold wings on forest green uniforms — except when they were wearing their dress whites, whizzing some good-looking girl around in a sharp, blue convertible. But, most important, they landed on postage stamps out in the middle of the ocean — the most demanding job in the world.

All true. But, today, most of the old exposure is gone. Magazines, as we knew them, have faded and movie styles have changed. Say to someone that you are a Naval Aviator and he may wonder what that is. Try to tell him and he will interrupt you with an exciting tale of his trip on an airliner. (Yep. They still have "air pockets.")

My earliest contact with a carrier was by means of a chipping hammer. Not exactly the image projected by *Victory at Sea*. It was a CVL, a converted cruiser hull named USS *Cabot*. Our group had hit the inevitable "pool" in the preflight phase and we were put aboard the carrier for "indoctrination." The first thing we learned was the effective resonance of a couple of dozen hammers, all in unison, systematically beating paint off the hangar deck.

When the din became too great, they took away our hammers and we were herded topside to observe flight operations. Students were to make qualification landings and, knowing that someday we would be in the same boat, so to speak, we were eager to see how it was done.

The first plane went over the side. The cockpit was inverted, suspended a few yards above the water, and it was interesting to see how they got the pilot out. They lowered a line. He grabbed it, undid his harness and hauled himself up to the catwalk. So *that* was the reason for all the physical training!

The *Cabot* taught us a number of things and, eventually, we would leave our marks on other ships in other ways. And through it all was the wonder of the spectacle and the realization that we were part of a unique tradition and way of life seldom seen by outsiders. A story worth telling.

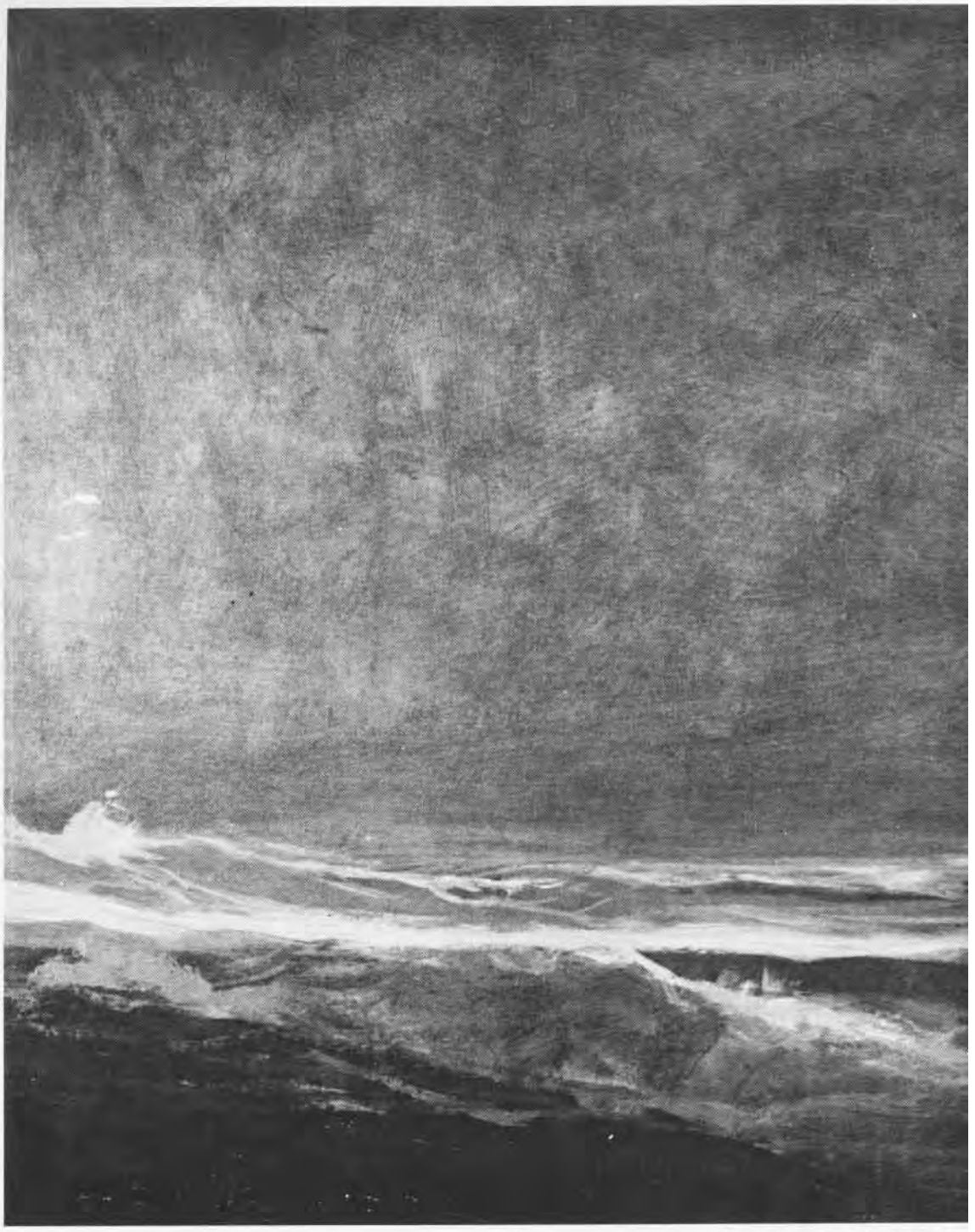
USS *Langley*, our first carrier, was commissioned on March 20, 1922. Now, for this Fiftieth Anniversary Year, *Naval Aviation News* has assembled varied treatments of the evolution. Hopefully, the initial pieces will inspire readers to relax a bit and add their own accounts.

Our special thanks to R. G. Smith for the cover painting of *Nimitz* and *Langley*. "R.G." cancelled his Christmas vacation trip to get it done for this edition.

And, for the first time in almost 30 years, Osborn is presented in color. We calculate Bob has 1,000 *News'* Grampaw Pettibone drawings under his belt. "Great balls of fire!" That ought'a be worth some kind of cake. . . .

—Cdr. Ted Wilbur, 1972

THE CASE



FOR

"HOOK DOWN, WHEELS DOWN" by John Scott
U.S. Navy Combat Art Collection

CARRIERS

The United States needs to be a strong sea power. Because we are bounded on three sides by water, our overseas commerce, our commitments to our Allies, our defenses against invasion are all dependent on our being able to use the world's oceans unmolested. In an effort to maintain U.S. sea power, the Navy has requested a third nuclear powered, Nimitz-class aircraft carrier, CVN-70. The reasons, many and varied, have been summarized by Vice Admiral Maurice F. Weisner, DCNO(Air Warfare), and members of his staff in the following article.

The relationship between the United States and her Allies is quite different from that which exists between the USSR and her Communist allies. This difference was recognized by President Nixon when he said, "What the Soviet Union needs in terms of military preparedness is different from what we need. They're a land power, primarily, with a great potential enemy on the east. We're primarily, of course, a sea power and our needs, therefore, are different."

It is axiomatic that the more technically advanced and economically sophisticated the U.S. becomes, the more dependent we are on our overseas commerce and free use of the oceans. Ninety-nine percent of the material that the countries of the world exchange is transported by sea lift — the most economical method available. There is not much

THE CASE FOR CARRIERS

Illustrations by John Charles Roach
U.S. Navy Combat Art Collection

difference between the peacetime and wartime percentage. About 96 percent of the support material needed for our effort in Southeast Asia has been moved by water. It is just not economically or physically possible to airlift a higher percentage, in peace or war.

The formula for the support of our friends overseas is the Nixon Doctrine, a simple reaffirmation of basic commitments. It serves notice to friends that while the United States will participate in the defense and development of Allied countries, we cannot, and will not "conceive all the plans, design all the programs, execute all the decisions and undertake all the defense for the free nations of the world." In keeping with that philosophy, we intend to reduce our overseas presence and depend more upon our ability to react quickly in times of crisis. We will support our Allies, including tactical air (TacAir) support, but we will minimize the actual use of our own troops.

Our supremacy at sea is being challenged. In terms of the total number of ships, the Soviets have long operated a larger navy than we have. In the category of major warships, where we have enjoyed our greatest advantage, they are rapidly gaining. They have more nuclear submarines than we have and are continuing to construct subs at a faster rate than we are. And they are increasingly deploying their fleet beyond home waters. Perhaps more significant is the fact that the Soviet navy is a new one and ours an old one—facing obsolescence in many critical categories. Since 1963, the USSR has built over 400 combatant ships while we have built less than 100. Fortunately, our inventory still includes a number of carriers — and these make a tremendous difference. Take away our carriers and the Soviet navy is clearly superior.

The carrier with her embarked aircraft is the only weapons system that outranges the Soviet antishipping missile. Our ships' guns have a range of about 15 miles; the *Styx* missile, 20 miles; the Soviet *Shaddock* is probably operationally effective to about 400 miles; and the U.S. carrier-based A-7 is effective out to 600 miles.

And the carrier is the only weapons system effective against the three-dimensional threat. In World Wars I and II, particularly in the mid-Atlantic, sea control was synonymous with antisubmarine warfare. No longer. With air, surface and submarine adversaries, we now need extended range and firepower to protect naval forces, convoys and other shipping in the high threat areas. The effective answer is aircraft carriers.

In hot and cold war situations in which we might become involved, there is no foreseeable combat situation — general nuclear war, general non-nuclear war, limited war or cold war — that does not require naval support for assured second strike forces (*Polaris* and *Poseidon*), to protect the sea lines of communication, to provide tactical air and naval gunfire for troop support, or as a show of force.

The carrier has a unique role in support of every naval task over the broad range of combat and deterrent requirements. With respect to strategic missions, the carrier, while not a part of our assured second strike force, is part of the nuclear deterrent. (The Soviet's biggest naval exercise [April 1970] had as one of its primary objectives stopping simulated carrier nuclear strikes against the Soviet Union.) And carriers provide tactical air power to almost all areas of the world, including the high seas.

The question always arises as to why we need such large carriers. The basic answer is that the large carrier is the most cost effective.

A carrier's purpose is to put aircraft to sea; at a given level of dollar expenditure, we can deploy a greater number of planes at sea in large ships than we can in small ships. A large ship maximizes endurance in terms of both jet fuel and weapons. It minimizes underway replenishment requirements, reducing the overall vulnerability of the force. The larger deck permits operation of the high-performance aircraft needed to counter a threat while providing safer operations from the more stable deck.

Operational flexibility is greatly enhanced with increased carrier size. All the sensors and equipment necessary to make all-weather operations feasible can be embarked, and the large quantity of consumables that can be carried reduces replenishment requirements.

Large carriers can sustain more enemy damage and remain operable. They have a better damage control system, which increases their survivability. They are large enough to have a complete maintenance capability, for both ship and aircraft, and to include the redundancy features desirable in a man-of-war. The large ship has the growth potential that will ensure its operation, with modern aircraft, during its 30-year life expectancy.

The advantages of nuclear propulsion add up to a significant increase in capability. The price paid for this increased capability is about one percent of the lifetime cost of a task group. This trade-off of high capability for the slight relative cost increase is more than justified when considered in the context of reduced forces.

Nuclear propulsion increases the capability of carriers in several ways, in addition to the obvious advantage of unlimited steaming endurance. The *Nimitz* class —

because of its space-saving character — can carry more aircraft than the earlier carriers and has several times the ordnance and jet fuel stowage. At reasonable rates of expenditure, it can expect to conduct sustained operations in the sea control mode for ten days or longer without having to replenish.

The air wing proposed for a modern carrier is flexible and the carrier's deck loading can be optimized to support either a sea control or projection ashore mission. For sea control, S-3's could be embarked (probably by off-loading a squadron of A-7's to make room). In a particularly severe ASW environment, the number of *Vikings* might go even higher (taking off RA-5C's as well as the A-7's). As conflict progresses and the battle for sea control is won, the attack and reconnaissance aircraft would be re-embarked and a shift made to a projection ashore mode of operation. This type of flexibility is possible only in the larger CV's and is dependent on having sufficient aircraft assets to make this kind of "swing wing" possible.

A carrier is mobile. Although its 30-knot speed may seem relatively slow with respect to land and air vehicles, it has a potential strike range, on any given day, almost five times as great as a fixed base.

A carrier is also free from foreign political constraints. At the end of WW II, we had more than 1,100 air bases overseas. This number dropped to 129 in 1953, 56 in 1965, and then to the present 50. Further reductions are possible.

Not only are many of our former bases not available to us but, in some instances, they are being used by potential enemies.

The seriousness of these political constraints was illustrated in the fall of 1970 when Syria and Iraq began military operations along the border of Jordan, creating a new threat to the uneasy peace in the Middle East. TacAir was needed, but land-based support was in Germany and would have had to fly down around Spain and through the Straits of Gibraltar. Three carriers were moved in, ready.

If a war broke out now in the Middle East and we had to aid Israel, political constraints might make it impossible to effectively support an operation in the eastern Mediterranean from land bases. Carrier aircraft might be our principal tactical air power.

Specific tasks that carrier aircraft may be called upon to perform in support of the three levels of conflict in which we may become involved are varied. With major Soviet involvement, these tasks include air superiority, interdiction (strikes), close air support, anti-submarine warfare, coastal patrol, area surveillance, reconnaissance, escort, air defense and nuclear strike.

All illustrate the need for greater carrier diversity, flexibility, sophistication and size; in some respects size is the most important. And most of those tasks cannot be performed with one or two aircraft. It is the magnitude of these tasks, many of which must be performed simultaneously, that dictates the size of both the ships and the total force. All but the last task could be required in lesser wars involving third countries.

Limited or third country wars are more likely to occur than a general war. This tempts many critics to suggest that we should design our forces for the most likely war; however, to have a credible deterrent we must maintain a readiness to fight the worst war. General war requirements, therefore, must become our primary guideline for force composition and ship/aircraft design.

Fortunately, ships built for one type war can be used in another, and the air tasks for both a general and limited war are much the same. Also, if one assumes that most third country wars will be with nations which will have weapons supplied by the Soviets, it can be understood that there is no reason to think less sophisticated weapons would be required.

In a limited war, there is also emphasis on projection of power ashore. This determines the size of our carriers much more than the sea control mission does. It generates the requirement for a volume of weapons and aircraft, and the need for sophisticated weapons delivery systems. In Korea and Vietnam, when there were at least 15 CVA's in the force, we were hard pressed to continuously meet the weapon and aircraft requirements.

Since about 1958, the Navy has almost continuously maintained, with its 15-carrier force, five carrier task groups in forward deployment areas. This is a ratio of two to one (two back and one forward). Some of the factors which determine this particular ratio are transit times (speed and distance) from the supporting base structure to the deployment areas and return; size and state of repair of the task group ships; overhaul schedules; morale of the crews in peacetime; number and types of support shipping, including the underway replenishment ships; and requirements for rotating carriers to train replacement personnel and to conduct fleet exercises.

