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## VOUGHT FIGHTERS: THE FIRST GENERATION

The name of Chance Vought for the last two decades has been associated primarily with the several series of outstanding fighters it has built for the United States Navy. The vast popularity of the F4U "Corsair" series, the F7U "Cutlass," and the present F8U "Crusader" tends to obscure the fact that the firm made its reputation originally as a producer of two-seater observation seaplanes, from which its earliest fighter designs were developed. These aircraft, the FU-1, XF2U-1, and XF3U-1, are little known today; as the forebears of such noteworthy descendants, however, their history is worth investigating.

By the early part of 1926 the Navy's Bureau of Aeronautics had reached the conclusion that future fighters, both for carrier and catapult use, should be air-cooled, and that development of designs should be based on the new and very successful Pratt and Whitney "Wasp" engine. An immediate need existed for a new catapult fighter, for use aboard the battleships of the fleet, since the Naval Aircraft Factory TS-1s currently used for that purpose were underpowered and unequal to the hard usage to which they were put.

Two promising catapult fighter designs, one by Boeing (XF3B-1) and one by Curtiss (XF7C-1), both using the "Wasp," were developed during the course of the year 1926, but quantity delivery of these models was impossible before late 1927 or early 1928.

For an interim seaplane fighter the Navy turned to Chance Vought. In 1922 Vought had built the UO-1, a successful observation seaplane for catapult use, and had produced some 140 aircraft of this basic model for the Navy in the ensuing four years. At the Bureau's request Vought prepared a single-seat fighter variant of this design, under the designation UO-3. Twenty of these aircraft, numbered A-7361 to A-7380 inclusive, were ordered on June 30, 1926, at a cost of \$259,709. In October 1926 the model designation was changed to FU-1 to conform to the intended tactical use of the aircraft.

The FU-1 was in most respects similar to the UO-1, but the strength of various components, notably the wings, was increased to improve the load factors of the structure; this permitted diving at speeds up to 200 m.p.h. and unlimited aerobatics. The Wright J-5 (R-790) radial air-cooled engine, substituted for the J-4A of the UO-1, had a normal rating of 220 h.p. at 1800 r.p.m. and was fitted with a Roots Model 3 super-charger which maintained sea-level

power to about 12,000 ft.

The overall dimensions of the fighter were virtually identical with those of the UO-1. Like it, the FU-1 was a two-bay biplane of wood and steel-tube construction, fabric-covered. In addition to the single cockpit, other features that differentiated it from the UO-1 were the wing-tips, which were smoothly rounded in the FU-1 as against the more angular outline of the UO-1. The fin area of the fighter was also noticeably smaller. The single central float could be replaced by wheel-type landing gear for use when the aircraft was shore-based. Standard fighter armament of two Browning calibre O.30 M 1919 machine guns was fitted on the cowling forward of the cockpit.

Particulars and performance data for the FU-1 were as follows:

|                            | Landplane         | Seaplane          |
|----------------------------|-------------------|-------------------|
| Span                       | 34 ft. 4 in.      | Same              |
| Length                     | 24 ft. 4-3/4 in.  | 28 ft. 4-1/2 in.  |
| Height                     | 8 ft. 10-1/2 in.  | 10 ft. 2 in.      |
| Tread                      | 5 ft. 2-1/2 in.   | --                |
| Wing area                  | 290 sq. ft.       | Same              |
| Fuel capacity              | 46 gals. (U.S.)   | Same              |
| Oil capacity               | 4 gals. (U.S.)    | Same              |
| Weight empty               | 1715 lbs.         | 2074 lbs.         |
| Weight loaded              | 2409 lbs.         | 2774 lbs.         |
| Wing loading               | 8.3 lbs./sq. ft.  | 9.55 lbs./sq. ft. |
| Power loading              | 10.9 lbs./sq. ft. | 12.6 lbs./sq. ft. |
| Maximum speed              | 125 m.p.h.        | 122m.p.h.         |
| Stalling speed             | 51 m.p.h.         | 54 m.p.h.         |
| Service ceiling            | 27,900 ft.        | 26,500 ft.        |
| Endurance (cruising speed) | 5.2 hrs.          | 5 hrs.            |
| Range (cruising speed)     | 430 mi.           | 410 mi.           |
| Climb to 5,000 ft.         | 4.3 min.          | 5.0 min.          |
| to 10,000 ft.              | 8.6 min.          | 10 min.           |
| to 15,000 ft.              | 13.5 min.         | 15,6 min.         |

