DOUGLAS SKYRAIDER

A REPRINT OF AN ARTICLE PUBLISHED IN
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FOREWORD

Our first intention in securing reprints of this fine tribute to the Navy's Douglas Skyraider was to make them available to the men in faraway places who are servicing and flying the attack bomber.

It then became evident that the development of the Skyraider into a machine which the article states is "the ultimate in aeronautical virtuosity" is, in a larger sense, an accolade for the entire field of aviation. So we are making the reprints available on a larger scale.

It was the foresight of the U. S. Navy's Bureau of Aeronautics which gave the nation the Skyraider. The Douglas El Segundo Division which designed and produced it is proud it has earned the Navy's statement as quoted in the story about this airplane– "The guts and backbone of the Navy's war in Korea."

DOUGLAS AIRCRAFT CO., INC.

AERO DIGEST
DESIGN ANALYSIS

"The guts and backbone of the Navy's war in Korea" — U.S. Navy

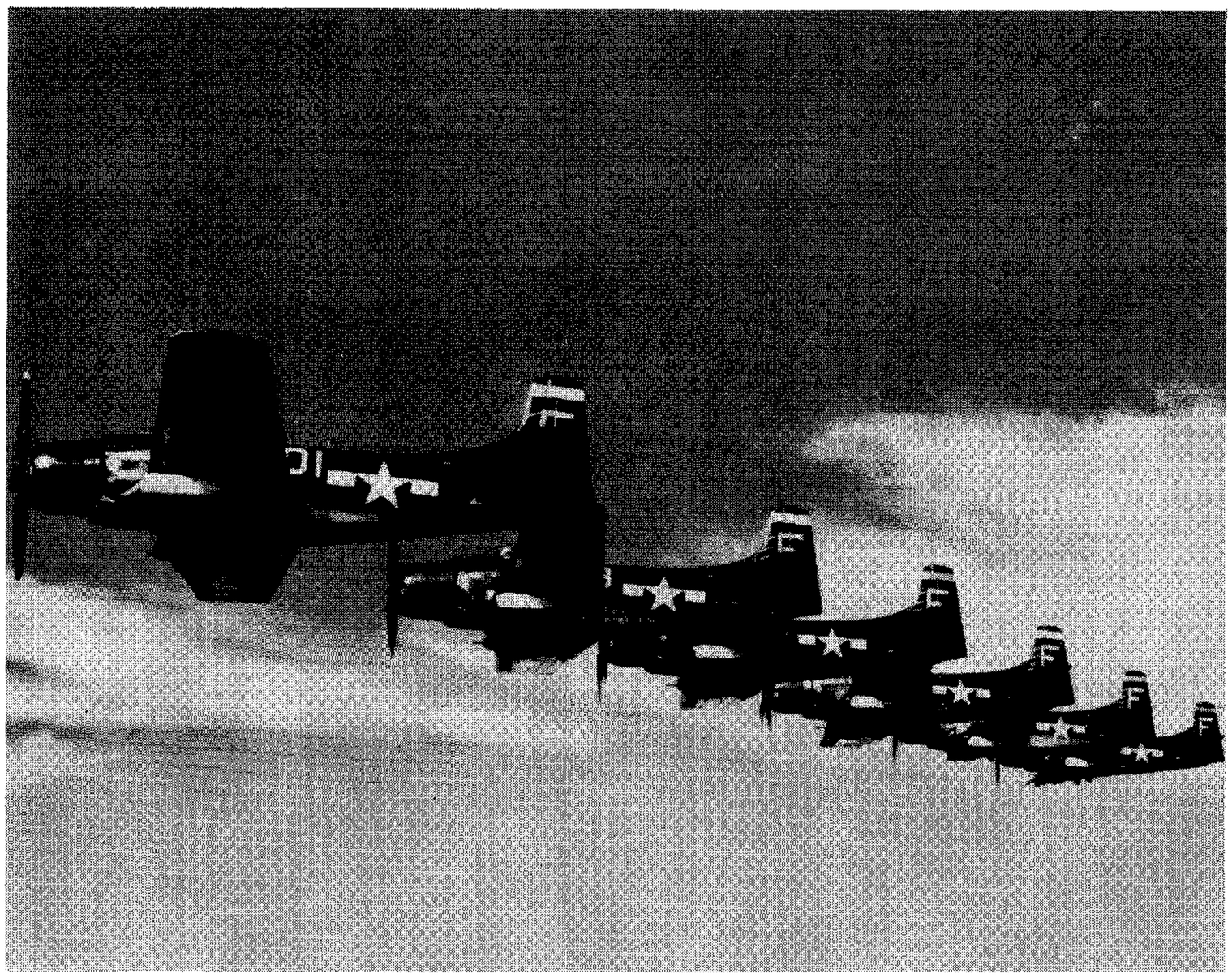
DOUGLAS

New Model AD-5, officially announced exclusively in this issue, is latest member of this rugged family, is equipped to perform every combat job yet assigned to aircraft

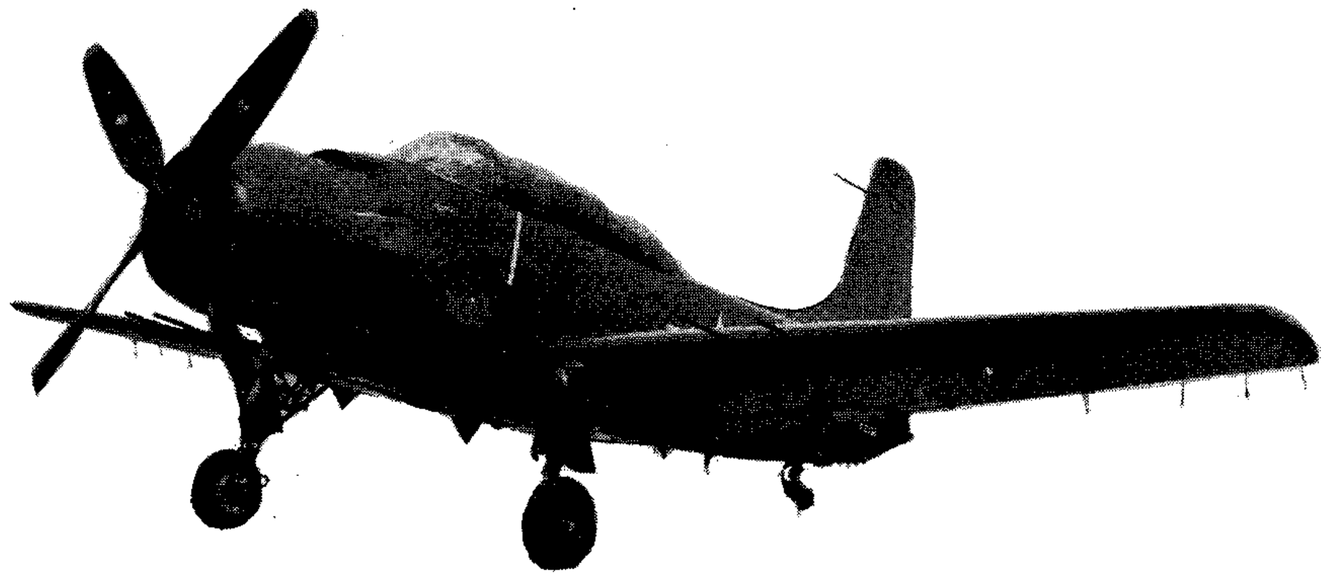
ENGINEERS of the Douglas El Segundo Division have put the lie to the aircraft design axiom that the "all-purpose" airplane is doomed to failure. There is no combat job yet assigned or even contemplated that the Douglas *Skyraider* not only cannot do but has not already done in combat and that means, simply, that here, for the first time in aviation history, is the "all purpose" airplane—with a vengeance.

El Segundo Division Chief Engineer Ed Heinemann knows as well as any living aircraft designer the arguments supporting the universal claim that the all-purpose airplane is doomed to inferiority when each of its versions is compared with specially-designed craft. He agrees—in principle—but will argue with every technical justification in the book that the all-purpose airplane, despite this theoretical limitation, can be not only a value but an essential tool in an air war. And he's got Korea to back him up to the hilt.

His whole argument (and nobody really argues it anymore) is summed up in the report of an interchange between an AD pilot and a ground officer. The latter radiod aloft to ask the pilot what particular load he was carrying and the AD pilot came back with: "You name it—we got it!" That epitomizes the capabilities and ubiquitous usefulness of the Douglas AD.