The Navy can mount, from its 15-carrier force, six or seven carriers to be kept on station simultaneously for sustained periods of time, such as during the Vietnam buildup. But this was done at the cost of depriving some of the other functions which may be postponed or rescheduled, but not ignored. In short, most of the

THE CASE FOR CARRIERS

A-4 Skyhawk pilots aboard Enterprise following an air strike in Vietnam.

operational constraints detailed above are capable of some variation and manipulation within certain limits. Changes in the base structure, or changes in technology affecting ship endurance or transit speed, could alter the 2-1 ratio to 1-1 on station, or 3, 4 or 5-1 on station, depending upon the size and direction of the possible changes.

Limited wars seem to occur where least expected. However, because of its mobility, the carrier, though designed for general war, seems to be an ideal solution to the limited war problem. Our first requirement, during limited war, is to maintain sufficient forces, forces which will be a credible deterrent to general war.

Carriers are, without question, the most flexible weapons of diplomacy we have at our disposal in cold wars. A specific example of their use was described by President Lyndon B. Johnson during the Suez Crisis in 1965:

"The fleet was under orders to stay at least 100 miles from the Syrian coast in its cruising pattern. I told McNamara to issue orders at once to change the course and cut the restriction to 50 miles. The Secretary of Defense gave the orders over the phone. No one else said a word. We knew the Russians would get the message as soon as their monitors observed the change in the fleet's pattern. That message, which no translator would need to interpret to the Kremlin leadership, was that the United States was prepared to resist intrusion in the Middle East."

But ships, even though they have greater longevity than any other weapons system in our arsenal, do wear out. Our carrier force is aging. We need to continue a new construction program. As a carrier ages, it loses compatibility with modern aircraft and systems, and much of its basic equipment just plain wears out. We are facing the further problem of block obsolescence in that most of the *Forrestal* class will reach age 30 as a group in the mid-80's.

Our carrier force is being reduced. We have gone from 24 in 1961 to 17 authorized in 1971, almost a one-third reduction. Since July, *Wasp*, scheduled out in FY 73, has been removed from normal operations. We are operating only 16 carriers today and may be forced, by obsolescence and lack of sufficient new construction, to as few as 12 by 1981, a 50 percent reduction from the 1961 level.

To make up for what we lose, we must replace our oldest aircraft carriers with new, modern, fully capable ships. This way we can increase the unit effectiveness of those carriers we do operate. We need sophisticated aircraft ready to counter a sophisticated threat, and we need modern carriers from which they can operate.

As carrier force levels decrease, we can no longer

afford the desired capability of operating them separately as attack and ASW ships. They must be used as CV's, multipurpose carriers, capable of embarking both tactical and ASW aircraft.

It is also increasingly necessary to use carriers in a three-dimensional, sea control environment, where we need the three-pronged capability of attacking submarines, surface ships, and airplanes and missiles. Only nine carriers are really capable of being modified and operated as CV's. Our construction program will add *Nimitz* in 1973 and *Eisenhower* in 1975, replacing two of the less capable ships at whatever force level we are operating at the time. CVN-70 would replace either an *Oriskany* or a *Midway*-class ship, again depending upon force levels.

With respect to force levels, there is quite a difference between Navy objectives, as stated by the Joint Chiefs of Staff, and the actual numbers in Defense budget projections. The total war-waging requirements, not constrained, as submitted by the Unified Commanders-in-Chief, come to considerably more than budget projections, with eight CVS's phased out completely in the Defense budget.

If the force level is reduced to 12 carriers, it becomes increasingly necessary that we obtain a fourth nuclear carrier as soon as possible. The optimum readiness posture feasible with this number of CV's is a combination of forward deployment and quick response. Carriers deployed in the Mediterranean and Western Pacific give reassurance to our Allies and visibility to our deterrent strength.

Backing up the deployed carriers, we should plan to have a minimum of four nuclear carriers, two each in the Atlantic and Pacific for reinforcement or contingency response in other areas. With two on each coast, we would be assured of having one available on short notice and a second, if not immediately available, usually within a reasonable time.

The nuclear carrier permits logistic independence and high-speed response to areas of crisis, without waiting for political negotiations. The large nuclear carrier arrives ready, with sufficient ordnance and fuel to operate for sustained periods.

The new-construction rate necessary to maintain a modern carrier force based on force levels of 12 and 15 carriers, with life cycles of 30 years, is a new carrier every two and one-half or two years, respectively.

Our construction program from 1962 and forecast through 1981 has been one every four years. Even if we could extend carrier life to 35 years, our present construction program would still be inadequate. The average age of our carrier forces is increasing at a faster rate than our modernization plan.

Authorization for the construction of CVN-70 is a controversial matter because of two relevant issues — survivability and cost. [The subject of carrier survivability is considered of such significance that it is covered in a separate article on page 54.]

CVN-70 is programmed at a cost of $951 million plus outfitting and port delivery charges. Its expected life cycle is 30 years, making its amortized investment cost $31.7 million per year. Going through a similar analysis for the aircraft which it will embark, the air wing's annual investment cost is over $100 million per year, independent of whether it is land-based or sea-based.

The carrier is ten percent of our total Navy TacAir cost in FY 73. It is less than 16 percent of the shipbuilding and conversion appropriation in the budget. It is only a little more than two percent of the overall Navy budget. And it is less than one percent of the Department of Defense budget. Is this too high a price to pay for the capabilities that it will bring us?

From FY 62 through FY 74, carriers will have accounted for only 9.7 percent of the shipbuilding and conversion budget, including CVN-70. Carrying this a step further, we see that TacAir, the category to which the carrier belongs, makes up about 15 percent of the total Navy budget. We could deduce from this that we might expect a larger share of the shipbuilding program to go into carrier construction.

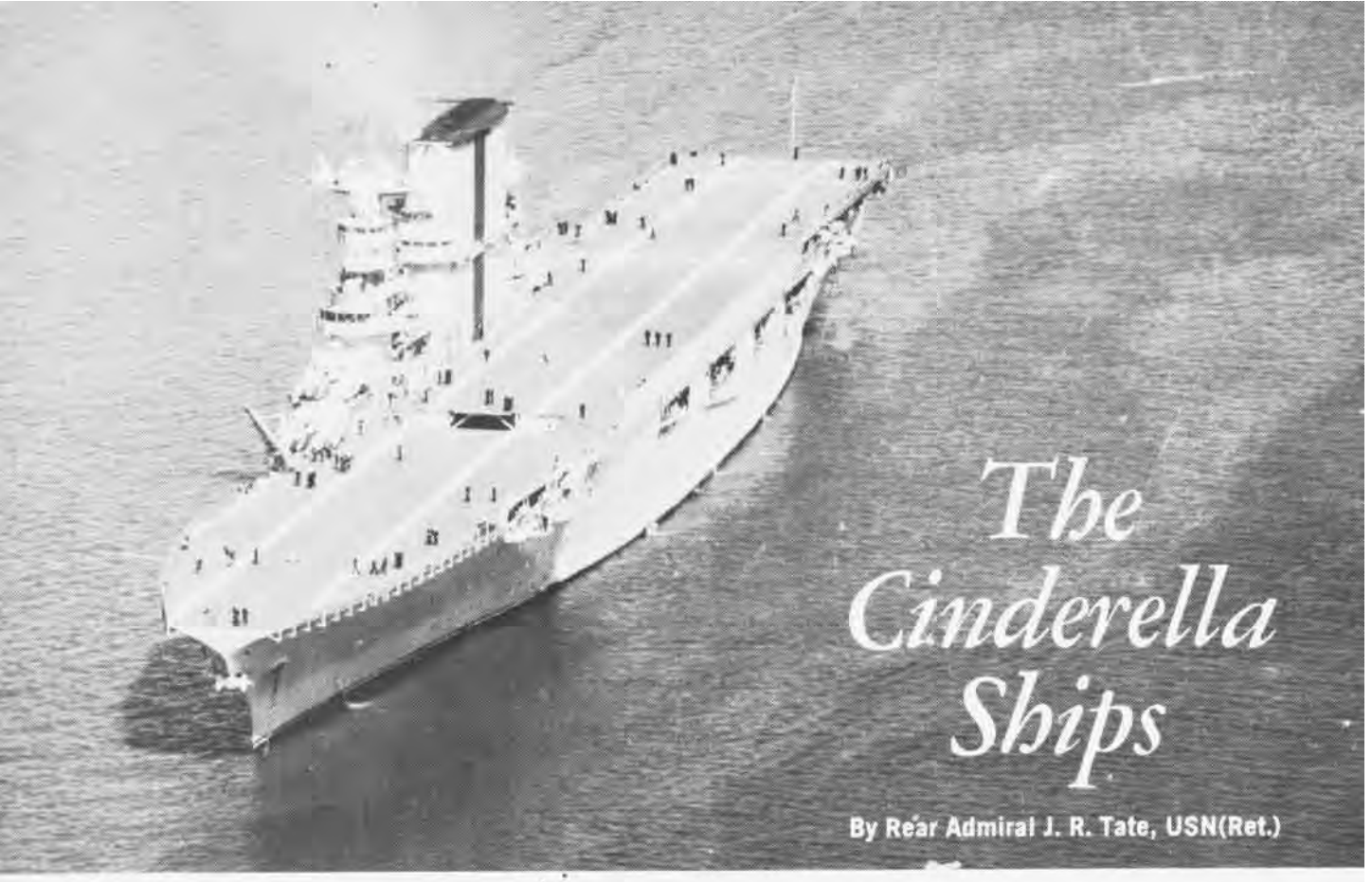
We are well aware of the inflationary trends in everything today, including weapons systems. The nuclear carrier program is not unique in this respect and its cost growth has not been disproportionate. The cost increase from *Enterprise* to *Nimitz* has been about 45 percent. Cost growth in this same time period in the area of total TacAir systems was about 101 percent.

Since the aircraft that are operated from land-based and sea-based systems are basically the same — in many instances, such as the F-4, they are almost identical — the differences in the two systems relate almost exclusively to the bases, ship or shore, and to their support. One cost factor that is not shown is what we may have to pay some countries for base rights.

There is an urgent need to get on with the construction of the third *Nimitz*-class nuclear carrier — CVN-70.

This fourth U.S. nuclear carrier is needed to fill out a vital capability at the upper end of the threat scale. Without a reasonable number of modern, sophisticated carriers, we will not long be able to control the seas or protect the vital sea lanes.

Lacking the inherent strength of a modern carrier force, the United States will soon find herself without a viable overseas strategy — and no longer a major power in a progressive, modern society.



The Cinderella Ships

By Rear Admiral J. R. Tate, USN(Ret.)

Though this article does not begin with "once upon a time," the story of the aircraft carrier during the 1920's and 1930's in many ways reminds one of the familiar tale of Cinderella's rise from rags to royalty. Instead of changing pumpkins to coaches, the Navy converted a coal ship and two uncompleted cruisers to aircraft carriers. At the beginning of the period, these ships, like Cinderella, were overshadowed by their imperious sisters, the battleships. However, in the end, as in the children's story, virtue was rewarded: WW II confirmed the aircraft carrier's position as queen of the fleet.

The Washington Naval Treaty of 1922 caused concern among the senior naval officers of the U.S., Great Britain, France, Italy and Japan about how many battleships and cruisers each had, the tonnage and how this was to be apportioned. The final answer was the so-called 5-5-3 ratio. The U.S. and Britain being the fives and Japan being the three. A lonely junior member of the U.S. delegation was Commander Kenneth Whiting, an aviator who was obsessed with the idea that the coming thing in the Navy was not the battleship or cruiser but the airplane carrier.

At the end of WW I, the Navy was building five battle cruisers. These, *Lexington, Saratoga, Constitution, Constellation* and *United States*, were to be huge affairs, bigger (33,000 tons), and faster (33 knots) than a battleship and were to have 16-inch guns. Whiting wanted to be sure there was a treaty clause permitting the first two of these to be converted to carriers. The clause was incorporated, with each ship limited to 33,000 tons plus 3,000 tons if armor were added. Total carrier tonnage was limited to 135,000 tons. (*Langley*, as an experimental ship, did not count.)

As early as February 1921, the Navy considered building a carrier, but there was considerable controversy as to size and scope of its mission. Should there be a big, fast carrier for the Scouting Force for long-range scouting and a smaller, slower carrier for the Battle Force? Three types were proposed. There was much discussion as to the role of the carrier and her disposition on the battle line. Some thought she should operate at least 25 miles behind the line and provide scouts and spotting planes with whatever torpedoes were available when the battle line engaged and during action attack. Likewise, use with the scouting force was in question. The carrier was also considered as a cruiser with planes.

Cdr. Whiting had other ideas and was worried if we would have any carrier aviation at all. The Navy was divided into The Battle Fleet, with capital letters, and the Scouting Fleet, only slightly less important. Everything else was merely an adjunct to the battle line.

Whiting, in a memorandum to the Committee on Naval Affairs, expressed this opinion: "When the war ended, those who had chosen the Navy as a life work, and especially those of us of the Navy who had taken up Naval Aviation, revived the question of carriers and fleet aviation. We found the sledding not quite as hard as formerly, but the going was still a bit tough. The

officers who had not seen Naval Aviation working retained their ultra-conservatism; some of those who had seen it working were still conservative, but not ultra; they were from Missouri and wished to be shown. Others who had seen had conquered their conservatism and were convinced. These, including the General Board, demanded that carriers be added to the fleet."

Whiting's work with USS *Langley* and her informal participation in the early fleet problems/exercises off Panama in the Caribbean gave him many new ideas.

Conversion of *Lexington* (CV-2) and *Saratoga* (CV-3) had been authorized. *Lexington* was being converted at the Fore River Yard of the Bethlehem Shipbuilding Company, Quincy, Mass., and *Saratoga* at the New York Shipbuilding Corporation, Camden, N.J.

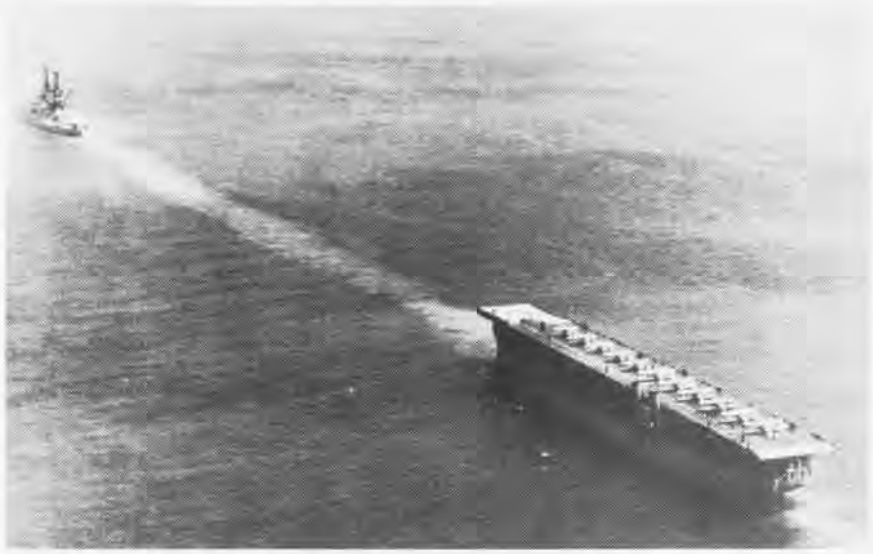
After *Langley* joined the Battle Fleet on the West Coast and her first squadron was assigned, she participated in Fleet Problem No. Five off the coast of lower California. For this exercise, she carried a motley group of planes consisting of twelve VE-7SF fighters of VF-2; her own planes, mostly UO-1's; and a few DT-1 torpedo planes to bring the total to 23. Her scouting flights became standard procedure and her little group's performance so impressed the observers that they recommended completion of *Lex* and *Sara* be speeded up. Whiting was detached from *Langley* and ordered to *Saratoga* as executive officer.