By April 1927 all 20 of the FU-1s had been delivered to the Naval Air Station San Diego, where the majority of them were assigned to Fighting Plane Squadron Two (VF-2B). From October 1927 to June 1928 they were operated as seaplanes, one aircraft with necessary personnel being embarked in each of the twelve battleships of the Battleship Divisions, Battle Fleet. Squadron operations during this period included participation in fleet maneuvers in the Hawaiian area. In June 1928 the squadron became shore-based again, operating its aircraft as landplanes at San Diego, and three months later the FU-1s were supplanted in the squadron by new Boeing F3B-1s.

When VF-2B went to sea again, however, it was as a carrier fighter squadron aboard the Langley. At the end of 1927 the Navy Department had decided,

partly because of logistic difficulties, partly because of their inherent inferiority in performance, to discontinue the use of seaplane fighters as a type and concentrate all fleet fighters aboard carriers. The arrival with the Fleet of the newly commissioned carriers Lexington and Saratoga facilitated this change. Henceforth only observation aircraft were carried aboard battleships.

This change of policy made the FU-1 redundant in its original role. A new career as a fighter-trainer, however, now opened before it. As early as September 1927 two FU-1s (A-7376 and A-7377) at San Diego were assigned to the carrier Langley as replacements for worn-out VE-7s that had been used for deck-landing training. When further aircraft were released by VF-2B they were assigned similar duty.

Experience in operating from the Langley soon showed that visibility from the cockpit of the FU-1 was inadequate for safe landings. This situation was corrected by providing a second cockpit, with removable controls, forward of the existing cockpit. Since the latter was in the same position as the rear cockpit of the basic UO-1, this proved a simple modification to make. By the end of 1928 all 20 FU-1s had been converted into two-seaters; in this form the aircraft was known as the FU-2.

From this time until the end of 1931 it became the practice to assign an FU-2 landplane to each of the West Coast based single-seat fighter squadrons, for training and utility purposes. These squadrons, which operated from San Diego when disembarked, were usually VF-3B and VF-5B, from the Lexington, and VF-6B from the Saratoga. A further three or four FU-2s, fitted as seaplanes, were normally assigned to Utility Squadron One (VJ-1B), which was based on the tender Aroostook until the end of 1930 and thereafter on the tender Argonne.

Despite a well-earned reputation for durability, normal wear and tear and training accidents took their toll of the FU-2s. By September 1931 only nine remained on hand, and the decision was taken to withdraw them from service. In February 1932 the last FU-2 in commission was turned in by VJ-1 at San Diego, and by May all had been written off, the last to go being A-7378.

Early in 1927, while Vought was busy with the FU-1s and the first O2U-1 "Corsairs", the Bureau of Aeronautics began to take an interest in the development of a high-performance two-seat fighter for use with the fleet. This was conceived of as having primarily a defensive role but could be utilized also as a light bomber. Desirable characteristics that were stressed were high maneuverability and the provision of an improved rear gun mounting, the naval Type A mount (Scarff ring) being considered unsatisfactory in a fighter. It was also thought that the type should be convertible as a seaplane for catapulting, but this requirement was later abandoned.

Consideration was first given to the possibility of adapting the two-seat O2U-1 for fighter use, but when this proved impracticable new designs were

sought from the industry. Experimental contracts were signed on June 30, 1927, with Curtiss for an XF8C-2, a naval development of the Army "Falcon" O-1 series, and with Vought for one XF2U-1.

The XF2U-1 (Bureau Number A-7692) was intended to be based on the O2U in large measure, but wind tunnel tests of the original design showed poor aerodynamic qualities, the correction of which required numerous changes. This fact and the preoccupation of the company with quantity production of the O2U-1, -2, and -3 and with export work led to a long delay in the completion of the XF2U-1, which the Bureau of Aeronautics considered excessive.

Not until June 21, 1929, two years after it was ordered, did the XF2U-1 make its first flight. By this time the Navy's interest in the aircraft had cooled considerably, particularly since the promising XF8C-2 had started its acceptance trials some weeks previously and an order had already been placed for a further development of this model, the XF8C-4.

