

# CARRIERS FROM THE KEEL

By Scot MacDonald

'Such remarks as I may have to make as to the nature and extent of the air force required by the Navy will be based upon the assumption that the airplane is now a major force, and is becoming daily more efficient and its weapons more deadly, . . . that therefore even a small, high-speed carrier alone can destroy or disable a battleship alone, that a fleet whose carriers give it command of the air over the enemy fleet can defeat the latter, that the fast carrier is the capital ship of the future. Based upon these assumptions, it is evident that our policy in regard to the Navy air force should be command of the air over the fleet of any possible enemy.'—Adm. William S. Sims, USN, October 14, 1925



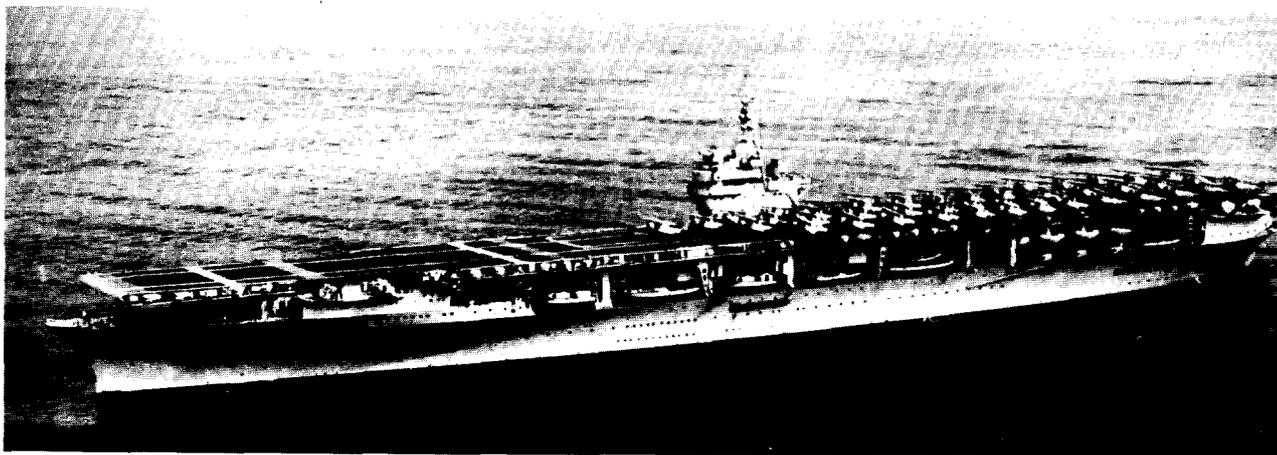
USS RANGER (CV-4) is viewed in March 1937. Commissioned in June 1934, she was the U.S. Navy's first aircraft carrier built from the keel up. Four more were built before World War II.

PLENIPOTENTIARIES of the United States, the British Empire, France, Italy and Japan met in Washington in the early Twenties to reach an agreement on the limitation of naval armament. The treaty they signed on February 6, 1922 had a profound effect on the evolution of aircraft carriers. From the time the U.S. Navy first embarked upon a carrier-building program, it was faced with tonnage limitations established by this treaty.

The total tonnage for aircraft carriers of each of the contracting powers permitted the U.S. and Great Britain 131,000 tons each, France and Italy 60,000 tons each, and Japan 81,000 tons. Of its allotted tonnage, the United States had already consumed 66,000 in the *Lexington* and *Saratoga*. Only 69,000 tons remained for future construction. The Navy gave much thought and study to the means of best utilizing this remainder, and, in 1927, when drawing up a five-year shipbuilding program, the General Board recommended construction of a 13,800-ton carrier each year.

The program involving this plan was promptly submitted to the President who approved it on December 31, 1927. It was subsequently submitted to Congress which, by act of February 13, 1929, authorized construction of one 13,800-ton carrier. The Navy attempted in the following years to obtain authorization for construction of the visualized sister ships, but without success. Indeed, before another carrier was to be authorized, the Navy had become more interested in larger ships of about 20,000 tons.