Now another problem entered the picture. Whiting, frustrated by the lack of understanding by the line officers on the use and handling of *Langley*, had gone to several members of Congress and had succeeded in having a law passed that all ships directly connected with aviation and operating planes would be under the command of aviators.

Lex and *Sara* were sisters, 33,000 tons, 901 feet long overall, 111 feet, 9 inches in beam and with a draught of 32 feet. The 16 boilers developed 180,000 hp, their electric motors driving them at 33⅓ knots. The armament was eight 8-inch guns in four turrets and 12 five-inch AA guns. Their cost was roughly $45 million each — they were beautiful ships. (But the senior aviator at the time was a commander.)

The Navy soon solved this pesky problem — it immediately sent a group of captains to Pensacola for a quick course (no piloting) and designated them naval aviation observers and thus Naval Aviators — satisfying the law. Actually the development and organization of the ships rested on the aviator execs.

Of the pair, *Sara* was the glamorous one. She was launched first and commissioned first.



Tactical doctrine initially called for carriers to follow the battleships and provide supporting aircraft as needed. Use of larger fast carriers such as USS Lexington, below, for independent attack soon changed that concept and the carrier task force was born.

Whiting was a man of many and original ideas. When exec of *Langley*, he wrote up each operation, such as this one dated February 1, 1923:

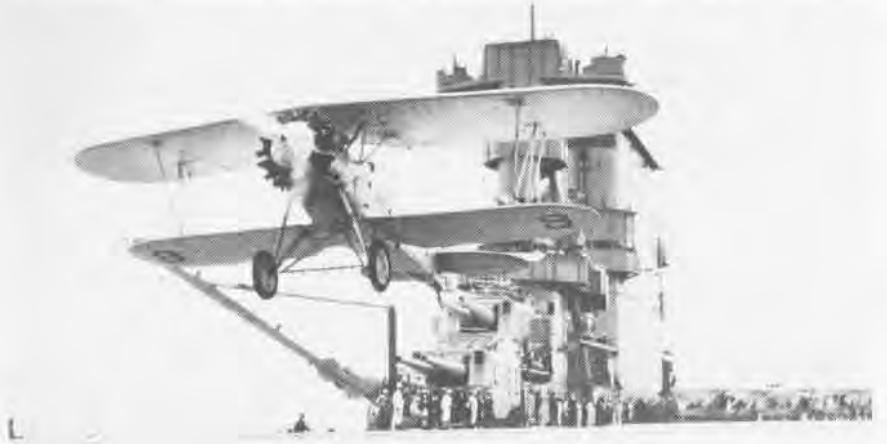
"The weather permitting, the ship will get underway at 9 a.m. tomorrow, February 2, 1923, and will proceed out of the harbor for the purpose of flying planes off and on the ship. The tug *Allegheny* will accompany the ship and take station 100 yards out and 200 yards astern of the starboard quarter, steaming at the same rate of speed as *Langley* — about six knots. When pilots are flying off and on, both lifeboats will be lowered to the rail and manned; the first or second motor launch, depending on which stack is in use, will be lowered to the level of the poop deck, manned and equipped with grapnels, crash kits and six men in addition to the crew. The boatswain will be in charge of this boat.

"The flight surgeon will fly over the ship in a flying boat piloted by Chief AP Darling. This plane will maintain station 200 yards behind and 200 feet over the plane which is flying off and on. This seaplane will start from the naval air station on radio signal from the ship. Bos'n Teher will go on the tug accompanied by three men from the Fourth Division with a crash kit.

"In case of fog tomorrow, the ship will not get underway, but will stand by until noon; in the event that the fog is cleared up by that time, will proceed.

"Steam will be kept on three boilers and engines in maneuvering condition.

Lexington, like her sister, Saratoga, carried fighter, dive bomber, torpedo and scouting squadrons totaling approximately 80 planes. Eight 8-inch guns gave these ships a dual threat.



"In case a plane goes into the water, the first boat to get to it shall at once attempt to rescue the aviator, at the same time making a line fast to some strong part of the plane, in order to hold the cockpit above the water."

From this type of daily order, Whiting developed the Plan of the Day for the operation of the ship. As originally set up, the squadrons were to be divisions of the air department with the squadron commanders as division officers. The ship was also set up to repair and overhaul planes and engines. It took some time to undo this concept.

The original assignment to each carrier was four squadrons: one fighter, one dive bomber, one scout and one torpedo. Each squadron had 18 planes. These, plus the ship's planes and a few utility planes, brought the operating complement up to approximately 80 planes. Spares were carried both assembled and disassembled. All sorts of tricks were devised to carry a maximum number of planes: outriggers to hold the tails of planes over the edge of the flight deck with only the main landing gear on the edge of the deck, planes rigged to the overhead on the hangar deck, etc.

LCdr. A. C. (Art) Davis and his F3B dive bombers had developed the split dive wherein 18 planes dove on a target from three directions. Bogush and his T4M torpedo planes could fold wings almost as fast as they could be parked on deck. One drawback, however, was that *Lex* and *Sara* were too big to get into San Diego harbor and had to anchor out in San Pedro while the squadrons were parked at North Island. Whereas in the old days there were two gunnery ranges, Point Loma to the border and Point Loma to La Jolla, now Art Radford and Skinny Wick had to go as far as Oceanside with their F2B fighters. The old ComAirRons had now become ComAirBatFor with a rear admiral commanding. Naval Aviation had grown up with the arrival of *Lady Lex* and *Sister Sara*.

The rivalry between these two ships and their squadrons was terrific. Everything was in an evolutionary stage. Dive bombing had been proven effective and the squadrons were developing new techniques. "Push over" and "roll over" became new methods and words for entry into the dive. New planes were reaching the fleet. The policy at that time was to buy a limited number of planes of a type — just enough to equip one, two or three squadrons. The first real dive bomber was the two-seat fighter and dive bomber, the F8C-4, but the following year the BM-1, which could dive with a 1,000-pound bomb, came out.

The fighters went to all-air-cooled engines and the Boeing series of fighters, which began with the FB, went through the F2B and F3B to the little, chunky monocoque F4B. Each year in January the fleet made the annual cruise and conducted a fleet problem, alternating between Hawaii and Panama, with *Lex* and *Sara* always pitted against each other. Carrier techniques were developed: antisubmarine patrols, combat air patrols and long-range scouting patrols up to 150 miles from the carrier, air group operations and attack with an air group, landing time of less than an hour.

There was very limited radio — all in Morse code—and only in the O2U scouts and T4M torpedo planes. There was no radar, and returning to the ship was sometimes a major problem. "Point Option" was developed — an imaginary point traveling at a fixed speed and course. The ship referred to her position in reference to this point. The aviators had enough trouble with their own skimpy navigation, but when the ship did not maintain her position in reference to this moving point, real trouble developed.

One incident comes to mind. Captain E. J. King, who was skipper of *Lex* and who took great pride in being a great disciplinarian and a prime SOB, sent *Lex's* air group out one afternoon on a strike. He called all the squadron C.O.'s on the bridge to brief them. It was to be a four-hour operation with the landing about one hour before sunset. He finished the briefing with what the ship would maintain in reference to Point Option.

At the end of the four hours, the combat air patrol, which had stayed within sight of the ship, landed. The VF commander went to the bridge just as LCdr. Steve Haddon, the torpedo squadron C.O., sent a message saying he was at the rendezvous and no ship. The VF commander made a remark that *Lex* wasn't within 40 miles of the rendezvous and King told him to get off the bridge. There was much excitement, radio bearings, *Lex* made heavy smoke, full power, more radio bearings — an hour passed. The sun was setting; Haddon called the group into tight formation; *Lex* turned all searchlights into the dark sky; Haddon pre-

pared to ditch the air group while they still had some light and gas. Suddenly, one of the scouts radioed he had *Lex's* searchlights in sight. Though few pilots had qualified for night landings, the air group got back aboard. But as one of the T4M pilots remarked, "I can drink all the gas left in that airplane." Later, in the wardroom, Haddon remarked "It would have been one hell of a splash and Ernie King's career would have been right in the middle of it."

Another time, when LCdr. Bill Masek was C.O. of Torpedo Two, the fleet pulled out into two columns. It was a misty day with low ceiling and reduced visibility. Masek was to conduct a torpedo practice. Launched, his 18 T4M's were to swing wide, come in and attack the enemy battleships. Masek took the course given him to the battle line and soon sighted the battleships. He deployed the squadron, came in on the starboard bow and dropped his 18 torpedoes — on his own ships. It was a terrific mess. No one was prepared to recover the torpedoes. The exercise stopped. Bill Masek retired as a lieutenant commander.

There was an incredible lieutenant in the fighter squadron on the *Sara* named "Bubbles" Fisher. He was short, heavyset, with almost inhuman strength and stamina. Bringing an experimental plane from the plant at Santa Monica to North Island, he cracked up ten miles at sea off Oceanside at about nine o'clock at night. He gave his life jacket to the mech and started to swim toward Oceanside. He walked into a house on the beach stark naked and announced, "I am a Naval Aviator who cracked up out at sea and I'd like to borrow your phone to call the squadron at San Diego!"

Another time, while doing acrobatics over the silver strand south of Coronado, Bubbles got into an outside spin. He couldn't get out of the spin and at 1,000 feet cut the switches, opened his belt and hit the parachute. A fisherman in the bay picked him up. The plane, without pilot, righted itself and made a perfect landing on the beach. At the end of the run, it ran into the soft sand and nosed up with no damage. Later, a crew went down to the beach, pulled the tail down, rolled it down to the hard sand and another pilot flew it back to the station.

A T4M goes around as USS Saratoga recovers torpedo planes during flight operations.

T4M

BM-1

F8C

F2B

O2U

F4B

FBC Falcons prepare for takeoff from Lexington in this 1928 photo. Martin T3M's at right display the wing fold characteristic of early torpedo planes.

T4M's like this one from Saratoga's VT-2 were an important part of the carriers' striking power during the late Twenties and early Thirties. They were expected to locate and attack the enemy battle line.

A hard situation to live down.

He was killed during dive bombing in an F4B-4. He pulled the bomb release and pulled out. The bomb did not release but the wings did!

The Seattle-Tacoma area was suffering from a record lack of rainfall and the power dams were depleted of water. The authorities put in a call for help for emergency power. *Lady Lex* went to Tacoma where she lay alongside the dock and hooked up the town's power lines to her power drive generators and for a whole month supplied all the power needed to operate all of Tacoma.

In 1929, the fleet conducted Problem IX. It was an attack on the Panama Canal. *Lex* was on the defending side and *Sara*, flagship of ComAirBatFor, was on the attacking side.

Rear Admiral J. M. Reeves, a brilliant tactician and advocate of naval air power, and a gifted speaker, had some very different ideas. He believed that the carriers should not be tied to or attached to the battle line and at a pre-problem briefing said so. There was some sharp talk between the Commander, Black Forces (the attacking force) and Reeves. Reeves said, "It will be the same old thing — the Scouting Fleet will scout, everything will be located, minor actions will occur and finally the big fleet action will take place and BatDivFive will attain the blind spot off Balboa and attack the Panamanian fortified islands."

After some discussion, Black Forces agreed to detach *Saratoga* and *Omaha* and two plane guard destroyers two days before the start of the problem to "operate on your own." *Langley* was in overhaul, so *Sara* took her 18 fighters and six scouts aboard, bringing *Sara's* group to an impressive 96 planes. When detached from the attacking force, Reeves took his little group, *Sara*, the light cruiser *Omaha* and two plane guard destroyers, and headed in a wide swing to the Galapagos Islands far to the south of the problem area. (The crews really enjoyed the fishing and swimming.) The Scouting Fleet scouted and found everything except *Saratoga*.

Lexington, operating with the Blue Battle Line, ran afoul of Black BatDivFive's 16" guns at short range and undoubtedly had been sunk. The loss of *Lex* at this early stage would have serious effect on Blue's defense, so the umpires ruled that she was damaged and slowed to 18 knots.

The problem was to be over at 0800 on January 26th. Reeves started his little group north at 30 knots, to arrive at a point 150 miles from Balboa at 0430 on the 26th. At this terrific pace, the escorts were having a tough time keeping up. Finally, *Omaha* signaled, "I cannot maintain this pace." Reeves signaled permission to drop out and proceed to Panama. *Sara* encountered a Blue destroyer and took her under fire with her 8-inch turrets and she was declared sunk, but several planes were declared wrecked by gun blasts. *Sara* then encountered the Blue light cruiser *Detroit*. She challenged *Sara* and Reeves flew a signal "Form 18." *Detroit*, thinking it was *Lex*, complied. After several hours of struggling in *Sara's* wake, Reeves notified her she was sunk. The umpires scratched a couple more planes damaged by gun blasts. At 0430 word went out, "Pilots, man your planes." It was still dark — very dark. But *Sara* launched over 80 planes which rendezvoused and proceeded to attack the locks at Pedro Miguel, Miraflores, and the army planes at Albrook Field and "any enemy battleships on the way home." Reeves told the air group that he would maintain his course and speed to close

the return flight — and stated, "By the time we turn into the wind to take you aboard, the problem will be over."

Though *Detroit* was sunk, she continued to send the defending forces messages giving *Sara's* position. The chief umpire then declared *Lex* was back in commission and could launch her aircraft.

Saratoga pilots had an airman's holiday. The planes at Albrook Field were lined up wing tip to wing tip. The AA guns at the lock all had gun covers on. The whole thing was a wild melee. Battleships were heading in for their assigned anchorages with planes diving on them from all directions. As *Sara* was recovering her air group, *Lexington* planes finally attacked. *Lex* and *Sara* were now in sight of each other and shore-based planes came out and attacked *Lex*, their own carrier, although no one realized it at the time!! Thus was born the Fast Carrier Attack Force which operated so successfully in WW II. At the ensuing critique, Reeves gave a masterful summation of his ideas on the use of aircraft and aircraft carriers and gained the enmity of every battleship admiral in the fleet.

He was shortly relieved and ordered as Inspector, Naval Material, West Coast. However, you can't keep a good man down and, two years later, he was back as Commander in Chief, U.S. Fleet. Someone in Washington realized a new era had arrived in the fleet with the advent of *Lady Lex* and *Sister Sara*.