The XF2U-1 was a straightforward two-seat, single-bay biplane with a steel-tube and fabric fuselage and wood and fabric wings. The latter were straight, lacking the sweepback of the O2U models. After the necessary redesign only the ailerons, wing ribs, horizontal tail surfaces, fin, and landing gear were substantially identical with those of the O2U-3. The powerplant, as in the O2U-3, was a Pratt and Whitney "Wasp" R-1340C, developing 450 h.p. at 2100 r.p.m. This was enclosed in a long-chord N. A. C. A. cowl, which gave the XF2U-1 much cleaner lines than the majority of its contemporaries.

Characteristics and performance of the XF2U-1 were as follows:

|                              |                   |
|------------------------------|-------------------|
| Span                         | 36 ft. 0 in.      |
| Length                       | 27 ft. 0 in.      |
| Height                       | 10 ft. 0 in.      |
| Wing area                    | 318.5 sq. ft.     |
| Tread                        | 6 ft. 2 in.       |
| Stagger                      | 17 1/2 in.        |
| Fuel capacity                | 110 gals. (U.S.)  |
| Oil capacity                 | 8 gals. (U.S.)    |
| Weight empty                 | 2532 lbs.         |
| Useful load                  | 1354 lbs.         |
| Weight loaded                | 3886 lbs.         |
| Wing loading                 | 12.2 lbs./sq. ft. |
| Power loading                | 8.6 lbs./h.p.     |
| Maximum speed (at sea level) | 146.1 m.p.h.      |
| Minimum speed                | 59.8 m.p.h.       |
| Service ceiling              | 18,700 ft.        |
| Endurance at full speed      | 2.26 hrs.         |
| Endurance at 110 m.p.h.      | 4.16 hrs.         |
| Climb in 10 minutes          | 9,100 ft.         |

Armament consisted of two calibre 0.30 machine guns mounted in the center section of the upper wing, firing outside the propeller arc, and a single flexible gun of the same calibre, on a Vought pivot type mounting in the rear cockpit. The latter made a favorable impression upon the Bureau of Aeronautics, particularly in comparison with the Scarff mounting which the XF8C-2 retained, and its advantages were emphasized and urged for subsequent adoption.

Although the XF2U-1 met all contract guarantees for performance and was accepted as suitable for service use, it was not superior to the XF8C-4 in any respect. There was therefore no cause to revise the Navy's decision in favor of the latter type, which shortly went into quantity production and achieved fame as the first Curtiss "Helldiver."

After undergoing routine deck landing tests at Norfolk, which showed that the N. A. C. A. cowling did not interfere unduly with vision for carrier operations, the XF2U-1 returned to Anacostia, where it had been flight-tested. In February 1930 it was assigned to the Naval Aircraft Factory, Philadelphia, for use as a station utility aircraft. Here it remained, performing routine assignments, for the remainder of its career. On March 6, 1931, it was badly damaged in landing at Norfolk and was subsequently scrapped as being beyond repair.

By the spring of 1931 the results of several months' operations of the F8C-4 in VF-1B, aboard the Saratoga, showed conclusively that the type was not satisfactory for fleet fighter duties, and the aircraft were withdrawn from first-line service at the end of that year. Following this action, the Bureau reformulated its requirements for two-seat fighters. Less emphasis was put on the bomb load (the F8C-4 had made a popular reputation as a dive-bomber) and greater power was demanded in the form of the R-1690 or R-1820 engine, or possibly the new two-row R-1510 or R-1535. Slots and flaps were advocated for better low-speed performance; biplane construction was still preferred, with non-folding wings of less than 35-ft. span.

Most of these features were shortly embodied in Bureau Design No. 113, which called for use of the geared and supercharged R-1535 (Pratt and Whitney) or R-1510 (Wright) engine. Proposals were received from seven manufacturers in April 1932 for designs following the general concept of Bureau Design No. 113. Those of Douglas and Vought were deemed most satisfactory by the Bureau, and contracts were signed on June 30, 1932, with each of these firms for one experimental fighter, i. e., the Douglas XFD-1 and the Vought XF3U-1.