In addition to the legal reasons which led the Navy to seek a 13,800-ton carrier, there was a body of thinking on the part of some Naval Avia-



OPERATING WITH THE FLEET, *USS Ranger* had 14,500-ton displacement. Unusual features were bow arresting gear, small island, stacks at stern. On deck are parked Vought scout bombers, Grumman fighters, Martin dive bombers in 1937 view. Capt. A.L. Bristol was first C.O.

tors which recognized the utility of small carriers. This was evident as early as 1925 when the General Board briefly considered but rejected the conversion of 10,000-ton cruisers to light carriers.

Two years later, LCdr. Bruce G. Leighton, then aide to the Secretary of the Navy, prepared a study on possible uses of small carriers. In addition to protection of the battle line, he suggested their suitability for anti-submarine warfare, reconnaissance, and reduction of enemy shore bases.

At about the same time, RAdm. William A. Moffett argued that British and Japanese experience with small carriers had made it clear that such ships could keep more aircraft in operation than could an equal tonnage devoted to larger ships.

Fleet commanders, who might be expected to have had a more conservative view of the military utility of aircraft than did Moffett and Leighton, expounded concepts that provided further justification for smaller carriers.

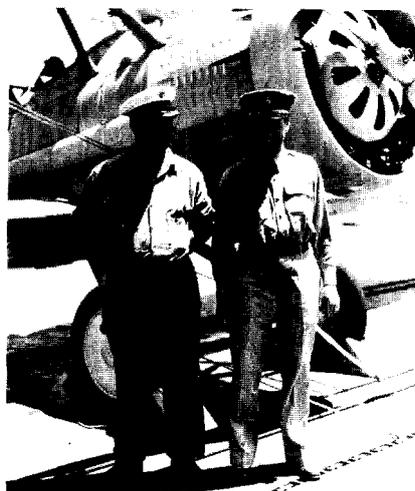
For example, the Commander in Chief, U.S. Fleet, noted in his 1927 annual report that the Fleet was seriously handicapped by the absence of a carrier with the battle line upon which spotting planes could land. Thus, both the aviation protagonists and the surface commanders recognized the need for carriers which would perform important roles, even if they were not of a size approaching that of the giants, *USS Lexington* and *USS Saratoga*.

Such considerations were in the genesis of CV-4. When it came to reducing them to detailed plans for

construction of a new ship, very little had been done. Studies made in 1923 and 1924 had been concerned with island-type vessels, such as the *Lexington* and *Saratoga*, and were not directly applicable to a new design—which was to be of the flush-deck variety. In addition, the basic concept for CV-4 was embodied in the General Board recommendations of 1927 and predated the commissioning of *Lex* and *Sara*. Hence, the concept could not incorporate any lessons learned



TWO-SEATER Vought O3U-3 Corsairs, such as the one above, operated from *USS Ranger*.



FIRST LANDING on CV-4 was made June '34 by LCdr. A.C. Davis; H.E. Wallace, ACMM.

during their early fleet operations.

This concept, as outlined by the General Board, included a speed of 29.4 knots, a clear flying deck, 12 five-inch anti-aircraft guns and as many machine guns as possible. On July 26, 1928, BUAER elaborated on this proposed design in a letter to Commander Aircraft Squadrons, Battle Fleet. The flight deck was to be about 86 feet by 750 feet and fitted with arresting gear. The navigating and signal bridge were to be under the flight deck, well forward, with extensions beyond the ship's side, port and starboard.