One result of Problem IX was that *Sara* was directed to paint a broad black vertical stripe on both sides of her stack. It did not settle the question of the so-called battle line carrier. The senior surface Navy could only see the majestic line of battleships aided and assisted by cruisers, destroyers, submarines and perhaps a carrier or two. There was a firm belief that airplanes could not sink a battleship.

In the early Thirties, the fore and aft wires of *Sara's* and *Lex's* arresting gear were removed as not being essential and the speedup of the air group landing was further accomplished by putting a standby plane in the landing circle at a half interval to move in, in case the landing plane was waved off.

Landing gears and barriers were improved and the operation became more sophisticated. Admiral Reeves (irreverently nicknamed Billy Goat because of his full beard) in a directive said, "It is not sufficient for one officer, ComAirRons, to be proficient in effectively employing aircraft. *This knowledge must be possessed by all flag officers.*" He then assigned *Lex* and *Sara* to periods with the cruiser force, the destroyers and submarines. He said, "This employment of aircraft in widely differing missions reacts not only to the vast improvement of the air arm but also, and equally important, it acquaints the officers of command rank with the possibilities and effective means of employing aircraft to further the main mission of the fleet — the destruction of the enemy."

He perhaps "acquainted" the officers of command rank, but few were educated in the use of aircraft to destroy the enemy. The battleship was the engine of destruction. In the Thirties, a major portion of the senior officers of the line were convinced a carrier could *not* sink a battleship under combat conditions and many said so publicly.

This was illustrated in one light forces' exercise where *Saratoga*, cruisers and destroyers attacked BatDivFive — *California, West Virginia* and *Colorado*. Actually, the air group was told to concentrate on *California* and did so. The unrealistic umpires assessed the *California* as losing two AA guns with all personnel; the *West Virginia* lost two planes on the catapults, her foretop and 50 percent of her fire control, with range finders lost on all after turrets; and *Colorado*, ten percent of firepower. They assessed all sorts of penalties for torpedo hits. The attacking force was beaten off.

When *Ranger* joined the fleet, there was a demand, "Here is the battle-line carrier." Only 14,500 tons, she was built as a carrier from the keel up and could carry an air group of four full squadrons. Fortunately, she was not assigned to that role.

She was a little sister to the mighty *Lex* and *Sara*, but she had many innovations and, although a little weak in some respects, was a welcome addition to the building naval air arm. The original group of Naval Aviators had now ranked up to captain. Ken Whiting got command of his old sweetheart, *Saratoga;* Jack Towers and Pete Mitscher moved into command.

In 1937 and 1938, *Yorktown* and *Enterprise* were commissioned and the next year joined the fleet. Though smaller than *Lex* and *Sara*, 19,800 tons, they were much more nimble, slightly faster and much more modern — hydraulic catapults and arresting gear double ended with bow and stern arresting gear. *Lex* and *Sara* were referred to as "big, clumsy and foolish."

Though the two sisters had reached a mature middle age, they were far from doddering. They had been facelifted several times and would prove their worth in WW II.

Saratoga and Lexington steam in line ahead of Ranger in the mid-Thirties. Planes in the immediate foreground are F3F's, while those forward are SBU's.

E

Fifty years ago the Navy commissioned a small, odd-looking vessel. To the battleship sailors of 1922, she must have looked like anything except a warship. But USS *Langley* (CV-1) was the beginning of a new Navy — the Navy of carrier task forces.

A descendant of *Langley* is USS *Enterprise* (CVAN-65), the world's largest warship and only nuclear powered aircraft carrier. The dimensions of this giant would completely awe the old sailors of *Langley* and are impressive even to their modern day counterparts. Displacing 90,000 tons and with a height equal to a 25-story building, *Enterprise* is capable of ranging the seas for months at a time without entering any port. Her nuclear plant will operate up to 13 years.

Enterprise, escorted by the nuclear powered *Long Beach* and *Bainbridge*, made a round-the-world cruise in 1964, Operation *Sea Orbit*, to demonstrate the capabilities of nuclear power.

This magnificent operating ability, coupled with her almost 100-plane air wing, gives *Enterprise* access to approximately 85 percent of the earth's

surface, in any weather, thanks to her massive array of technical equipment.

A year after her world cruise, *Enterprise* departed Norfolk, Va., and sailed over halfway around the world to the coast of Vietnam and immediately began to launch combat sorties — without a pause for replenishment of any type.

With her four and one-half acre flight deck, she is capable of launching and recovering high speed aircraft at a tremendous pace, while moving through the sea at speeds up to 30 knots. During her ten years' service, she has recorded approximately 120,000 launches and recoveries.

Her 5,000-man crew, including the carrier air wing, works a 12-hour day, seven-day work week when operating on the line off Vietnam. During flight operations the *Big E* looks like any other attack carrier. Brown-shirted plane captains climb over their planes giving them final checks; red-shirted ordnancemen attach their deadly devices under the wings; and yellow-shirted cat personnel anxiously await their turn.

Day after day, night after night, this routine continues. By daylight or in the eerie, dim lights used for night operations, the bright-shirted men move about the flight deck giving the necessary signals to the cockpit-enclosed pilots.

To the men involved, each move has its proper place in the ritual and all signals are made in a professional manner by proven professionals.

Just below the flight deck, in the ship's enormous hangar bays, the aviation repair gangs hover around the aircraft much like bees around a hive. Each plane has the man with the right expertise diligently working to correct any trouble or complete the necessary maintenance for safe operation of the aircraft. Electricians, metal workers, hydraulic specialists and jet mechanics — each solves the problem in his area of responsibility and lends a hand to a shipmate when needed. It is a team effort, each squadron looking after its planes, the air wing assisting the squadrons, and the crew of *Enterprise* assisting and supporting the whole.

Keeping the planes ready to go — that is the name of the game.

FIFTY YEARS:

Fifty years ago, on March 20, 1922, the ex-collier Jupiter became the U.S. Navy's first aircraft carrier. As USS Langley (CV-1), she was the most revolutionary development since the Monitor. Above, Langley undergoes conversion at Norfolk in 1921. Her first three years were spent as an experimental ship developing the art of carrier operations. In 1925, assigned a regular fleet squadron, the ship joined the fleet in exercises off California. Langley's 534x64' flight deck and 14-knot speed limited her operations, but she still saw useful work as a carrier, then a seaplane tender and, later, as an aircraft transport in WW II. Below, autogiro tests are conducted with an XOP-1 in 1931.

A PICTORIAL REVIEW OF THE AMERICAN AIRCRAFT CARRIER

Saratoga's 880x90′ flight deck could accommodate up to 80 aircraft, with more stored on the hangar deck. Her 35-knot speed and sleek lines were inherited from her battle-cruiser hull.

Lexington, Saratoga and the airship tender Patoka, seen from the dirigible Los Angeles, symbolized the Navy's advancement in taking aviation to sea in the late 1920's. Below, fighter and torpedo planes fill Lexington's deck. Aircraft shown include F3B's, F6C-3 Hawks and T4M's.

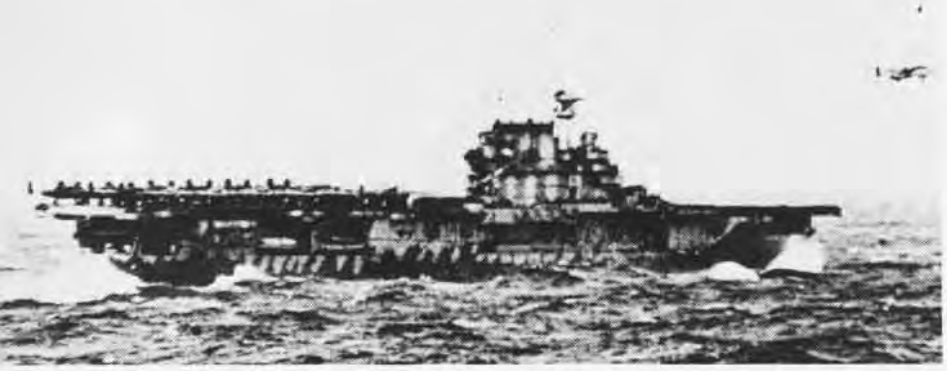
Lexington and Ranger follow Saratoga's wake in mid-30's photo. Aircraft in foreground are F4B-4's. Below, Sara, distinguished by vertical stripe on stack, lands T4M's.

FIFTY YEARS

Ranger (CV-4), commissioned in July 1934, was the first U.S. carrier built from the keel up. She was smaller than Lex and Sara, and during most of WW II confined her operations to the Atlantic where she participated in the Neutrality Patrol, North African invasion and in support of British fleet.

Yorktown (CV-5), loading aircraft at NAS North Island in March 1940, like her sister ship Enterprise (CV-6), below, was larger than Ranger. It had been determined that 20,000 tons was the minimum effective size for a carrier. Yorktown, a veteran of Coral Sea, joined Enterprise to win at Midway.

SBU takes off from Ranger in late 1937. Planes in foreground are BG-1's of VB-4. Wasp (CV-7), below, was smaller than Ranger but gained fame delivering British fighters to Malta and supporting Guadalcanal-Tulagi landings.



A new class of ships which was to become the backbone of carrier aviation in the latter part of WW II was ordered in 1940. Essex (CV-9), the first of this series, was delivered December 1942. At first, pre-war ships such as Hornet (CV-8), left, which made the first raid on Japan, April 1942, carried the load.

SOC's line the deck of the escort carrier Long Island (AGV-1) on Neutrality Patrol. Below, two F2A Buffalos appear on Long Island's 465' flight deck, built on merchant hull, in June 1941.

Yorktown under attack by Japanese planes during the Battle of Midway in which four enemy carriers and several major warships were destroyed. U.S. carrier aviation accounted for this turning point in the Pacific. Below left, SB2U's circle Ranger in the Atlantic. SBD is brought on deck, below.

Escort carriers fulfilled numerous missions. In the Pacific they provided air support for amphibious landings and operations ashore. A burning enemy bomber, left, passes over two CVE's during the Marianas Campaign. Above, F4F's and SBD's line the deck of a CVE escorting a convoy bound for N. Africa.

FIFTY YEARS

F6F comes aboard Saratoga after raid on Rabaul in November 1943, left. Above, Hornet, in company with Enterprise and a battlewagon, launches planes. CVE's form a line astern, below.

CVE carried a mix of Avengers, Wildcats and SBD's for ASW duties. Later, the SBD's were dropped from this mix and Atlantic ASW aircraft adopted a light-hued paint scheme, below.

SBD's of Task Force 58 return to their seaborne airbase after hitting Palau, prior to the invasion of those islands.

FM-1's, right, are respotted and rearmed aboard Sargent Bay (CVE-83) in February 1945 in preparation for an air support mission. Below, Randolph typified the growing power of U.S. carrier aviation as more Essex-class ships joined the fleet.

FIFTY YEARS

Bon Homme Richard and battleship Missouri refuel at sea. This underway procedure greatly extended the carriers' range. Rocket-laden F4U's, left, taxi forward for launching from Hancock late in WW II. These newer and more powerful aircraft increased the carriers' striking power considerably.

Army aircraft also flew from carrier decks. In addition to these P-40's used in the North African invasion, P-51's were delivered to India and Doolittle's B-25's raided Japan from carriers. Left, a Hellcat takes off from Yorktown. By war's end a large force of carriers had been assembled to sweep away enemy opposition. These Essex-class ships are gathered at Ulithi Atoll in 1944.

Art of the Carrier

Presented for the first time in full color — a portfolio of illustrations depicting carrier operations, executed in the Combat Art tradition by professionals with camera, brush and pencil.

Above, Marine Corps Captain Alex Raymond portrays WW II interrogation of USS Gilbert Islands' pilots after strike against enemy forces. Raymond was creator of the original "Flash Gordon" adventure strip.

R. G. Smith's "Ensign Gay, Sole Survivor Torpedo 8"

Another view of the Battle of Midway, by Smith

"Torpedo attack on Hwachon Dam," a Smith painting, shows VA-195 Skyraiders from USS Princeton in successful 1951 Korean War raid. At right, pilot mans A-4 Skyhawk in illustration for Naval Aviation News by Commander Ted Wilbur. Below, PH3 William R. Curtsinger captures A-6 Intruder in twilight landing aboard USS Roosevelt.

At left, "Night Operations," a Curtsinger photo. Above, an Alex Raymond sketch of a pilot during briefing. Below, in Smith's "Launch," an F-4 Phantom is about to be catapulted from USS Constellation in Tonkin Gulf.

USS RANGER (CVA-61) ON YANKEE STATION

painting courtesy of

U.S. Navy Combat Art Collection

USS LEXINGTON (CV-16)

'R.G.' Smith has his own way of looking at Naval Aviation. His view of the training carrier Lexington, above, differs somewhat from that of the imaginative photo, opposite. An advanced military systems design engineer, Smith has rendered more than 700 paintings in 36 years with Douglas Aircraft. Two tours in Vietnam as a Navy Combat Artist added 20 more oil paintings to that collection. Below, the preliminary sketch for the Constellation "Launch" painting.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By Rear Admiral Dan Gallery, USN (Ret.)

I flew off the old *Covered Wagon* back in 1936-37 as a lieutenant and operations officer of VS-4. Squadron skipper was LCdr. "Long John" Cassidy and X.O. was Lt. Tommy (Lord Plushbottom) Robbins. The skipper of *Langley* was Captain "Genial John" Hoover; his exec and air officer were Commander Art Davis and LCdr. Slats Sallada, respectively (all later made admiral).

At that time, Aircraft Battle Fleet consisted of *Saratoga, Lexington, Ranger,* the *Covered Wagon, Beano* and *Me Too. Beano* (*Aroostook*) acquired her nickname because it was alleged the word was often passed "Liberty will start at 4 p.m. but there will be no boats." *Me Too* was a little seaplane tender, a minesweeping tug whose name I've forgotten, a sister ship of *Teal* and *Sandpiper.* In the early days, when Aircraft Battle Fleet sortied from San Diego, the order of battle was the *Covered Wagon, Beano* and *Me Too.*

Langley was just about the size of the Kaiser jeep carriers of which we had 60 in WW II. She was a converted collier and flush decker, having no island. Her new bridge was under the flight deck, up in the bow. She had smoke stacks on each side of the flight deck aft which were pivoted so they could be swung down horizontal during flight operations, thus giving you a clear shot at the landing area. You needed it because the landing area was tiny and *Langley's* top speed was 15 knots.

Our LSO was Lt. Warren Berner. He used to stand on his platform at the aft port corner of the flight deck and wave us in with semaphore flags. His signals were not advisory. They were direct orders. And they had to be right because often there was only 20 knots of wind over the deck, and from the ramp to the first barrier was only 250 feet. But looking back on it now, we had surprisingly few barrier crashes.

Rule #1 in those days was "never touch your throttle after you take a cut until the traffic director on deck gives you the signal." If you bounced, or if your hook jumped the wires, you just had to sit there and take it while your plane went into the barriers. But if you gave it the gun trying to go round again and didn't make it, you plowed into a whole mess of airplanes parked forward of the barriers. There would be blood, guts and feathers all over the flight deck. But no brains.