The XF3U-1 (Bureau Number 9222) made its first flights at the Vought factory in May 1933 and was delivered to the Naval Air Station Anacostia for flight tests on June 22. Structurally, it followed conventional practice in having a fabric-covered welded steel-tube fuselage; wings and tail surfaces were of metal construction, fabric-covered except for the fixed tail surfaces,

which were metal-covered. Crew comfort was enhanced by the provision of a sliding transparent enclosure over the two cockpits. The twin-row Pratt and Whitney R-1535 engine permitted a longchord small-diameter cowling, which, together with tapered wings and streamlined wheels, made for an aerodynamically refined and graceful outline that contrasted sharply with the bluff and sturdy appearance of the Corsair, retained even in the final versions of that aircraft.

Test pilots found that the XF3U-1 had excellent flying characteristics. In maneuverability it compared favorably with many single-seat fighters. It was also a particularly safe aircraft, giving positive stall indication and being difficult to spin.

Aware of the potentialities of their design, Vought engineers suggested that the Navy also test the XF3U-1 as a scout, a conversion which involved mainly an increase in the fuel load and could be satisfactorily accomplished within the limitations of the airframe. They calculated that a range of 858 miles at 150 m.p.h. cruising speed could be attained in this condition; by contrast, the maximum range of the SU-2, the standard service scout, was 635 miles at 130 m.p.h.

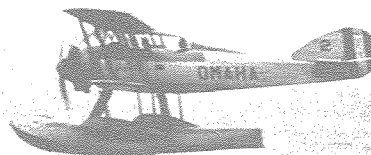
Impressed by these figures, the Bureau of Aeronautics ordered supplemental tests of the XF3U-1 as modified to scout requirements. Results of preformance tests in both conditions were as follows:

|                            | Fighter                            | Scout                                        |
|----------------------------|------------------------------------|----------------------------------------------|
| Propeller                  | Hamilton Standard<br>(fixed pitch) | 2-blade, 10-ft. dia.<br>(controllable pitch) |
| Weight empty               | 3092 lbs.                          |                                              |
| Useful load                | 1551 lbs.                          |                                              |
| Weight loaded              | 4643 lbs.                          | 4937 lbs.                                    |
| Wing loading               | 15.8 lbs./sq. ft.                  | 16.8 lbs./sq. ft.                            |
| Power loading              | 4.8 lbs./h.p.                      | 5.1 lbs./h.p.                                |
| Fuel capacity              | 110 gals. (U.S.)                   | 150 gals. (U.S.)                             |
| Oil capacity               | 8.5 gals. (U.S.)                   |                                              |
| Maximum speed at 8900 ft.  | 214 m.p.h.                         | 211 m.p.h.                                   |
| Maximum speed at sea level | 200.6 m.p.h.                       |                                              |
| Minimum speed              | 67.5 m/p/h/                        | 69.5 m.p.h.                                  |
| Service ceiling            | 24,800 ft.                         | 25,500 ft.                                   |
| Rate of climb at sea level | 1300 f.p.m.                        |                                              |
| Rate of climb at 8900 ft.  | 1340 f.p.m.                        | 1660 f.p.m.                                  |
| Climb in 10 minutes        | 12,700 ft.                         | 15,000 ft.                                   |
| Duration at full speed     |                                    | 2.5 hrs.                                     |
| Range at full speed        |                                    | 525 miles                                    |
| Duration at cruising speed |                                    | 5.0 hrs.                                     |
| Range at cruising speed    |                                    | 800 miles                                    |