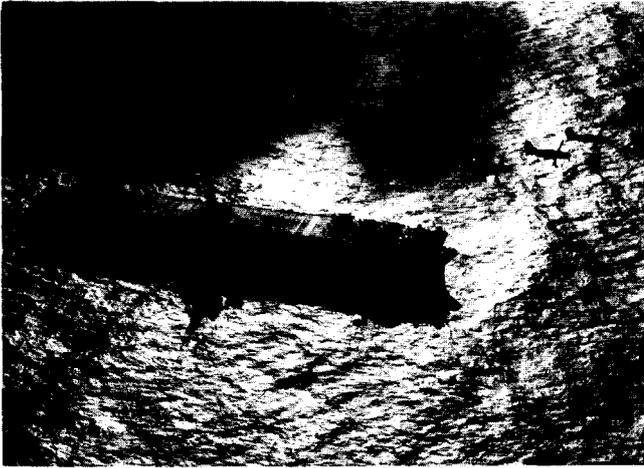
As for the anti-aircraft battery, it had been reduced to eight 5-inch 25-caliber guns located two on each quarter. Anti-aircraft battery directors were to be provided, but BUAER thought that range finders should be omitted.

Secondary conning stations were to be located on the starboard side of the upper deck and combined with the aviation control station. A plotting station consisting of flag plot and aviation intelligence office was also to be provided.

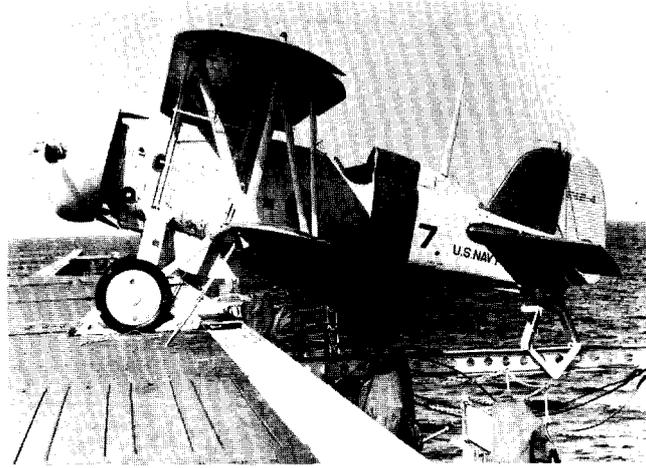
Despite the fact that the general concept could not benefit from experiences of the *Lexington* and *Saratoga*, the two ships did comment on plans for the *Ranger* on the basis of such experience as they had obtained during the first year's operation.

For example, they felt that both elevators and shop provisions should receive special consideration above and beyond that which had already been given.

"Experience during the present con-



CURTISS HELLDIVERS fly over the USS Ranger during WW II. Spotted on the deck forward are Vought Corsairs and Grumman Hellcats.



OUTRIGGER PARKING, here on the USS Ranger's starboard side, supported a Boeing F4B-4 in August 1934. This system saved deck space.

centration on both carriers has emphasized the importance of the after elevator in addition to the two now contemplated (for CV-4)," wrote *Saratoga's* commanding officer.

"There is required a great deal of re-spotting of planes in flight operations, and an after elevator will considerably expedite this process. After planes have landed on deck, it is sometimes necessary to send below a plane from the after part of the flight deck, which is now difficult with the flight deck filled with planes and the elevators forward."

OFFICERS ABOARD both *Lex* and *Sara* held informal conferences, the results of which were passed to BUAER. Speed was most desirable in aircraft carriers, but speed also had its drawbacks, as these officers were quick to point out to their superiors.

"The location of the A&R and general work shops aft is decidedly undesirable," BUAER informed the Bureau of Construction and Repair, "and it is strongly recommended that they be relocated further forward, if there is any possible way of doing so. Experience on CV-2 and CV-3 has shown that it is impossible to do any work requiring precision or accuracy, such as cutting a thread, when the ship is steaming at about 22 knots or more."

Early in the planning stage, BUAER encountered head-on the problem of lighting and night landings. A memorandum written for BUAER files pointed out: "The primary difficulty involved in night operations for airplane carriers is the provision of ade-

quate illumination to enable the pilots to make safe landings and at the same time to enable the ship to maintain darkened ship conditions that will prevent disclosure of the carrier's provision to surface craft and enemy aircraft. . . . The technical difficulties in this project are so great that complete success can scarcely be hoped for for several years and then not without the expenditure of much more time and effort than appears desirable at present.