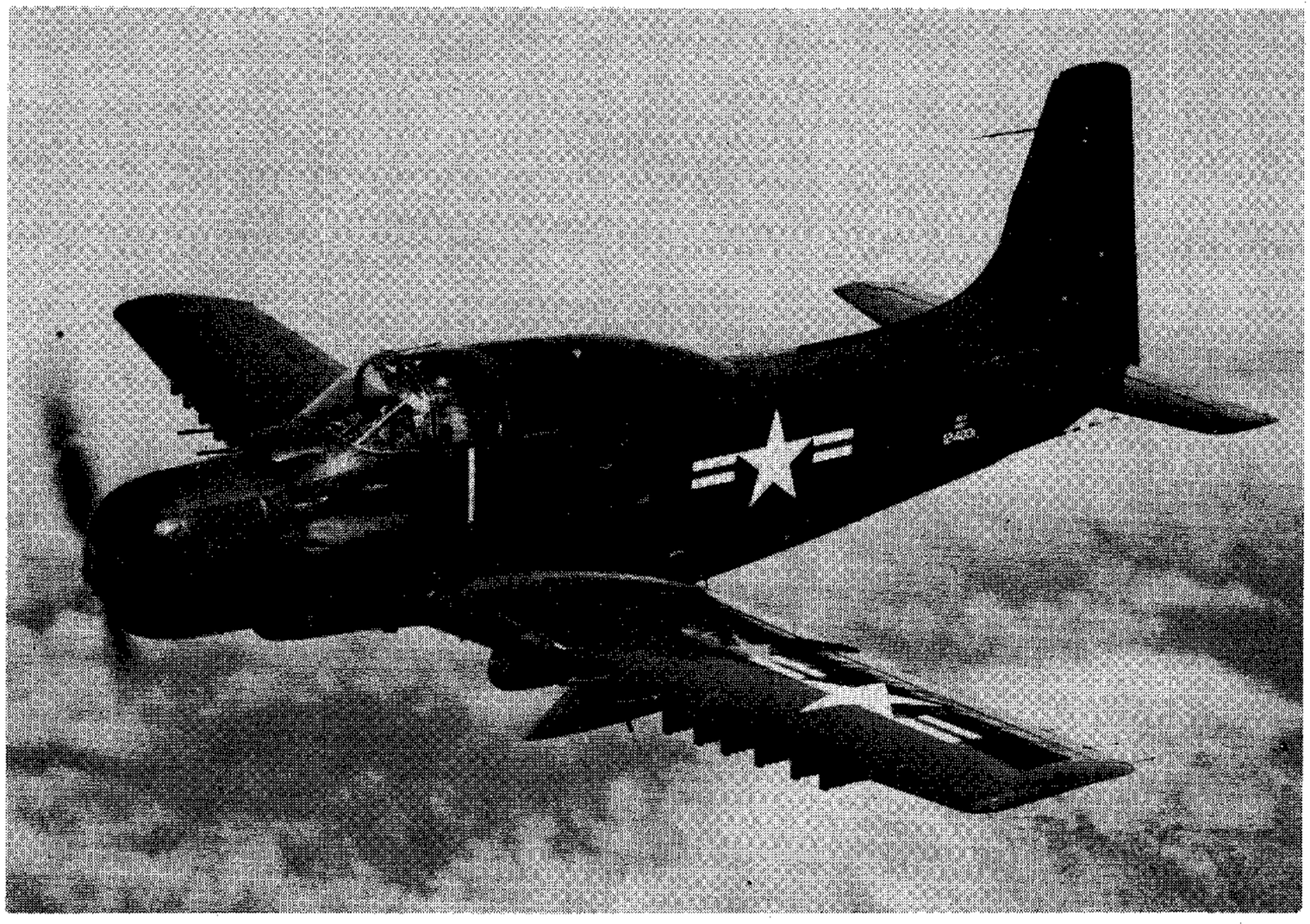
Deadly *Skyraiders*, here on the prowl, symbolize striking power of Naval Aviation in Korea



Exclusive ground view of new AD-5 shows expanded fuselage, higher fin and detailed refinements