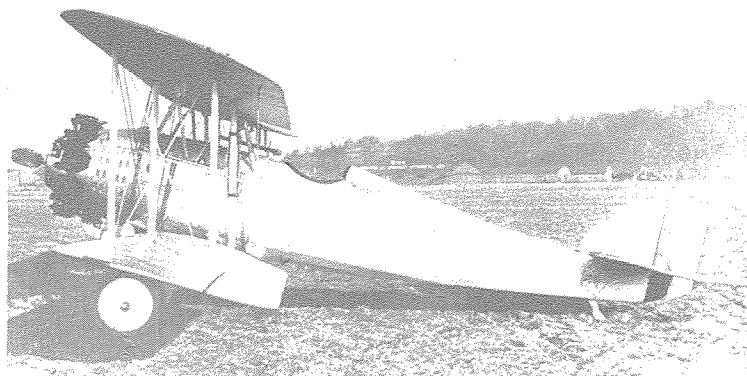


VE-7

W.A.Riley UO-1

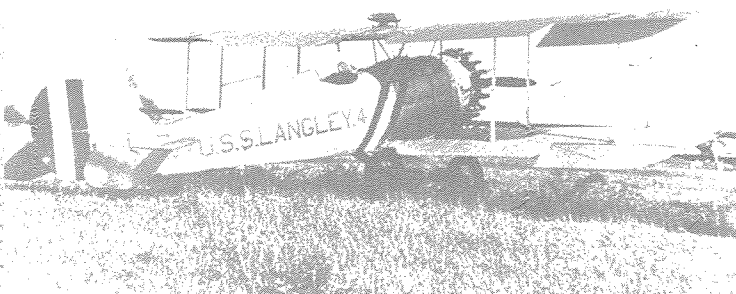


W.A.Riley

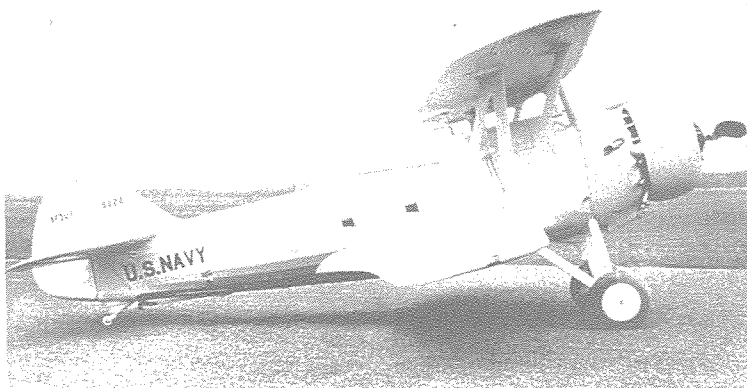


FU-1

U.S.Navy FU-2

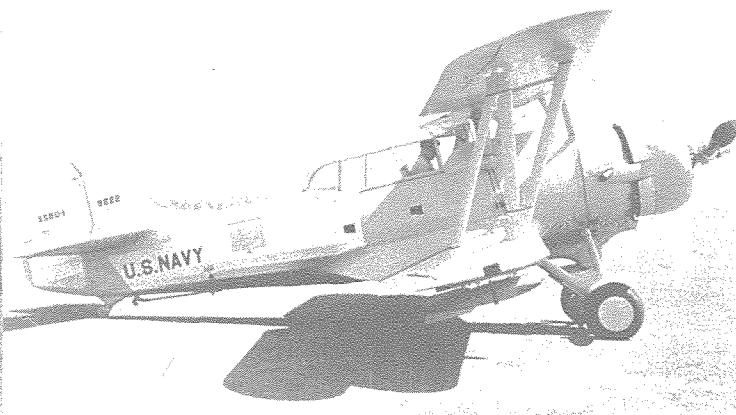


U.S.Navy



XF3U-1

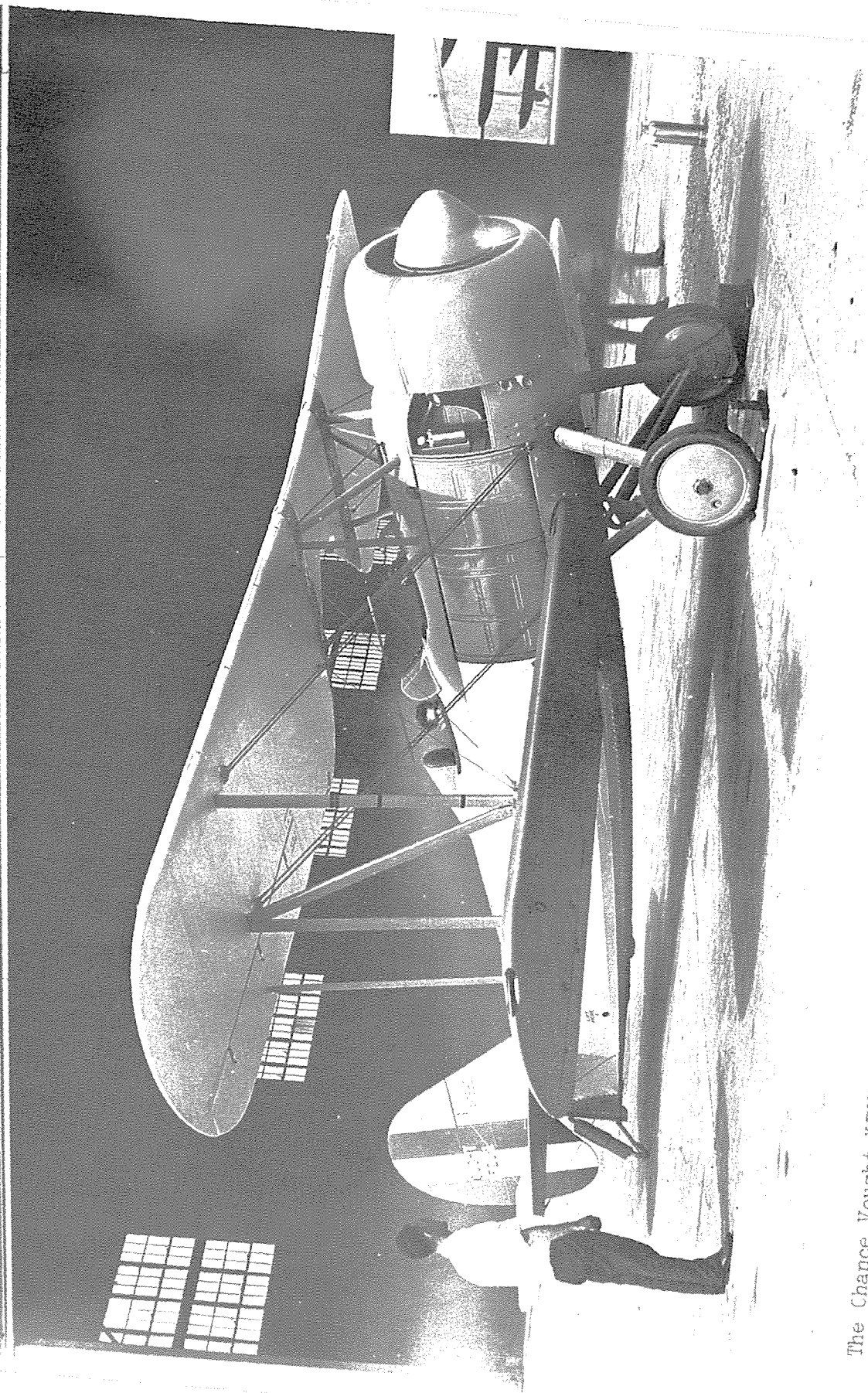
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## VOUGHT TYPES IN TRANSITION

Vought aircraft were used in the Navy from the early 1920's. The VE-7's were early used aboard the carrier Langley. This particular airplane (upper left) is rigged to ditch at sea if necessary. Flotation gear is installed under the wings and the landing gear has an attachment to prevent nosing over in the water. The upper right photo shows a UO-1 being catapulted from the light cruiser Omaha. The UO-1 was used for scouting missions and fighter protection. A direct descendent of the UO-1 was the FU-1 naval fighter, (middle left). This plane and its two-seat counterpart, the FU-2, were assigned to the Langley as fighters, later as carrier training and utility aircraft. The FU-2 shown here wears Langley's red, white and blue stripes. In the late 1920's the Navy advertised for a two-seat fighter, and the XF2U and XF3U (lower left) entered the competition. The XF3U was not accepted as a fighter but was strengthened and delivered as a scout bomber, the XSBU-1 (lower right).