"Night flying experiments were conducted on the *Langley* to determine the type of illuminating equipment for the *Saratoga* and *Lexington*. Although the number of landings made were not very great, enough information was obtained to determine upon equipment that would at least provide for a point of departure for future experiments in an effort to further solve the basic problem. No carrier night flying has been conducted since 1925." The memorandum was dated June 14, 1929.

This sparked an intensive series of experiments which caused the introduction of several lighting systems aboard various carriers. At best, most of these provided safe illumination for night landing but were less successful in maintaining darkened ship. Incandescent lights of low wattage were tested in various arrangements and intensities. Neon tubes were tried, some colored green, red, blue or amber. Of these, plain white was considered the best—but was not a solution. Even luminous paint was investigated. The problem of night deck illumination

was to plague Navy for years to come.

How the problem was handled in USS *Ranger* is indicated by a November 1934 report her commanding officer made to BUAER:

*"In anything but bright moonlight when the ship's outline can be made out at a reasonable approach distance, it is very difficult, definitely too difficult, to get in the groove when only landing deck lights are used. Although Ranger's landing deck lights extend the length of the ship and are well lined up on each side, which it was hoped would improve the difficulty described by Saratoga and Lexington pilots, the pilot is frequently too near the ship before he can find out which way to swerve. If he happens to hit the groove early, he is well fixed. If he doesn't, he sees a jumble of landing deck lights and can only guess whether to change course to right or to left.*

*"With ramp lights turned on in addition to the landing deck lights, there is unanimous agreement that getting in the groove is very easy. Exactly why this is true is not clear, but the string of lights across the ramp appears not only definitely to locate the end of the deck, but also to give the pilot sufficient basis for setting his course normal to the lights and up to the centerline of the deck.*

*"Athwartship landing deck lights at bow and stern are no use and would be hazardous if opened when planes are landing. (Confusion in getting in the groove existed whether or not these lights were opened, worse when opened.)"*

Other problems were of concern to BUAER during the design stage of CV-4. Relatively minor, but illustrative of the care devoted to carrier de-

sign, was the question of paint color for interior surfaces. A flurry of correspondence between BUAER and BUC&R concerned the color of paint to use on the deck, overhead, and bulkheads of the hangar.

This was not so much a problem of habitability as it was one of weight limitation and maximum reflective power. White paint, light gray and aluminum were considered. Misinformation supplied the Bureau of Engineering caused it to advocate light gray, but BUAER objected. Tests were conducted and aluminum proved lighter and more reflective of the three paints considered.

Finally, in early December 1929, plans for CV-4 received approval. Copies were sent to the Fleet, noting that major changes could not be made in them, but that the Bureau would "be glad to have comment or suggestion with regard to minor points, should such comment appear desirable."

By February 1930, active work on the design of the 13,800-ton carrier had stopped. Shortly after British Prime Minister Mr. MacDonald visited the United States, the President gave instructions to suspend all work on this ship, pending the outcome of the then projected London conference on naval armament. Months went by, the President was consulted again, and again the Navy was told to do nothing about the ship until the treaty had been ratified.

The treaty was signed in London on April 22, 1930. Ratification of the treaty was advised by the Senate on July 21, 1930, and by the President on the following day.

In the meantime, the Navy Depart-

ment, Office of the Judge Advocate General, drafted an advertisement which was published when the ratification restriction was lifted. The advertisement invited bids for the construction of CV-4. The bids were opened September 3—and proved to be "bombs."

All bids submitted far exceeded the appropriation given the Navy for construction of the ship, the lowest bid (by Newport News Shipbuilding and Dry Dock Co.) exceeding the limit by an estimated \$2,160,000.

The four Navy Department bureaus involved in the construction plans—BUC&R, BUAER, BUORD, BUENG—forwarded a joint memorandum to the Secretary of the Navy requesting a 60-day extension of the period before execution of the contract in order to consider necessary changes in characteristics which would permit construction of the carrier within the cost of the lowest bid.