Langley had no catapults, so every takeoff was a fly-off. Sometimes, with only 20 knots of wind over the deck, you would roll off the bow ramp, right on the verge of stalling speed. But the flight deck was about 50 feet above the water and, by judicious use of this altitude, you could pick up flying speed before you hit the water.

In those early days, Naval Aviation was a dawn to dusk outfit. Once or twice a year, we would make four night landings with a full moon. *Langley's* squadrons always did this on *Lex* or *Sara.* Later, during the war, I broke the ice on round-the-clock flight operations in the Atlantic with *Guadalcanal,* a jeep carrier no bigger than

Langley (*NANews*, April 1969, p. 14).

The planes we had in VS-4 were OS2U's as I recall. They were two-seater, open cockpit biplanes with fixed landing gear, no slots or flaps, and a fixed tail skag. Their top speed was around 150 and I doubt if they did any more than 250 even when we shoved them straight down in a dive-bombing approach. Their stalling speed was about 58 and they had an endurance of about five hours. However, when flying off the ship, we never got out to more than 100 miles. This distance was fixed by our ability to find our way back. All our navigation was by dead reckoning on a chart board that slid under the instrument panel.

You were often lucky to find the ship at all after a 100-mile flight out and back, considering variations in flying a course, inaccurate compasses and airspeed meters, variable winds and the fact that the *Covered Wagon* wasn't always where she said she would be when you got back. If you got lost, you made "U-O's" on your radio and the ship would take radio bearings. If that didn't work, as it sometimes didn't when the ship gave you a reciprocal bearing, she would reluctantly open up and make U-O's on her radio so you could home on her.

Langley carried two squadrons of 18 planes each. The other squadron was VF-1. As I remember it, it flew F4B's which were of the same vintage as our OS2U's.

Admiral "Billy Goat" Reeves was CinCUSFleet. He was a Naval Aviation Observer, had been ComAirBatFor and was a brilliant naval officer and advanced thinker — ahead of his time. Back in '36 he was constantly preaching the need for eternal vigilance against a sneak attack by the Japanese on the U.S. Fleet. He impressed this indelibly on all hands one weekend. One Saturday afternoon, he waited till everybody was ashore for the weekend, and then he sent the following urgent signal from his flagship in San Pedro: "U.S. Fleet get underway immediately and assemble in battle formation on course 270, 100 miles west of San Pedro Light, at dawn Sunday." This dispatch hit the San Pedro-San Diego area like a blockbuster. This was right after the Panay incident and, for all anyone knew, we were going to meet the Japanese fleet off San Pedro that Sunday morning. There were battleships that got underway that afternoon with lieutenant commanders on the bridge, leaving captains and commanders jumping up and down on the dock. *Langley* was in San Diego and had Scotch boilers which took a long time to raise steam, so all her officers got back. The squadrons flew out from North Island and landed aboard at daylight the next morning, and we joined the U.S. Fleet in battle formation. Then Adm. Reeves sent a signal, "Well Done. Report to port."

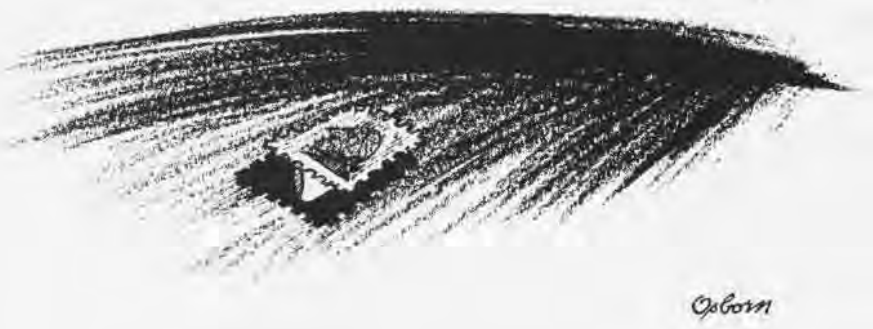
The battleship was still the backbone of the fleet. Most naval officers visualized the final battle of the coming war with Japan as a classic fleet action between main bodies, like Jutland. The two battle lines on parallel courses would slug it out at about 20,000 yards with the light forces of the van and rear harrassing the main battle lines. Nobody was quite sure what part aircraft carriers would play in this fleet action. Most strategists agreed that they would be kept 50 to 100 miles on the disengaged flank and might be useful in finishing off cripples with bombs. Pearl Harbor changed that!

One day we were operating with the Battle Fleet off Panama, exercising with submarines. The Battle Fleet was steaming along in column with a destroyer screen ahead and our submarines were supposed to make submerged attacks on it. I was sent out that morning to hunt submarines and report any I found to CinC. As I was to verify later in the Battle of the Atlantic, a submerged sub, which only occasionally pokes up the end of its periscope, is very difficult to spot from the air. But that morning I happened to find an oil streak which was growing at the rate of about six knots and headed right for the battleships. It was obviously coming from a submerged sub with an oil leak. I gleefully latched onto it and reported it to CinC.

I spent the next half hour flying up and down this streak at very low altitude, carefully checking its compass course and zooming up in the air when I got to the end of it, thus indicating the sub's exact location. I kept CinC fully informed on the approaching menace. Finally, the sub got to its firing position about 2,500 yards from the flagship, and I was making another pass up his oil streak. I was nearing the end of the streak, ready to pull up, when the sub fired its torpedo and turned loose some sort of an infernal machine which came to the surface and fired a rocket straight up. That damned thing didn't miss me by more than a few feet. I almost acquired the unique distinction of being shot down by a submerged submarine!

On that cruise, a lot of the boys on *Langley* took to growing beards. This did not meet with the approval of Genial John, our skipper. One morning the last item on the Plan of the Day, in large capital letters, was the simple statement "NO BEARDS." The beards all disappeared that day.

Langley was a grand old ship and it was an honor to serve in her. From her small flattop hull has sprung a distinguished line of giant canted-deck ships carrying squadrons of supersonic jets. I trust that the sailors who man these ships are still the same adventurous hardy lads that we had in the *Covered Wagon*.



MOONLIGHTERS

By Rear Admiral J. R. Tate, USN (Ret.)

Even before the commissioning of USS *Langley*, Whiting, Chevalier and Griffin held a conference with all the pilots of the prospective crew to consider night flying and how it could be adapted to carrier operation. Whiting was insistent that it was extremely pertinent, even though field operations at that time were sketchy, to say the least. The pictures Whiting drew up for us of whole squadrons taking off, going on missions of a hundred miles and returning to the carrier were almost inconceivable to us. He did concede most missions would terminate after sunup, but insisted all pilots should be qualified in night landings in case of emergency.

With this directive (viewed with some skepticism by quite a few pilots), a program of night flying was scheduled. The first problem was landing lights. At this time, there were no night landing lights of any sort, even for field use. Night flying was scheduled for full moon periods at NAS Hampton Roads. Two rows of buckets, spaced 50 feet apart and the width of *Langley's* deck, were put on the field and filled with rags doused in oil and a little gasoline. This was supposed to represent the flight deck.

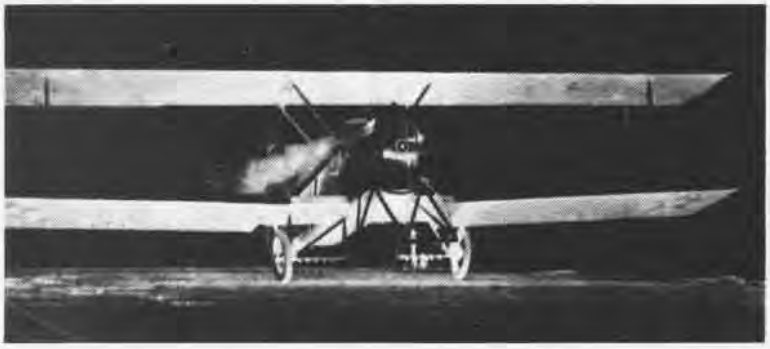
For the first few months, night flying consisted of two or three hours of circling the field and making landings. An officer sat to the side, recording each landing and estimating which wire would have been engaged.

Lt. F. W. Pennoyer, a naval constructor and an aviator attached to the ship, designed a series of boxes with various types of deck lights and louvers — for deck lights. These were put on the field in place of the buckets of burning rags. The best of these designs was selected for the ship's deck lights. Whiting also investigated the use of various types of floodlights and asked Prof. Meggars of the Bureau of Standards down to discuss the use of ultraviolet lighting on the decks. No further work was done on night operations until *Langley* arrived in San Diego.

It then became a prime project. All pilots were required to do extensive night flying at North Island in all types of aircraft — VE-7, TS-2 and DT-2. Flare buckets were used on the field, but deck lights were fitted on the mock *Saratoga* deck, built on the field along-

side the balloon hangar. Practice approaches were made on this field. All pilots made at least one night cross-country to San Pedro and returned following the coastline. Fortunately, *Langley's* deck was almost into the prevailing wind when port-side-to, and plans were made for actual landings on a flight deck at night.

Some new difficulties immediately appeared. During the day, landing approaches were made in a lefthand turn. To do this required most of the approach to be over North Island and Coronado. The night approach was modified to a run up San Diego Bay with a slight left turn into the groove to landing. Lt. "Gotch" Dillon came in very nicely in a VE-9 and landed with no difficulty but complained about all the miscellaneous lights in the dock area and suggested they be turned out.



Soon all pilots qualified in the VE and TS fighters. Then, all qualified in the UO-1 and finally in the Douglas torpedo plane, DT-2. There were several casualties, with one TS ending up still hooked to a wire on the deck while hanging over the side. Most casualties, however, were caused by the tail hook riding a fore and aft wire. Pilots were directed, if they went over the side, to try to make it to starboard as a water landing was considered better than going off onto the dock. The ship's only truck was badly damaged on the dock by a TS! (Trucks were not replaceable in those days.)

Finally, landings were made at sea, underway, successfully, and it was considered that all carrier pilots should be qualified for both day and night operations.

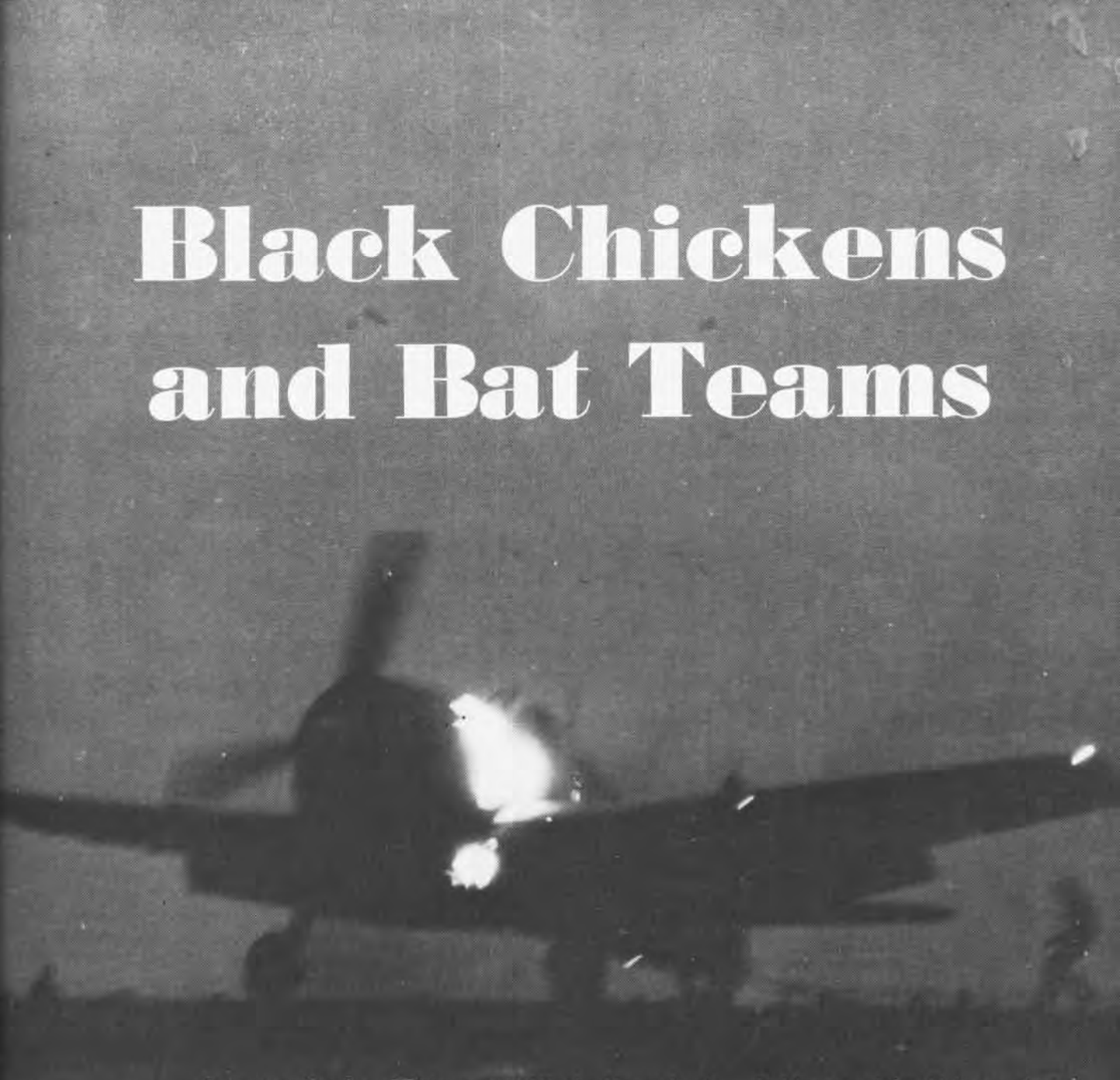
In the middle Thirties, night flying became organized, with the *Lex, Sara* and *Ranger* operating out of Long Beach and 12 squadrons operating from the field at North Island. San Diego Bay had not been dredged sufficiently for the carriers to get inside, so they had to base in Long Beach. When they came to San Diego, they had to anchor outside, and it was a long boat ride into the station dock. A tower had been built, the landing area alongside the balloon hangar paved and landing lights installed. Night flying was scheduled five nights a week. However, the Navy and the Coronado city council agreed that all night operations would cease by 10 p.m.

All pilots were to qualify with a minimum of ten hours of night flying and ten night carrier landings. Each squadron was then required to make a night flight to San Francisco and, finally, squadron night carrier landings. The goal was finally reached in 1936. When *Yorktown* and *Enterprise* joined the Battle Fleet in the late Thirties, this practice was almost routine and added thereto were night catapult operations. This was fine except for the air group commander and his section, who were fired out of the hangar deck catapults crosswind! At night, this was a bit hairy and not at all popular.

With all this preparation and planning, it is hard to realize that at the Marianas Turkey Shoot most of the pilots returning to the carriers after dark were *not* qualified for night landings. What happened?

In an effort to shed light on one of carrier aviation's obscure aspects, *NANews* queried other pioneers in Navy night attack/fighter operations. An account follows.