The Chance Vought XF2U-1, which first flew on June 21st, 1929. It used a Pratt & Whitney 1340C engine. But it was too late for its time. Like many other aircraft which have met similar fate, the Navy found during its tests that the XF2U-1 was in no way superior to the XF8C-1 and there-fore stood by its original contract. The result was a "rare bird" - a one-of-a-kind.

|                            |         |
|----------------------------|---------|
| Take-off run (14-kt. wind) | 243 ft. |
| Take-off run (calm)        | 395 ft. |

Dimensions of the XF3U-1 were:

|           |                  |
|-----------|------------------|
| Span      | 31 ft. 6 in.     |
| Length    | 26 ft. 6 1/2 in. |
| Height    | 10 ft. 11 in.    |
| Wing area | 294.6 sq. ft.    |

The powerplant, an R-1535-64 14-cylinder engine, was rated at 700 h.p. at 2500 r.p.m. at 8900 ft. Armament consisted of three Browning calibre 0.30 M-2 machine guns, each with 600 rounds of ammunition; two were mounted in the fuselage forward of the pilot's cockpit, the third on a flexible mounting in the rear cockpit. Provision was made for replacing one of the fixed guns with a calibre 0.50 weapon, for which 200 rounds of ammunition were supplied. A Mark III telescopic sight was provided for the pilot.