Permission was obtained and the various departments reviewed their requirements. Panels of officer-experts in each were formed to submit recommendations. Out went consideration of an extra elevator. Out went the possibility—at this time—of moving the shops forward, as *Sara* and *Lex* had suggested. Submitting its list of recommended savings, BUAER listed the elimination of catapults, smokestacks on one side, sliding doors for the hangars, securing tracks, and airplane booms and nets, and requested that necessary eliminations be made in that order.

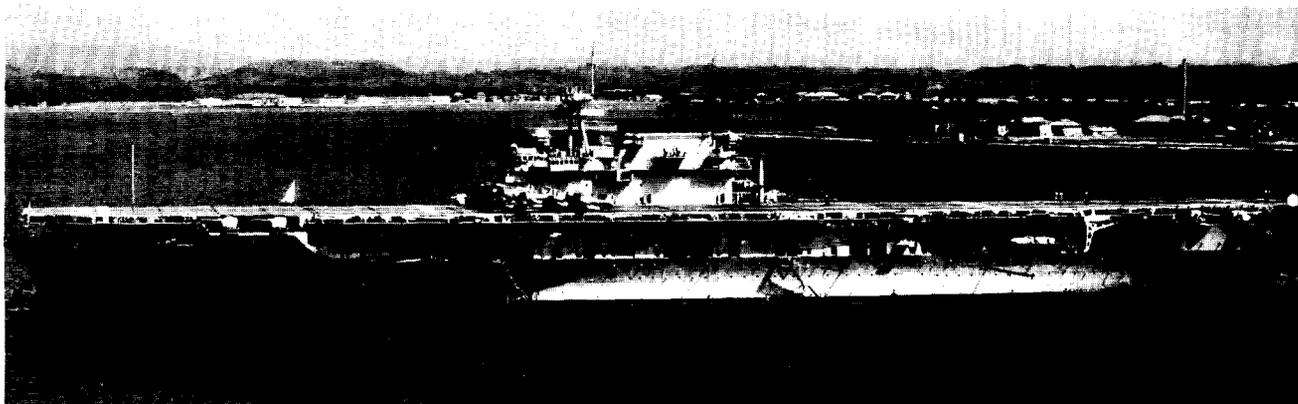
"This bureau feels," wrote Cdr. R. K. Turner for BUAER, "that elimination or reduction in the balance of items considered, namely, arresting

gear, elevators, or gasoline capacity would seriously affect the characteristics of the ship as an aircraft carrier, and, therefore, urgently recommends against any sacrifice in these items."

By October 2, the Bureaus had signed another joint letter, addressed to the General Board, listing their recommendations on how to cope with the problem of the elimination of design features. Among other things, *Ranger's* fire control was to be simplified, ammunition storage space was to be reduced, bombing planes were to be substituted for torpedo planes (this eliminated the purchase of torpedoes), deck catapults were to go by the boards, as were plane booms and nets. Twenty percent of the flight deck securing tracks were to be eliminated, as well as housing palisades, and the voice tube system. Finally, the arresting gear system was to be reduced. On November 1, 1930, the contract was signed by Newport News.