Black Chickens and Bat Teams



A commentary by

Vice Admiral William I. Martin, USN(Ret.)
Vice Admiral Turner F. Caldwell, USN(Ret.)
Commander Edwin R. Jenks, USN(Ret.)

Prior to WW II, the Navy placed little emphasis on instrument flying and few pilots were really proficient at "flying the gauges." Carrier squadrons were effective only during daylight — and only in weather which permitted orientation by visual contact with the surface of the earth. Pilots were required to be "night carrier qualified"; however, the qualifications, consisting of six night takeoffs and landings, were conducted only when there was good visibility under moonlight conditions. The carriers and the squadrons were greatly relieved when these once-a-year ordeals were over.

In fairness to those old-timers, pilots of modern carrier aircraft should bear in mind that flight instruments were primitive and unreliable; navigation facilities provided approximate azimuth but no range information. There were no radars, so pilots received no position or collision avoidance assistance from the carrier. There were many hairy tales about planes being unable to return to their carrier because of weather conditions. Without radar and adequate weather forecasting assets, the carrier frequently was surprised to find herself in low visibility areas. At night pilots had no means

F6F-5N night fighters in a rare grouping. Photo below illustrates moonlight silhouetting effect on enemy ship under a bombing attack.

Black Chickens and Bat Teams

of avoiding clouds and bad weather areas. To a pilot unskilled in instrument flying, it is nightmarish to be unable to orient visually with the earth. It is little wonder that night flying was extremely unpopular among carrier pilots—in fact, they jokingly spoke of instrument flying as "needle, ball and rip cord."

Parenthetically, it should be stated that our potential enemy in the Pacific was no better off. It is possible, however, that the kamikaze cells in his blood stream obscured his fear of the operational risks involved.

A short time before WW II, Navy pilots began hearing about an electronic device called "radar" which, if it could be installed in an aircraft, would be able to detect things and give the pilot bearings and distances. For Navy pilots proficient in instrument flying, the promise of eyes to see through darkness and bad weather was indeed exciting.

In 1941, as tensions increased, the Navy placed much greater emphasis on instrument flight training and initiated procurement of airborne radar for carrier-type aircraft. Even greater attention was applied when WW II started.

Under the pressure of combat, night carrier operations took two separate paths, led by separate groups of people. These were the development of night attack and night intercept operations. These specialities soon began to converge until by the summer of 1944

it was possible to form a night combat air group, CVLG(N)-41, aboard USS *Independence*. Soon thereafter, she was joined by USS *Enterprise* with CVG(N)-90 embarked.

Night Fighters

Requirements grow out of enemy capabilities and, therefore, the development of carrier-based night fighters grew out of operating requirements in the early days of the war in the Pacific. This is not to denigrate the excellent carrier operations in the Atlantic — but the main story is that of the Pacific.

The Japanese were forced to develop tactics for night reconnaissance and attack in order to react to the movements of U.S. forces. In operations in the Solomons during the summer of 1942, the Japanese found that their losses in night operations were only a fraction of those during daylight, and that they were accomplishing useful results. The tactics developed for night torpedo attacks against U.S. ships consisted of shadowing the formation until the composition was known, then dropping flares on one side. The torpedo-carrying aircraft would then attack from the other side with their targets silhouetted against the light of the flares. *Denver* was the victim of these tactics on November 13, 1943, during the Bougainville operation. A month later, these tactics were used against us in the Marshall Islands, resulting in the torpedoing of *Lexington*. The frequency and effectiveness of Japanese night air attacks grew as the Pacific War continued and as operations led us closer to Japanese bases.

We were thus forced into the night sky by our enemy. His tactics and aggressiveness initiated the program which was to produce our night fighter pilots.

In April 1942, the Navy started Project *Affirm* at Quonset Point, R. I. Under Captain E. J. Taylor, USNR, who had night fighter experience with the British in 1941, the Navy — with the help of the Sperry Company and the Massachusetts Institute of Technology — developed the equipment and trained the pilots necessary to gain control of the night sky.

The first operational night fighter units were a squadron of six F4U *Corsairs* under Commander William J. Widhelm, and a squadron of six twin-engine Lockheed *Ventura* patrol planes commanded by Lieutenant Colonel Frank N. Schwable, USMC. These squadrons, land-based in the southwest Pacific, did much to develop night air intercept tactics, particularly the techniques of working with combat information centers.

The first night intercept attempts from a carrier were carried out during the Gilbert Islands operations in November 1943. LCdrs. John L. Phillips and Edward H. O'Hare, of *Enterprise*, were given permission to attempt night intercepts with a *Hellcat* fighter and an *Avenger* torpedo bomber, using the search radar (ASB-1) of the latter to locate the target. This effort, with minimum equipment and training, broke up a large scale Japanese attack. Unfortunately, "Butch" O'Hare was lost.

By early 1944, night-trained pilots were being assigned to various carriers as four-plane units. Each unit was an integrated team of pilots with a specially trained fighter/director officer and maintenance personnel. Pete Aurand, Jim Gray and Pete Peterson were three among nearly a dozen officers who led these early detachments. Their feedback of information to the training facility in Rhode Island was invaluable.

Night Fighter Squadron 79, (VF (N)-79), with 18 F6F *Hellcats*, commanded by Commander Turner F. Caldwell, was assigned to *Independence* (Captain E. C. Ewen commanding) in early July 1944. Shortly thereafter, the previously mentioned convergence of night fighter and night attack capabilities occurred. A squadron of nine TBF *Avengers* under Lt. R. A. "Rebel" Taylor was assigned to *Independence* and the group was designated CVLG(N)-41.

The effectiveness of night fighter operations was dramatically demonstrated in one incident during the passage of Task Force 38 through the Bashi Channel between Formosa and Luzon, en route to the South China Sea. A CVLG(N)-41 fighter pilot, Ens. W. W. Williams, shot down a Japanese transport airplane (evacuating people from the Philippines) directly over the fleet flagship, USS *Hancock*. The fuselage struck the water a few yards to starboard, the engines to port. Admiral McCain, Task Force Commander, came on the radio to congratulate all concerned. His teeth chattered so from excitement that he was scarcely intelligible.

Night Attack

Air Group Ten, deployed aboard *Enterprise* in 1942, took a special interest in instrument flying and developed the Navy's first instrument flight manual applied to the specific needs of carrier squadrons. At the end of that combat tour, a few of its instrument flight enthusiasts volunteered to form the nucleus of a new Torpedo Squadron Ten because it was to be the first carrier squadron completely outfitted with radar-equipped TBF's.

These Grumman torpedo bombers then carried a primitive radar designated ASB. Presentations on its scope were subtle and elusive; interpreting was like learning a strange language.

At night a Hellcat's presence was generally signaled by the enemy bursting into orange ball of flame.

Black Chickens and Bat Teams

F6F Hellcats and radar-equipped TBF Avenger, typical Bat Team, being spotted on Enterprise for night launch.

Many weeks of intensive work were necessary to train radar operators to navigate and to coach the pilot through bombing attacks.

The second Air Group Ten deployed to the Western Pacific, again aboard *Enterprise*, in 1943. *Torpecker Ten*, as the torpedo bomber squadron was affectionately known, had sharpened its skill in low level night attack. Aircrew morale was high. It was their conviction that losses due to enemy action — AA and night fighters — would be much lower at night. Night flying admittedly involved higher operational risks; however, these were proportional to the skill of the aircrew.

Contributing also to their high motivation was a realization that if they could operate successfully at night, they could shorten the war. The enemy was servicing his aircraft and repairing his airfields and ships at night. Redeployment of aircraft and staging for future operations were carried out under cover of darkness. By taking the offensive to the enemy at night, we could disrupt these operations and keep him off balance until dawn, when our daytime air offensive would take over. We would give his forward area people a bad case of insomnia.

Because night attack was new and untried, there was reluctance initially on the part of task force commanders to employ Torpedo Squadron Ten in a night role. Its first opportunity to prove its capability came in February 1944 when it was permitted to attack Truk the night before planned daylight operations. It was a very black night when *Enterprise* launched 12 radar-equipped TBF's to attack enemy ships anchored in Truk Lagoon. Applying a masthead level bombing technique developed by the squadron, each plane made at least two low altitude runs releasing one or two 500-pound bombs on each run, depending on pilot/radar operator confidence that the target was a ship rather than one of the many very small islands or rocks in the lagoon which gave a ship-size radar return.

That night the feasibility and effectiveness of night carrier attack were proved. Two tankers and six freighters were sunk and five other ships were left burning. All but one of the TBF's returned safely to *Enterprise*. The success of that mission gave strong support to the night attack carrier air group concept.

Subsequently, Commander William I. Martin, with a few volunteers from old Scouting Squadron Ten and many volunteers from Torpedo Squadron Ten, formed the nucleus of Night Air Group 90 (CVG(N)-90). Through a very happy turn of events, *Enterprise* was designated the carrier, CV(N)-6, which would take the night air group into combat.

Because of time constraints, Night Attack Squadron 90 (VT(N)-90) formed and trained in Hawaii where it was joined by Night Fighter Squadron 90 (VF(N)-90). In optimizing the TBF for night attack, the squadron made some weight reduction proposals which higher authority disapproved. In order to carry more ordnance and improve the safety of overload night takeoffs, the squadron wished to remove the turret, the tail gun and all armor plate—totaling about 1,700 pounds. When Cdr. Martin appeared before Admiral John H. Towers to appeal the disapproval, the admiral said that his aeronautical engineers had advised him that removal of those items would dislocate the CG so that the aircraft would not fly; furthermore, the O&R people had advised him that the proposed modifications would take so long they could not be accomplished before the scheduled deployment. The commander responded with a request, "Admiral, I'd like to borrow a jeep to return to Barbers Point. Last night, in just a few hours, squadron personnel made the modifications we've proposed and I flew that TBF here to Ford Island this morning. In view of what I've just heard about that plane, sir, I sure won't attempt to fly it back!" The modifications were approved and priorities were assigned to assure their timely accomplishment.

The success of the night attack concept was made possible not only by skilled pilots but also by the officer and enlisted radar/navigator bombardiers. These "rear-seat" men with technical/operational expertise, dedication and fearless trust in their pilots were absolutely essential to this effort. The teamwork between pilot and crew was the most important factor in developing the overall capability. Each had to have the fullest confidence in the competence of the other.

Ltjg. E. R. "Bud" Jenks, radar

Pilots found night carrier landings more demanding. At right, a TBF mishap.

countermeasure officer on Admiral Gardner's staff, was also assigned to the air group staff and flew as a radar/navigator bombardier. He installed ECM equipment in ten TBF's and became the first ECM operator in combat.

Subsequent operations with makeshift ECM gear were perhaps the Navy's first effective and sustained tactical employment of what later came to be known as electronic warfare and now is a major facet in all areas of warfare applications.

In addition to the few names mentioned above, there were literally hundreds of *Enterprise* men who were key to the success of pioneering night operations — old-timers will recognize them: Bud Hall, Tom Hamilton, Roscoe Newman, Tommie Thomas, Killer Kane, Jack Blitch, Henry Loomis, Bill Chace, Russ Kippen, Charlie Henderson, Jim Plummer, Dal Runion, Russ Otis, K. D. Smith, Owen Young and Logan McMillen.

Night Carriers and Air Groups

Enterprise joined the fleet as a night carrier in January 1945 and participated in operations with *Independence*. By this time, operating techniques had so improved that a large night air group was at last practical and a large carrier was required. The South China Sea operation proved that *Enterprise* was much superior in operating efficiency. When *Independence* completed her tour in February 1945 and returned to Pearl Harbor for upkeep, she was reconfigured for day combat operations. The remainder of the war saw night operations being conducted exclusively from large carriers — *Saratoga* and *Bon Homme Richard* in addition to *Enterprise*.

Independence and CVLG(N)-41, during their six months of combat operations, provided night defense and attack capabilities for the fleet from before MacArthur's landing at Leyte, through the vicious fighting in the Philippines in November and December 1944, culminating in the great sweep through the South China Sea in January 1945. The record shows 27 confirmed night kills, including 9 out of 12 giant *Emily* flying boats operating against Task Force 38 out of Manila Bay. (The other three were destroyed at their moorings.)

On Christmas Eve 1944, the newly designated night carrier *Enterprise*, with her night air group, sailed on what was to be the ship's last combat tour. This great ship had worked hard to prepare for night operations — modifications, technical changes and specialized training as involved as those confronted by the air group. Fortunately, *Independence* and her night air group, CVLG(N)-41, already operating successfully at night, were very helpful in passing on lessons learned. For example, technical changes such as special external lighting and the use of a deck edge mounted airborne radar (APS-4) for controlling the landing pattern were *Independence* innovations. A YE radio homing beacon had also been installed at Pearl Harbor.

Although the ship was designated a night carrier, circumstances in combat demanded that she operate around the clock. Her flight deck was always available for taking aboard the emergencies of all the day air groups. The night air group frequently was called on to perform daylight missions when the weather was too severe for the day air groups.

The commanding officer and the navigator spelled each other on the bridge. Looking back on the many times during night and day when general quarters, flight quarters and torpedo defense were sounded, one wonders how anyone ever slept.

Engagements against the enemy consisted of air strikes against Formosa, Luzon, Indochina, the China coast, Pratas Reef and Okinawa; support of landing operations on Luzon; strikes against the Tokyo-Yokohama area; support of landing operations on Iwo Jima; strikes against Kyushi, the Inland Sea of Japan, Kikai, Amami, Kyushu, and Shikoku.

This combat tour ended when a kamikaze plane crashed through the forward flight deck on the morning of May 14, 1945, blowing the forward elevator 400 feet vertically. *Enterprise* and Night Air Group 90 had completed five months of significant pioneering under combat conditions. In addition to undetermined damage to the enemy's war-making resources ashore, Night Air Group 90 had deprived the enemy of 38 ships and 115 aircraft — an impressive accomplishment!

After the war the legacy of night operations from these briefly-sketched years was applied to "all-weather flying." Instruments, equipment, techniques and tactics were developed so that carrier-based aircraft can now operate in nearly any environment. Today's young pilot may find this second nature but, as in all man's endeavors, someone had to do it first, and the years 1942-1945 were essentially when they did it.

It is impossible to mention by name all the outstanding pilots, radar officers, enlisted aircrewmen, plane captains, ordnancemen and technicians who worked hard and risked their lives to make our efforts a significant part of winning the war. Nevertheless, we dedicate this article to them — they shall never be forgotten.

Heart of the system: personnel in radar room on board Essex-class carrier.

Sea Control

By LCdr. Paul N. Mullane

In recent years, the number of antisubmarine warfare aircraft carriers has declined sharply while studies continue to indicate that wartime ASW needs of our task groups and convoys would be greater than could be met with currently planned force levels. At the same time, our security interests and national commitments depend, to a great extent, upon the Navy's ability to maintain control over the sea lines of communication.

This poses the problem of protecting our vital sea routes against a widely distributed threat while limited carrier assets prohibit their employment in other than high-threat areas.