SKYRAIDER

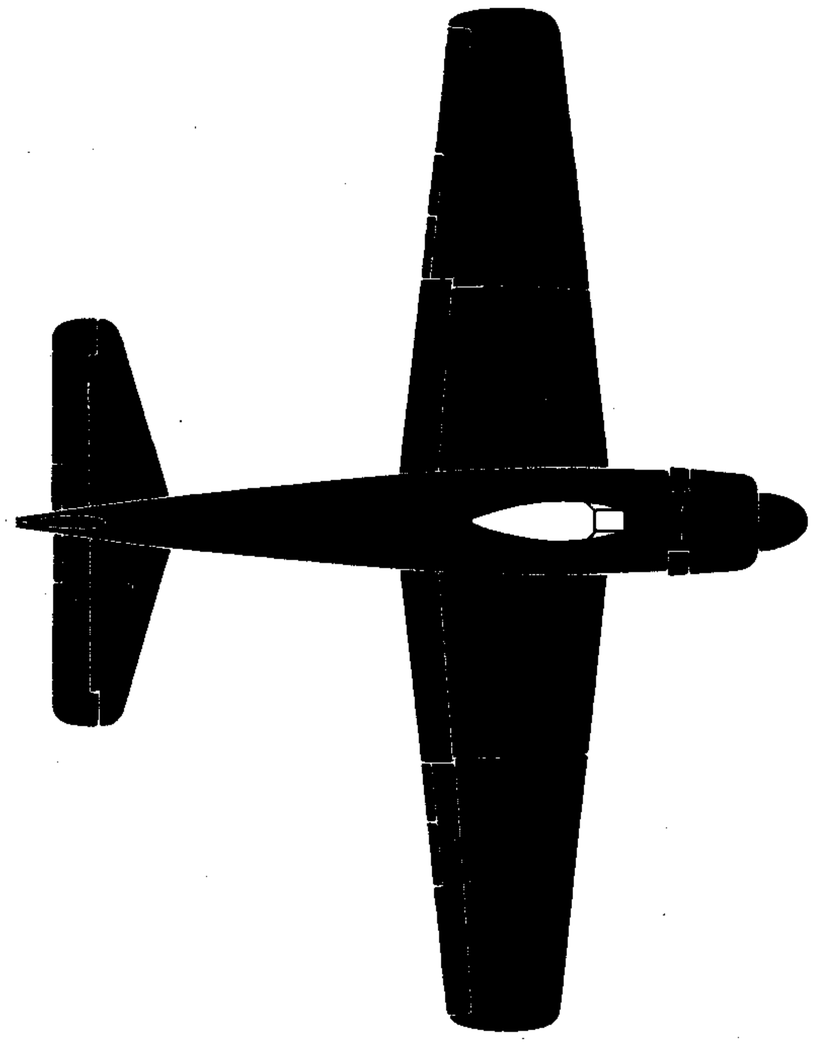
But Douglas was not satisfied with the 18 different versions of this rugged combat weapon already in action and has developed the new AD-5 version, which completes the full repertoire of the flying machine by including accommodations for passengers and litter patients. It is an understatement of aircraft design history to state flatly that the present range of AD models encompasses *every* flying job yet accaccomplished by an airplane. And when you have produced such an aircraft you have established the ultimate in aeronautical virtuosity—and that is the accolade of the Douglas *Skyraider*.



New Douglas AD-5 carries two men abreast, features four 20 mm cannon and added combat load combinations

It would be technical dishonesty to credit El Segundo engineers with having produced this unique airplane design full-blown and ready for its 22 jobs. The truth is that it began life as a highly specialized machine and, like the musical genius that plays every instrument well, simply "growed" into its present panoply of capabilities. Simple in the telling, this reflects not the haphazard growth of a flying machine but is a striking monument to the inherent efficinecy and basic soundness of the original design. The *Skyraider* has not been brought forcibly along this load-strewn trail but, instead, has led its designers and the Navy Department the kind of determined race that characterizes the thoroughbred horse, which keeps giving as long as it is asked.