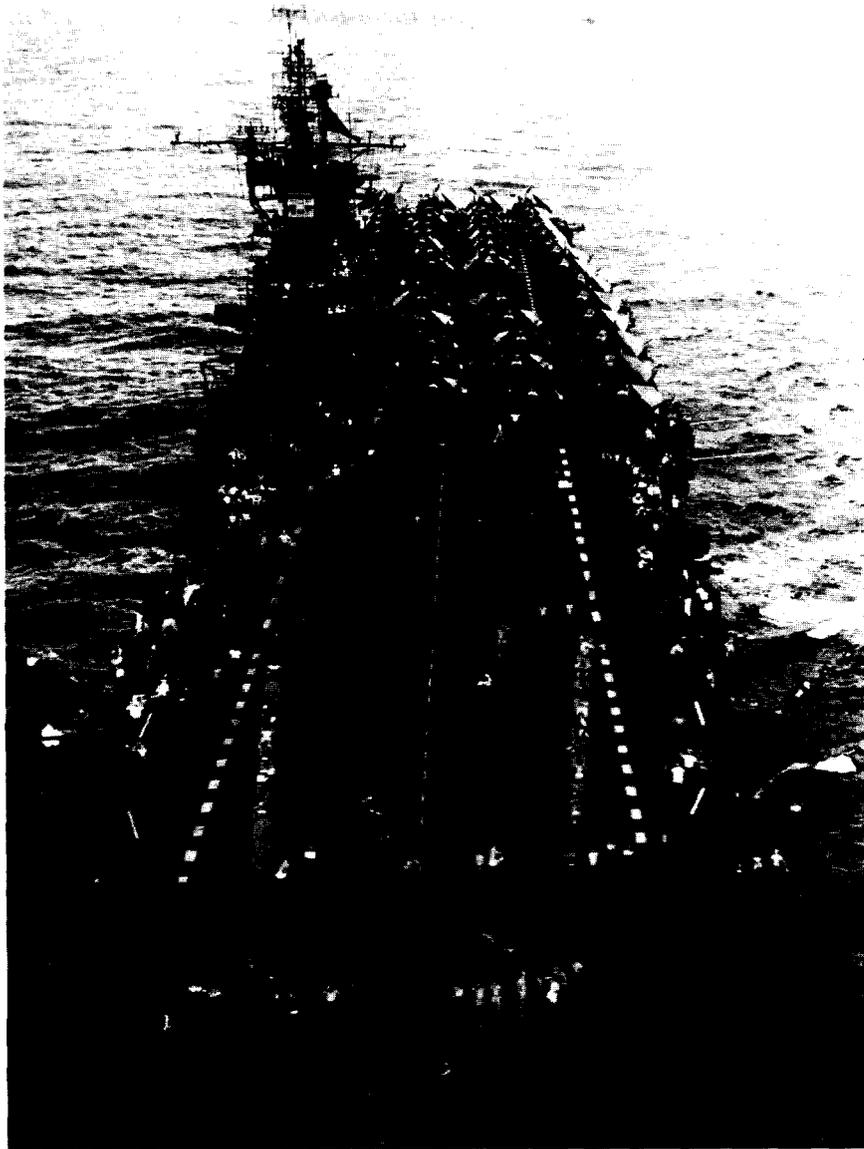
Throughout official correspondence, the 13,800-ton carrier was referred to simply as CV-4. On December 10, 1930, the Bureau of Navigation informed a long list of addressees that "The Secretary of the Navy has assigned the name *Ranger* to Aircraft Carrier No. 4, authorized by Act of Congress dated February 13, 1929. The assignment of the name *Ranger* is in accordance with the Department's policy of giving names formerly assigned to those battle cruisers scrapped by terms of the Washington Treaty."

On September 26, 1931, *Ranger's* keel was laid. Seventeen months later, the ship was launched, and on June 4, 1934, she was commissioned. Though planned originally as a 13,800-



USS YORKTOWN (CV-5) was launched in April 1936 and commissioned in September 1937. The 19,800-ton aircraft carrier operated in

both the Atlantic and Pacific before WW II, participating in Fleet problems and training activities. First C.O. was Capt. E.D. McWhorter.



**USS ENTERPRISE (CV-6)** was commissioned in May 1938, a sister ship to the *Yorktown*. "The Big E" was to become a popular ship. Capt. N.H. White, Jr., was her first commander.

ton aircraft carrier, she exceeded this tonnage by 700 tons. Original plans also called for a severe flush deck, but, upon commissioning, she had a small island.

USS *Ranger* had eight 5-inch 25-caliber AA guns, other AA guns in gallery. She could operate 75 aircraft and had a complement of 1788, of whom 162 were commissioned officers. Her aircraft consisted of four squadrons of bombers and fighters and a few amphibians. CV-4 also was equipped with a box arresting gear—a feature included in other fast carriers until early 1943.