To overcome this dilemma, the Chief of Naval Operations directed an OpNav study group to look into the problem and recommend an appropriate solution. The concept which emerged is the Sea Control Ship — with the mission of providing underway protection for surface forces in conjunction with conventional escort vessels. The Sea Control Ship (SCS) is to utilize airborne vehicles — helicopters and V/STOL aircraft — as its sensors and weapons. The SCS, in conjunction with destroyers and other escorting vessels, would be charged with the safety of underway replenishment groups, merchant convoys, amphibious assault forces or task groups with no aircraft carrier in company. The sea control ship would have capabilities aimed primarily toward ASW defense with limited ability in air defense, antiship missile defense and surface strike against hostile warships.

The SCS is not commensurate with a CVS or any other type of aircraft carrier. It will be useful in many low-air-threat areas which require sea control forces, but a CV or CVA must be used when there is a need for air superiority or when large quantities of aerial ordnance must be delivered.

Austere is the word for the sea control ship. It will be small, with a small aircraft complement. Its principal characteristics are a displacement of 14,100 tons, a length of 630 feet, a speed of over 24 knots and an aircraft capacity of approximately 17 helicopters and multimission V/STOL. It will have no catapults, no armor, limited armament and electronics, and no arresting gear. The ship will have a hangar deck, serviced by two aircraft elevators and limited command and control facilities. It is expected that the total manning figure for the ship and its aviation component will be about 700 officers and men.

The sea control ship seems the optimum candidate to fill the role outlined by its assigned mission. It is less costly than aircraft carriers which, being too few in number and needed elsewhere, are normally unavailable to perform SCS tasks. Surface escorts alone, on the other hand, are inadequate in numbers and lack offensive standoff capabilities in ASW and antiship-missile defense.

Now that the OpNav study has de-

Harriers from MCAS Beaufort's VMA-513 and SH-3G's from NAS Lakehurst-based HS-15 will assist in USS Guam evaluations.

termined the requirement for a sea control ship and its basic characteristics, DOD approval and funding of an SCS program is being developed. In the meantime, *Guam* (LPH-9) has been designated as an interim sea control ship and began a test and evaluation program in January 1972. Two aviation units will participate in the evaluation. Newly formed HS-15 at NAS Lakehurst has been commissioned specifically for this task. In addition, the Marine Corps is making available AV-8A *Harriers* from VMA-513 for operations from *Guam*.

The objectives of the sea control ship evaluation will be to provide operational information for design purposes, to investigate tactical employment and to provide inputs to assist in future helicopter and V/STOL programs. *Guam* is committed to this evaluation through June 1973. If the sea control ship program is approved, the first of these new ships will be introduced to fleet service in 1978.

An artist's view of the Sea Control Ship on the opposite page shows the proposed ship's general features. Guam (LPH-9), above, began evaluation activities in January when it became the interim SCS. Cast in a role similar to the one filled by escort carriers during WW II, below, the SCS will also be small and austere.

GREAT LAKES CARRIER

With the Chicago skyline as a background, FDO Lt. Fred Durant prepares a pilot for takeoff from the training carrier USS Sable.

Slowly, the flattop eased away from her harbor home, headed toward the offshore breezes that blew in the morning mist shrouding the city. Five miles out, the ship turned into the wind and the deck crew prepared to take aboard the first flight of aircraft from the nearby air station. Wind snapping his clothing, the LSO took up his position, paddles in hand, and spotted the aircraft approaching for a day's carrier training.

By noon, the entire flight had landed and taken off several times, and flight operations were temporarily secured for lunch. The view of the shore and the buildings which rose from it became clearer as the wind scattered the mist.

The city had neither a Golden Gate nor a Statue of Liberty to distinguish it from other port cities, but to any native aboard the cruising carrier there could be no mistaking that windswept

skyline. In 1944, as always, Chicago was, indeed, a windy city.

A carrier off Chicago, on Lake Michigan? Fred C. Durant's eyebrows raise a pica in surprise at the question, as he assures you that there were not one but two carriers on the Great Lakes. Converted Great Lakes' steamers, complete with reciprocating engines, side paddle wheels and flight deck, the two carriers constituted two-thirds of the Navy's full-time training carrier force during WW II, qualifying thousands of Naval Aviators on their way to join the saltwater fleets in combat.

In his Washington, D.C., office overlooking The Mall, F. C. Durant III, Director of Astronautics for the National Air and Space Museum, Smithsonian Institution, leans back, lights his pipe and stares reflectively at the panoply of books, diagrams and models of and about things mechanical that fly.

As his eyes fix you in their attention-grabbing stare, he speaks with the measured cadence of authority, of one who knows from personal experience — a former flight deck officer aboard one of those Great Lakes carriers.

"These two ships, engaged in carrier qualification of pilots during the war, were *Sable* (IX-81) and *Wolverine* (IX-64), both operating out of Chicago. Before conversion, they were known as *Greater Buffalo* and *C&B*, respectively. Each had a flank speed of 21 knots so that even during the summer in a flat calm, we could get sufficient knots across the deck (normally 18 or 19) for flight operations.

"From July 1944 to December 1945, I served aboard *Sable*, which I think was the Navy's first steel-topped carrier [conversion being completed in 1943]."

The aircraft operated out of NAS Glenview, 15 miles from Chicago, and were flown by pilots from all over the country who came there to qualify for carrier landings. On occasion, a busload of pilots would come on board and take turns qualifying throughout the day.

"We usually commenced operations about 0800 every morning, seven days a week, depending on the wind. We ran downwind as far as possible if the wind was from the north, as it generally was, and turned around in time to catch the first group of aircraft from Glenview.

"On most days, a half hour before the carqualing aircraft arrived, the landing signal officer would fly out. He would check with flight operations before taking his station on the platform. The LSO was part of Glenview's flight operations section and normally he had taken the students through the field landing practice.

"There were no hangar decks on either ship but, just ahead of the island on the starboard side, we had one or two outriggers which were T-shaped affairs. The LSO's airplane was simply backed onto one of them with the tail out over the water. The aircraft would come out to us in groups of five to seven and the LSO would bring them aboard for their landings. They each made at least five landings.

"As any old Naval Aviator knows, under the old system a cut was mandatory—you didn't take a waveoff on

An interview with Fred C. Durant

By Michael McDonell

your own, you landed. Once the pilot got the cut, chopped the throttle, dropped the nose, flared out for a landing and caught a wire [there were nine hydraulically operated wires aboard *Sable*], the flight deck officer took over. As *Sable's* flight deck officer, I was the only person on deck at all times. My deck crews and tail-hook men were on the catwalks. It was normal for the entire crew to duck each time a plane landed because the cable was pulled out and, in case it broke, they wanted to be out of its reach. I would run forward to get the attention of the pilot. Then, as I stood on the starboard side, I gave him the first signal — keep your feet off the brakes.

"When the cable had slackened sufficiently, I signaled him to hold brakes. The tail-hook men would release the hook; the cable men would retract the cable; the barrier would be taken down. As soon as the deck was clear, I checked to be sure the propeller was in full low pitch position. As soon as the pilot nodded that he had checked the pitch, I would visually check to see that his flaps were in full drop position. We were then ready for turn-up. I held up my left hand, the signal to hold brakes, and also signaled to remind him to keep the stick full aft. Waving a small flag in my right hand, I would turn up the engine to full takeoff speed. When I dropped the flag, the plane would take off. (There were no catapults.) As soon as the aircraft was clear, the barrier was raised again and, ideally, at that point, the next pilot in the circle would be ready to land and receive his cut."

How many planes did you handle during operations?

Durant grins, pleased that you asked.

"It seems a little incredible, but we ran these planes in ten-second intervals—six landings a minute, with a little slack, six landings every two minutes, which equals 180 landings an hour. After the flight had qualified, we would radio to them to go home,

After missing the wire, unlucky F6F hangs from the catwalk, collecting spray. In the background is a Coast Guard plane guard.

and the next group would come in. It was a nice operation."

But not always so nice.

"We ran a seven-day week. There was never a day off except for a day in port for refueling. There was very little maintenance that we couldn't do onboard when we came back to harbor. In wintertime—and the winter of '44-'45 out of Chicago was rugged—we had to contend with six to eight inches of ice on the lake and force our way out of the harbor to warmer water."

But these were minor inconveniences when compared to the life or death situations which sometimes occurred.

"We had plenty of accidents but I am quite proud that we never lost a pilot during the time I was aboard. We lost approximately 20 aircraft in the lake and another 40 that broke up on the deck."

The causes were the classic ones occurring aboard any carrier: missing the cable and going into the catwalks; the incredible gaffe of giving yourself a wave-off and settling into the water; tail hooks catching the cables on the catwalk, etc.

"The pilots who went into the drink were usually picked up by one of two Coast Guard escort vessels acting as plane guards. We did have trouble with one chap. He kept sitting there while the plane was slowly sinking. With a bullhorn, we told him to get out. He acknowledged with a wave of his hand, but bent his head over. This alarmed us and we yelled again and again, and finally he got out. When the escort vessel dropped him onboard our ship, we asked him why he hadn't left the plane. He told us. He had been using his jackknife, frantically trying to take the clock out of the instrument panel. It was a prized possession!"

Not all of the accidents were confined to the pilots.

"We had some accidents on deck. I had an assistant who had both legs broken. Another chap was killed on deck by a wheel that came off during a landing. Then there was a cable break which put me in the hospital for three weeks. Fortunately, it was winter and I had on two pairs of long johns, two pairs of khaki trousers, a leather transport coat and two helmets.

The LSO signals "Roger" as an aircraft heads for USS Sable's flight deck and one of nine arresting wires. Side paddle wheels made the Great Lakes training carriers highly stable.

Above, an Avenger makes a nice landing aboard Sable. Note the aircraft parked on the outrigger forward of the island. Below, the deck crew scrambles to move disabled Wildcat.

USS Sable (IX-81) was built in 1924 and was acquired by the Navy in 1942. Her conversion completed in 1943, she was scrapped in 1948.

I was struck and hit a stanchion which cut through both my helmets. It was messy."

With the exception of high stability, owing to the side paddle wheels and the lake's lack of heavy ground swell, in general, landing aboard *Sable* was not very different from landing aboard any other carrier.

Fred Durant describes it simply.

"It's a terribly exciting and fun thing to do. The first carrier landing is something you don't forget. And it is really quite simple. You go through field practice with a landing deck laid out on the ground, complete with an LSO on the port and corner.

"Even after you've learned the landing signals — come on, fast, high, low, OK, cut— you're still not ever quite prepared for landing on a carrier. You find that out quickly when you are landing. The ship is moving and, with the relative wind over the deck, you approach it much more slowly — you have plenty of time. Time stretches out.

"On a proper carrier landing, you would take your cut closer than you would at field carrier practice. Remember that these planes — *Corsairs*, F6's, TBF's, etc. — were slow; they stalled in the low 70's, usually. You would come up the groove around 75 knots, ease off a little power. When you got your cut, you dropped your nose just enough and then flared out and grabbed the wire. There was no problem; it was a great thrill.

"Operating aboard the ship seven days a week did get tiresome but it was endurable.

"Serving aboard *Sable* was a wonderful experience as far as the camaraderie and the team activity of the ship's company were concerned. We felt that we were doing an important job. In that last year of the war, with the push coming up in the Pacific, we needed qualified aviators."

Fred Durant lingers for a moment in his memory of those days and then fixes his attention on you.

"Well, that's what we did and that's about all I can recall. I hope it is enough."

Quite enough, Mr. Durant.

CV a new, triple threat concept for carriers

By LCdr. Paul N. Mullane

The CV concept, which combines the operation of tactical attack and air defense aircraft with antisubmarine aviation from the same flight deck, became a reality with the successful deployment of *Saratoga* during the summer and fall of 1971. The project, which began as a CNO initiative to improve the Navy's sea control capability, was evaluated in *Saratoga* during her recent Med cruise — after the concept had been the subject of a detailed study within OpNav.

The CV concept is a new one for the U.S. Navy even though the CV designation is not. American carriers have traditionally separated tactical aviation (TacAir), which includes attack and air defense missions, from ASW. Prior to World War II, no real carrier-based antisubmarine capability existed. The measures taken during the war to combat U-boat depredations in the Atlantic were at best improvisations — a mix of fighters and torpedo planes on merchant hulls converted to escort carriers.

It was not until the postwar period that planes were designed specifically to perform an ASW role from flattops. At first, antisubmarine squadrons continued to fly from CVE's and, later, from CVL's. After the Korean War, when interest in ASW took on added emphasis, certain *Essex*-class carriers which were considered unable to operate the latest jet fighters were designated CVS's and assigned exclusively to ASW operations. The remaining carriers (*Midway* and *Forrestal*-class CVB's and *Essex*-class CV's) became CVA's and concentrated on TacAir responsibilities. This arrangement has continued down to the present.

Due to their smaller size and the

The CVA, utilizing antiair-warfare and attack aircraft to perform its TacAir mission, needs greater flexibility under current conditions.

limited number of aircraft they can carry, the *Essex*-class CVS's still in commission are not suitable for modification to the CV role and will retain their exclusive ASW mission. The *Midway* class will likewise retain its TacAir mission, for similar reasons. However, all CVA's of the *Forrestal* class and larger will be modified to CV's when they are scheduled for regular yard periods.

The CV concept envisions the aircraft carrier configured alternately or concurrently to either a TacAir or ASW role. The central feature of this idea is flexibility to tailor the deckload to fit the requirements of an assigned mission or to meet an expected threat. This flexibility may extend to readjusting the mix of aircraft during a deployment in response to a changing situation, and will require a new approach to the number of squadrons to be maintained to fill CV decks. The present system of dedicating one CVW or CVSG to each type carrier will have to be altered in order to provide sufficient squadrons of each type to configure the CV air wing for the specific needs of each deployment. This will require an increase in the ratio of aircraft to flight decks.

The Navy turned to the CV concept for two primary reasons: the increasing size and capability of the Soviet Navy to control the seas, and the decreasing size of the U.S. Navy's carrier force. WW II-vintage carriers, most over 25 years old, have been retired in recent years — without sufficient new ships being built to replace them. As the number of our attack carriers dwindled to the lowest level since 1950 and CV's were cut to three, it was determined that some means must be found to increase the ability of the remaining decks to individually fulfill a wider range of missions without seriously jeopardizing their effectiveness in either the TacAir or ASW role.

An OpNav study group began an examination of this problem in December 1970 and submitted its report in May 1971. It analyzed alternate deckload mixes of ASW, AAW and strike aircraft. The group compared and evaluated various combinations of aircraft, estimating operational flexibility and effectiveness.

To accomplish this evaluation, scenario analysis was employed to focus on certain assumptions and mission requirements in order to determine options open to the carrier force commander. Only those aircraft currently in development or in the inventory were considered in analyzing the relative capabilities of varying air wing

The CV concept adds fixed wings and helicopter ASW aircraft to the TacAir deck mix. Command and control equipment required for their efficient employment will be installed.

compositions. The CV concept was applied to the complete spectrum of naval warfare.