Like all great aircraft, the Douglas *Skyraider* was born of a need. Chief



BASIC MODELS

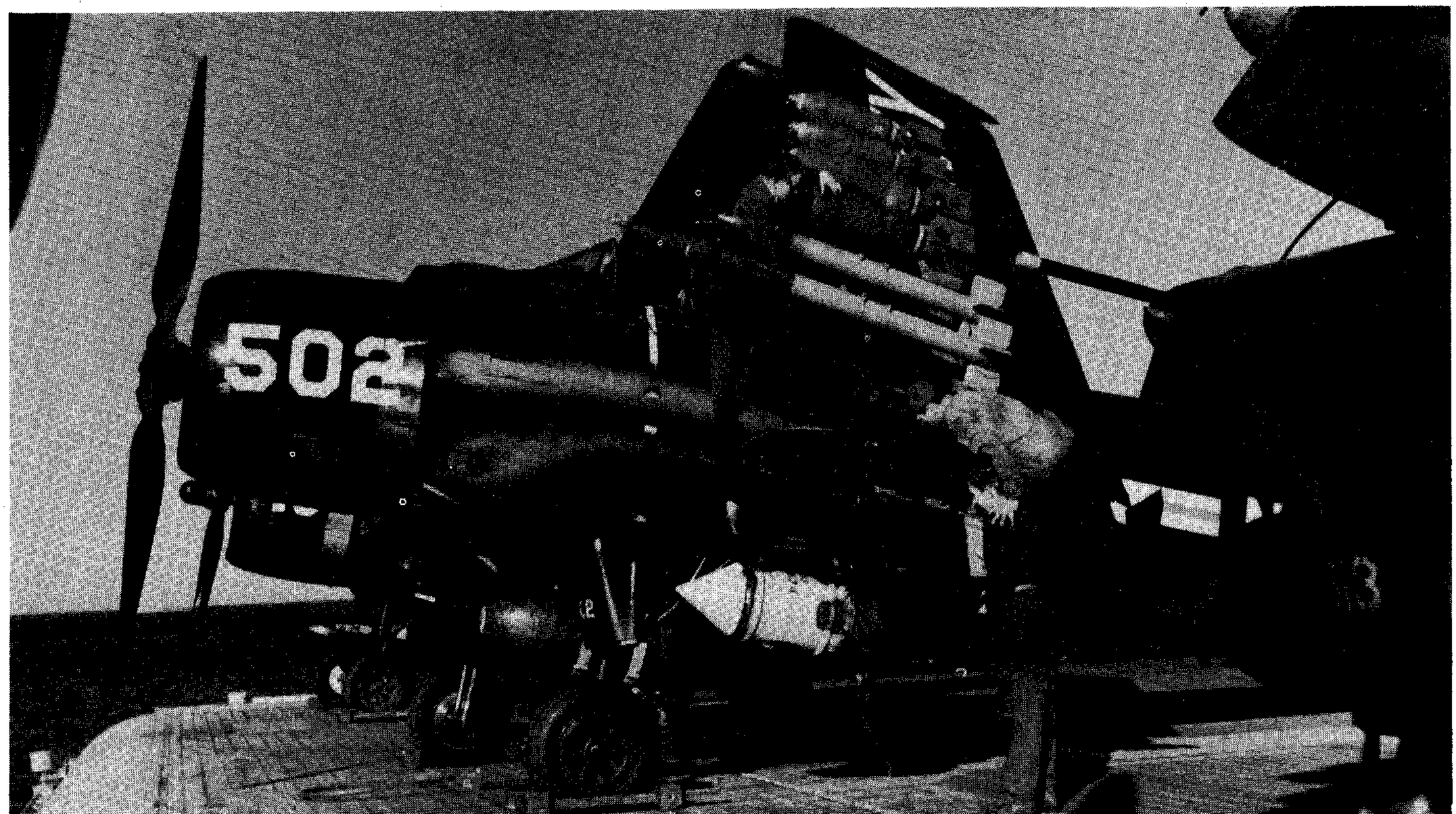
XBT2D-1	Prototype designed July, 1944; first flight March 18, 1945.
AD-1	First production airplane delivered August, 1945. Models include XAD-1W and AD-1Q (see below).
AD-2	Structural strengthening of main landing gear supporting structure and inner wing. Standardized cockpit added, including new seat, symbolic controls, edge-lighted instrument panels, etc. Landing gear doors added. Engine changed to provide additional take-off power. Models include AD-2Q and AD-2Q(U) (see below).
AD-3	Additional structural strengthening of landing gear region, redesigned canopy and windshield, increased travel in main landing gear, new tail wheel, propeller change. Models include AD-3N, AD-3Q, AD-3W, AD-3E and AD-3S (see below).
AD-4	Auto pilot added, improved radar, redesigned windshield, modified arresting hook, instruments relocated for new radar scope. Models include AD-4N, AD-4W and AD-4Q(U).
AD-5	Extensive redesign including side-by-side cockpit seating, additional empennage area, provision for kit-change into wide variety of models including passenger and ambulance versions as well as AD-5N, AD-5S and AD-5W configurations.