The General Board had become con-

vinced—even before the *Ranger* was launched—that the minimum effective size of aircraft carriers was 20,000 tons. A request for two of these heavier ships was made in the Building Program for 1934, which was issued in September 1932. In May the following year, the Board again submitted this recommendation. As a result, the Secretary of the Navy asked the President for Public Works Administration funds to build two carriers of this tonnage, in addition to other ships. USS *Yorktown* (CV-5) and USS *Enterprise* (CV-6) were authorized.

Files of the Bureau of Aeronautics

housed in the National Archives reveal a memorandum dated May 15, 1931, which was to affect the two new carriers:

*"The Department has approved a new building program with two aircraft carriers similar to the Ranger, but before embarking on this new construction, it is suggested that a careful examination may show many design changes are desirable.*

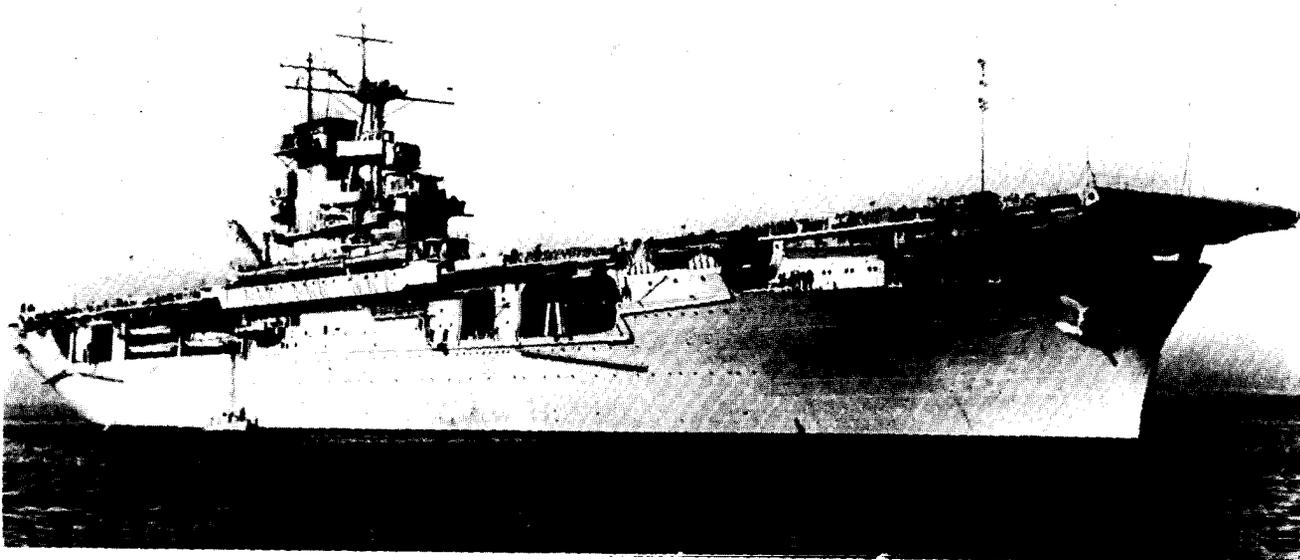
*"The particular improvements in the Ranger design that should be considered are: speed increase to 32.5 knots; addition of underwater subdivision to resist torpedo and bomb explosions; horizontal protective deck over machinery magazines, and aircraft fuel tanks; improvement in operational facility (this includes hangar deck devoted exclusively to plane stowage, four fast elevators, complete bomb handling facilities, possible use of two flying-off decks, and improved machine gun anti-aircraft defense)."*

The *Yorktown* was launched April 4, 1936, sponsored by Mrs. Franklin D. Roosevelt. When the carrier was commissioned September 30, 1937, her over-all length was 827 feet, four inches; extreme beam was 95 feet, four inches; and standard displacement, 19,800 tons. Her trial speed was 33.6 knots.