The conclusion of the study was that in view of the reduction of our carrier forces, while the Navy's responsibilities remain essentially the same as they have been over the past 20 years, a capability to operate in the full spectrum of naval warfare must be maintained — if not simultaneously from different decks, then simultaneously from the same deck. This entailed development of multimission abilities without significant degradation of either the sea control or force projection missions. Configuring existing and future carriers, where possible, to carry out varying degrees of each task was accomplished by tailoring the composition of the embarked air wing and modifying the ship to accommodate either mission.

Although it was realized that a reduced carrier force configured for a multimission role could not maintain the same capabilities as a larger force level assigned to specific missions, the CV concept would greatly increase a task force commander's options under present circumstances. At the same time, other new concepts are expected to assist in augmenting the ASW role. These include LAMPS (*NANews*, June 1971) and the Sea Control Ship (page 42).

The CV concept, in addition to overcoming many of the problems induced by fewer flight decks, offers several advantages. The employment of CV's allows greater peacetime deployment of carriers with an attack capability to the Sixth and Seventh Fleets than is permitted by a mixed force of CVA's and CVS's. For example, two CV's with a full ASW air group between them can carry more TacAir planes than one CVA and one CVS.

Each CV can individually tailor its aircraft complement to best suit its specific mission in its deployment area and be better prepared to meet any hostile threat. The ASW aircraft available to the CV allows it to more effectively counter an unexpected submarine threat to itself and its task force, and the CV is better equipped to react, with its wider range of capabilities, in a crisis.

In order to actually evaluate this capability, the CV concept had to go to sea. *Saratoga* was selected as the test vessel and, in December 1970, entered the yard for modifications which would prepare the ship for its new role. *Saratoga's* aviation gasoline system was refurbished to support piston-engined S-2's, storage facilities were prepared for ASW ordnance and

The multimission CV must simultaneously operate antisubmarine and TacAir planes in performance of their individual tasks. Frequent round-the-clock ASW operations may be needed to meet the sub threat.

sonobuoys, an additional ready room was provided for the antisubmarine squadrons, and an ASW classification and analysis center (ASCAC) was installed to give an antisubmarine command and control ability to the ship. During her yard period, *Saratoga* was also modified to prepare her maintenance spaces for repair of S-2's and SH-3's and the aviation consolidated allowance list (AvCAL) was increased to support these planes. Additional storage space for these spares was found by a rigorous AvCAL purification program. No existing facilities or capabilities were removed in adding these new features.

Saratoga was assigned certain objectives in the evaluation of the new concept. The principal objective was to determine the capabilities and effectiveness of the CV and its embarked air wing while carrying out naval strike, AAW and ASW missions simultaneously from the same deck. Collateral evaluation included determining the feasibility of a quick change of the air wing mix while deployed and a report on necessary changes in operating procedures, tactics, ship installations and material requirements to support the CV concept. In addition, *Saratoga's* deployment was utilized to define a data base from which support requirements and warfare capabilities could be determined for various air wing mixes.

In March 1971, *Saratoga* began her training period with the Second Fleet and soon established the feasibility of simultaneous execution of AAW, ASW and strike missions. ASW operations were integrated into the existing command and control system and minor problems in aircraft handling and air traffic control were quickly solved.

Air wing pilots completed day and night carrier qualifications and refresher training. This was followed by several days of round-the-clock ASW operations during the ORI and was carried out while daily TacAir missions continued.

With these initial preparations out of the way, *Saratoga*, in June, conducted the first evaluation of a CV-configured ship in a fleet exercise. Again, all three mission areas were involved and, once more, round-the-clock ASW operations were conducted in a multi-threat environment which included nuclear attack submarine opposition. A second such evaluation was made during a NATO exercise in the North Sea in mid-June.

In late June, *Saratoga* chopped to

Saratoga (CV-60) returned to Mayport from her recent Mediterranean deployment as the Navy's first multimission-capable aircraft carrier.

Sixth Fleet and began operations in the Mediterranean. In addition to ASW exercises and various strike and AAW operations, the embarked air wing mix was altered several times to evaluate operations with differing mixes in order to determine if problem areas exist in connection with these changes. The effectiveness of the CV concept hinges on the relative capability of ASW aircraft to operate efficiently in the CVA environment without serious detriment to TacAir operations. During these changing mixes, the effectiveness of each component of the air wing was evaluated in an attempt to develop an optimum mix and a tactical doctrine. Various elements of the air wing were shore-based during portions of the Med cruise to accomplish this evaluation, flying aboard *Saratoga* and then launching to carry out assigned missions. ASW aircraft were sent ashore to allow more TacAir planes to be added during one phase. Another part of the evaluation called for some A-7's to transplant from their base at NAS Cecil Field and join the embarked air wing when called upon. Some planes were cross-decked to *America* and SH-3's visited *Nashville* (LPD-13) during the changes in air wing composition aboard *Saratoga*.

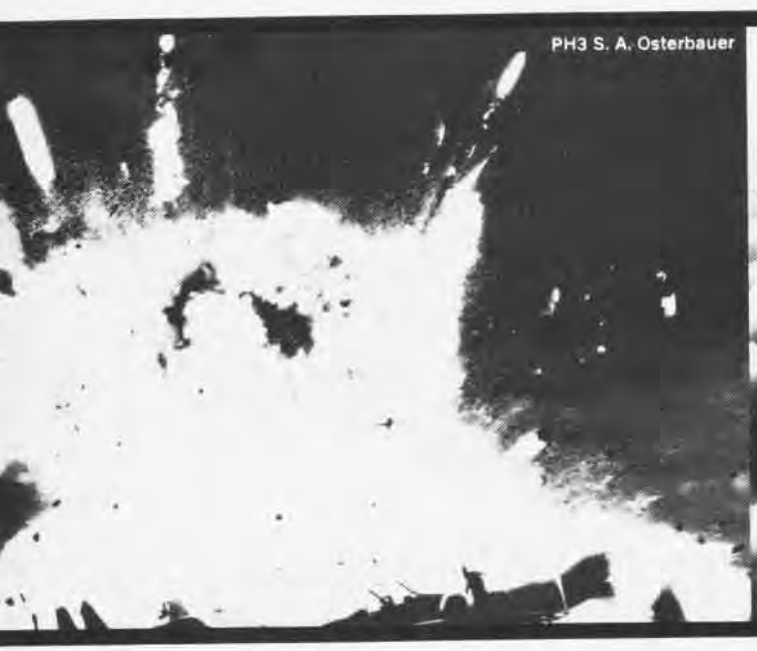
Involved in this evaluation work were VF's 31 and 103, VA's 37, 75 and 105, VS's 22, 28 and 32, HS's 5 and 7, VAW-123, RVAH-9 and VMCJ-2. The types of aircraft operated during the deployment included F-4J's, A-7A's, A-6's, E-2's, S-2's, SH-3's, EA-6's and RA-5C's.

Following her successful deployment as a CV in the Med, *Saratoga* returned to Second Fleet control in October and was exercised in her control mission. As a part of this operation the deck load was reconfigured to increase the ASW portion of the air wing mix. This was accomplished at Bermuda by a cross-deck transfer of S-2's and SH-3's from *Wasp*. A week of around-the-clock ASW operations followed.

Saratoga's deployment demonstrated the validity of the OpNav study and more CVA's will be modified to CV's as they become available.

In implementing the CV concept, some minor problems still remain to be worked out in the areas of operating procedures, integration of ASW control equipment into CVA spaces, increasing predeployment training time and an increased requirement for berthing and storage spaces. But the Navy now has, in *Saratoga*, its first multimission-capable aircraft carrier.

THE QUESTION OF



SURVIVABILITY

In 1943, Captain Frederick C. Sherman, who had commanded USS Lexington *in the Battle of Coral Sea the previous year, was addressing a civilian group in Chicago when the question arose, "What is the answer to the vulnerability of the carrier?" At that point in time, halfway through the war in the Pacific, Sherman was content to reply: "More carriers."*

Not long ago, a national magazine published a rendering of a carrier, magically transplanted to the sweeping seas of the central plains. Upon a posture of the seemingly well known "obsolescence and vulnerability" of this type of ship, it was proposed that aircraft carriers would serve a more useful purpose as power plants in the agricultural domain.

Modern attack aircraft carriers with their embarked aircraft are the most powerful warships ever built. As offensive weapons systems they conduct both offensive strikes and defensive operations. Additionally, such ships can also provide a passive political military presence.

It is on these points of reference that the attack carrier has nourished a tradition of controversy and, over the years, critics have hammered away at its "extreme vulnerability against a sophisticated enemy in a limited war," and its "absolute uselessness in a nuclear war." The criticism is, and has been, loud and clear. Yet, we still have carriers. A paradox?

Seldom pursued is the basic argument's antithesis: the carrier's relative INvulnerability. Examination of the question from this refreshing viewpoint results in interesting answers. Captain Steven De La Mater and members of his Air Weapons Systems Analysis staff have provided NANews *with some details on the lesser-known "other side of the coin."*

Although the inherent mobility of the carrier makes it a difficult target to attack, carriers are *designed* to defeat enemy weapons and to absorb damage from enemy action with minimum disruption of their operational capabilities.

A consideration of carrier survivability must encompass the total range of warfare situations in which the carrier may be employed. A particular feature of the carrier weapons system is its operational flexibility which permits its use across the full spectrum of warfare — from sea control and projection of force ashore in a conventional scenario to a general nuclear war.

Although the probability of general war is small in comparison with the possibility of limited conflict, the consequences of a general war and the threat to our national security are so great that the material, tactical and operational concept of the U.S. Navy must be predicated upon the maximum threat. Naval forces which are capable of *surviving* this maximum threat are obviously more effective and less vulnerable in less intense warfare situations.

Under general war conditions, the worst threat to U.S.

'The vulnerability of any weapons system is not an absolute quality. It is relative.'

Capt. De La Mater

PH3 L. T. Henderson

In spite of awesome damage to the nuclear-powered Enterprise, above and at far left, resulting from 1969 ordnance explosions, flight operations could have been resumed within a few hours.

carriers, both now and in the near future, is posed by Soviet air, submarine and surface forces. The Communist Chinese air and submarine forces also present an increasing threat as they develop improved delivery vehicles and nuclear weapons.

The primary Soviet threat to the carriers today is antiship missiles launched by long-range *Bear* and *Badger* aircraft, surface ships and submarines.

The fact that the Soviet Union possesses these weapons systems does not automatically preclude carrier operation in their presence. Many difficult problems must be overcome before they can attempt an attack.

First, the enemy must *detect* the carrier task force in the vast ocean operating areas. In contrast to a fixed land target — the position of which is always known — the highly mobile carrier cannot be pre-targeted. The Soviets must expend great effort — by long-range aircraft, trawlers and/or other systems — in order to *locate* the force and identify the carrier.

Cloud cover, darkness and controlled electronic emissions degrade the enemy's reconnaissance and direction-finding capabilities. A modern task force under tactical or strategic warning conditions could operate in an electronically silent, full-alert condition which would increase the attacker's detection problems.

Assuming that the force can be located, the enemy has an additional problem as the force maneuvers and changes composition, courses and speeds: *identifying* the individual ships to determine which is the carrier.

The inherent mobility of naval forces at sea requires continued and real-time location and tracking if they are to be attacked. Even if the carrier's position is precisely known at a given time, three hours later it can be somewhere in the area of a circle encompassing more than 25,000 square miles.

Once the enemy has accomplished the complicated and massive task of aircraft carrier detection, location and tracking, he must position his launch vehicle within the designed parameters for launch. In this evolution, both the launch vehicles and their missiles are susceptible to detection and destruction by the carrier and her accompanying friendly forces.

The enemy bomber must normally radiate energy to locate and target the carrier prior to the missile attack. In this regard, hostile air, surface and submarine forces can be detected long before they enter the carrier's operating area. The detection of the missile launch vehicle can be accomplished actively and/or passively by various escort and carrier sensors. The aircraft task force can detect

Continued

Soviet missile submarine

Soviet *Bear/Badger* aircraft with its radar and ECM detection equipment. Advance warning is provided by stationing picket ships (DDG/DD/DLG-type surface combatants) at a distance from the carrier in the direction of the threat.

Far-ranging advance warning can be extended even more effectively through the use of the carrier-based E-2 which is capable of surface and air search in excess of 200 miles from the aircraft. The E-2 possesses both active and passive search capabilities. Additional airborne sensors are provided by EA-6 and fighter aircraft.

Once hostile forces enter the area, they are immediately brought under surveillance by the carrier's air and surface escorts. Land-based patrol aircraft augment this area surveillance.

The attacker must now penetrate a defense-in-depth, comprised of various combinations of aircraft, surface ships and submarines. The task force has a number of defenses that can engage the enemy before he launches his weapons, after launch and during terminal flight.

The initial defense against long-range guided missiles is the detection and destruction of the delivery vehicles. Far-ranging, nuclear-powered attack submarines can detect and attack enemy submarines, destroying potential missile launchers. Airborne early warning aircraft will direct combat air patrol aircraft to intercept and destroy the intruders—air, surface or, possibly, submarine. The two-fold objective is to shoot down the enemy's reconnaissance aircraft, thus denying him the essential targeting intelligence required for a long-range missile attack, and to destroy the missile carriers before they reach their missile release point.

To counter the bomber threat, in addition to the F-14 and F-4 carrier-based fighters with their *Phoenix* and *Sparrow* weapons systems, we will have the surface-to-air missile systems from our DDG/DLG ships and the EA-6B electronic jamming aircraft to neutralize tracking and guidance electronics.

Soviet missile ships can be attacked by all of the above plus A-7, A-6 and A-4 aircraft, each equipped with both air-to-surface missiles and bombs.

The Soviet missile-launching submarine can be opposed by a sizable number of weapons systems including S-2, S-3 and P-3 aircraft, helicopters, destroyers and nuclear attack submarines, all interrelated.

Should the enemy's missile aircraft, surface ships or submarines evade or saturate this initial defensive perimeter and successfully launch their missiles, the guided missiles themselves then become the primary target in the next defensive phase. Some of these missiles are similar in general size and performance to aircraft, and are therefore vulnerable to the task force's antiaircraft defenses. To reach the carrier, the antiship missile must evade fighter aircraft and then successfully penetrate the surface-to-air missile defenses of the screening guided-missile ships. Finally, surviving enemy missiles are exposed to the highly effective fire of short-range, point defense missiles and the automatic gunfire from ships of the task force.

Ships in the carrier task force are fitted with electronic warfare equipment which masks the identity of the ships, jams the guidance devices in the missiles and confuses their homing systems.

The aircraft carrier's speed (30 knots or greater), mobility and evasive maneuvering capability are the principal defensive tactics employed to defeat or at least minimize the subsurface-launched torpedo attack threat. A high speed transit by a carrier presents a difficult attack problem for an enemy submarine intent upon a torpedo attack. The high speed needed by the submarine to position itself for attack makes it extremely vulnerable to sonar detection by defensive surface, air and subsurface ASW forces.

If our carriers sustain hits from conventional bombs, torpedoes or missiles, some damage will occur. This does not mean that the ship will be put out of action. Modern carriers are extremely tough ships. No U.S. attack carrier built during WW II or after has been lost to enemy action.