Compared with the XFD-1, which utilized the same engine, the XF3U-1 showed a slight margin of superiority in all aspects of performance, and it was therefore recommended for acceptance as a service type at the end of its test period.

Meanwhile, official opinion in the Navy was becoming progressively less favorable toward the two-seat fighter, and plans for further development and procurement of aircraft of this type were dropped. With the retirement of the Grumman FF-1 from fleet service in 1935, the type passed out of operational use. In view of the versatility of the XF3U-1, however, it was decided in November 1933 to modify the aircraft into a scout-dive bomber under the designation XSBU-1. At the same time a tentative commitment was made to Vought for the procurement of at least 27 aircraft of this design if the experimental model met the revised requirements.

The revisions called for in the design included provision of a single internal fuel tank of 150-gal. capacity (on tests the XF3U-1 had carried its extra fuel in a 40-gal. auxiliary belly tank); stronger wings, of increased area, fitted with flaps; modification of the rear cockpit to accommodate an additional radio set; deletion of one fixed machine gun; and the installation of a Mark XXXV bomb rack and bomb displacing gear under the fuselage for a 500-lb. bomb. Subsequently it was found necessary to provide a new fin and rudder, of appreciably increased height and area, to make lateral control more effective. This change produced the most noticeable alteration in the outward appearance of the XSBU-1.

Rather than modify the existing XF3U-1, the Vought company decided to construct a second aircraft to incorporate these design changes. The original engine and much of the equipment of the XF3U-1 were transferred

to the new airplane, which, bearing the same serial number (9222), was delivered to the Navy early in June 1934. Test flights, including a series of terminal velocity dives, gave full satisfaction, and in January 1935 a production contract for 84 SBU-1 aircraft was awarded to Vought. Details of the XSBU-1 as tested at Anacostia were as follows:

|                                |             |
|--------------------------------|-------------|
| Weight empty                   | 3435 lbs.   |
| Weight loaded                  | 5100 lbs.   |
| Maximum speed at 8900 ft.      | 210 m.p.h.  |
| Stalling speed at sea level    | 62 m.p.h.   |
| Rate of climb at 8900 ft.      | 1410 f.p.m. |
| Climb in 10 min. from 8900 ft. | 18800 ft.   |
| Time to service ceiling        | 35 min.     |
| Take-off run into 8-knot wind  | 434 ft.     |
| Take-off run into 25-knot wind | 195 ft.     |

In the meantime, it was decided that the original XF3U-1 airframe, which was practically intact at East Hartford, could be used to advantage as a flying test-bed for the development of two-stage supercharged air-cooled engines. The XF3U-1 was restored to flying condition, given the new Bureau Number 9746, and turned over in June 1935 to the Pratt and Whitney Company, which installed an experimental engine, the XR-1535-70, for flight testing. For the next eighteen months No. 9746 was based at East Hartford, engaged in this program of development of a series of engines that were to power a wide variety of Navy service aircraft during the years immediately preceding World War II. Upon completion of the contract with Pratt and Whitney, the XF3U-1 reverted to the Navy, which put it into storage at the Naval Aircraft Factory. There, in November 1937, the airframe was finally disposed of.

The results of these first ten years of work by Vought in the naval fighter field were not, on the whole, very impressive. No really first-rate fighter was produced at all, but this was less the fault of the manufacturer than of the Navy. The FU-1 was, admittedly, the final stage in the development of an already obsolescent service model that had plainly served its time and had no further potentialities. Nothing more was expected of it than to serve as a stop-gap fighter and fighter-trainer. The XF2U-1 was unfortunate in being held up, otherwise it might have been produced and made as good a showing as the F8C-4. The XF3U-1, finally, was the victim of the Navy's vacillation about the two-seat fighter type. Only its inherent versatility permitted it to be adapted successfully to scout-bomber use, a field in which it became the first of several successful designs Vought developed for the Navy. With the definite elimination of the two-place fighter as a tactical type the situation was clarified, and when in 1938 Vought attempted a fresh single-seat fighter design, the result, in the form of the XF4U-1, was eminently successful. It marked the beginning of a second generation in Vought fighters and the start of a new epoch in the firm's history.

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