USS *Enterprise* (CV-6) was the seventh Navy ship to bear this name. Her keel was laid July 16, 1934 and she was launched October 3, 1936, sponsored by Mrs. Claude A. Swanson, wife of the Secretary of the Navy. She was placed in commission at Norfolk on May 12, 1938. Her specifications were similar to *Yorktown's*. She had accommodations for 82 ship's company officers and 1447 enlisted men.

As soon as CV-5 and CV-6 were authorized, the General Board did not request additional carriers of such tonnage. It did, however, vainly plead for a 15,200-ton replacement for the obsolete *Langley*. The *Langley* had been classed as an experimental ship and did not figure in the U.S. Navy's aircraft carrier tonnage limitations. To replace her with another carrier would have been to violate the treaty. The Navy did plan, however, to request new aircraft carriers when the *Lexington* and *Saratoga* reached retirement age.

Tightening of world tensions in 1938 caused the Navy Department to reconsider its carrier-building program,



USS WASP (CV-7) was launched in April 1939 and commissioned in April the following year. She displaced 14,700 tons, this weight restricted by the tonnage remaining from the limitation of the 1922 naval armament treaty. First skipper was Capt. J.W. Reeves, Jr.

and USS *Hornet* (CV-8) was authorized on May 17 that year. She was launched December 14, 1940 and commissioned October 21, 1941, with Capt. Marc A. Mitscher, her first commanding officer.

USS *Wasp* (CV-7) had been ordered earlier, on March 27, 1934. Her keel was laid April 1, 1936, she was launched April 4, 1939, and commissioned April 25, 1940. This carrier had to be built within what was left of the 135,000-ton limit set by the treaty. She was commissioned at 14,700 tons. Thus there were left only a few hundred tons remaining of the treaty-authorized carrier strength.

Already in the mill, during construction of *Yorktown* and *Enterprise*, were plans for a new class of aircraft carrier, the first of which would be known as USS *Essex* (CV-9).

War clouds were gathering over Europe and the Pacific. Fleet exercises and war games were stepped up as international tensions mounted. The treaties of 1922 and 1930 terminated December 31, 1936 when Japan abrogated.

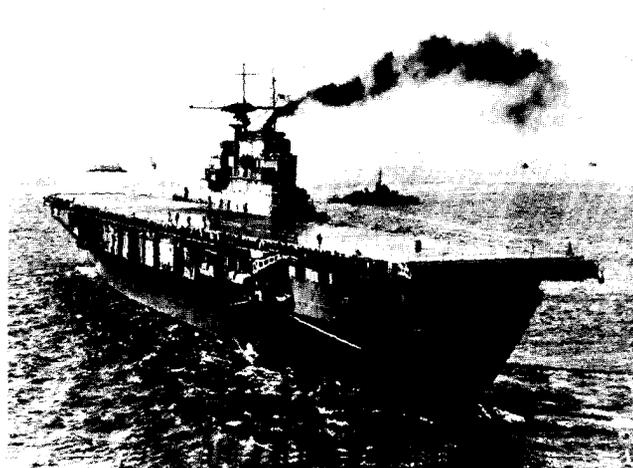
In its provisions for Naval Aviation, the Naval Expansion Act of May 17, 1938 authorized an increase in total tonnage of under-age naval vessels amounting to 40,000 tons for aircraft

carriers, and also Authorized the President to increase the number of naval aircraft to "not less than" 3000. Carriers built as a result of this authorization were the *Hornet* and *Essex*.

On September 8, 1939, President Roosevelt proclaimed the existence of a limited national emergency and directed measures for strengthening national defenses within the limits of peacetime authorization. In May 1941, an unlimited national emergency was declared. Seven months later Japanese aircraft, launched from carriers, attacked Pearl Harbor, and within 24 hours, the President went before Congress and the nation was at war.



USS HORNET (CV-8) was authorized in 1938 when world tensions mounted, launched in December 1940, commissioned in October 1941.



SISTER SHIP to *Yorktown* and *Enterprise*, *Hornet* had a standard displacement of 19,800 tons. First C.O. was Capt. Marc A. Mitscher.