Note: The various suffix letters on the basic models above indicate: N—night operation; Q—countermeasure equipment; W—special search equipment; E—special electronics and S—antisubmarine equipment.

Engineer Ed Heinemann made a personal inspection tour of carrier operations in the Central Pacific to observe the combat records of the SBD *Dauntless* dive bomber. This immortal aircraft, together with the Grumman F6F *Hellcat* and the Grumman TBF *Avenger* won the Navy's air war in the Pacific but early in 1944 this ultimate victory was far from certain with the bloody Kwajalein and Eniwetok campaigns still fresh in the memory and the monumental battles of the Marianas yet to come. Heinemann and the Navy saw the urgent need for a new dive bomber with greatly improved performance over the *Dauntless,* which traced its ancestory back to the Northrop BT-1 bomber of 1935 and its immediate predecessor models back to pre-Pearl Harbor days.

Douglas El Segundo engineers were already far along on the design of an SBD replacement, the radical XSB2D-1 featuring remotely-controlled turrents above and below the fuselage, the big, new Wright R-3350 double-row radial engine and a tricycle landing gear. This big new scout-bomber was designed as an improvement over the

Bombs and rockets are being loaded by ordnance men on AD *Skyraider* prior to striking ground targets in Korea



Brewster and Curtiss craft then entering production and, therefore, was actually a double-jump forward over the *Dauntless.*

The war in the Pacific had already showed, however, that the immediate need was for an airplane with a primary dive-bombing duty, rather than an "SB" type designed basically for scouting with bombing only a secondary mission. Therefore, in 1943 the Navy Department established a new tactical mission designated "BT," which combined the primary mission of dive-bombing with the secondary mission of torpedo attack.

This new tactical type was designed for operation by a single crewmember: the pilot and the traditional rear gunner was dispensed with for the first time in Naval aircraft design history for aircraft other than the pure fighter. As a consequence, the XSB2D-1 was redesigned for this new purpose. The rear cockpit and remote-

Curtiss and Kaiser entries and the big Martin *Mauler* was carried along an independent line of develoment. Douglas received BuAer contract No. 743 for 28 of the BTD-1 airplanes for service test and development.

Heinemann, however, was dissatisfied with the airplane and clearly foresaw its limited potentialities. On the basis of his combat observations, he listed the following as the broad necessities for the job: shorter takeoff distance, increased combat radius, increased rate-of-climb, greater load-carrying ability and improved stability and control. In essence, these things meant more lift and less weight than the then-current BTD-1 airplane.

The El Segundo staff, in collaboration with BuAer officers, reduced these broad requirements to specifics and established the following goals for the new airplane: reduce weight from 18,000 lb. to 16,500 lb.; increase maximum lift coefficient from 1.8 to 2.0;

designated 65, had swept through the industry with an eager reception providing, as they did, new reductions in airfoil drag coefficients. This profile had been used on the BTD aircraft and had provided substantially higher speed than the plane might otherwise have had. However, the basic requirement for the new XBT2D-1 design was clearly stated as increased maximum lift and it was apparent to all concerned that the low drag qualities of the NACA 65-series profiles were available only at a penalty in maximum lift characteristics. The hard decision was made, then, to return to the familiar NACA 24-44 series of conventional airfoils, which promised the higher lift at a penalty in drag coefficient. Douglas planned to overcome this defection through careful external drag clean-up of the airplane and this later proved to be the case.

The new XBT2D-1 wing was made up of an NACA 2417 section at the

Former reserve squadron from Glenview, Ill., VA-702 is shown here operating from *U.S.S Boxer* on way to bridge west of Wonson, Korea, which was demolished on this mission

control turrents were dispensed with and the new model redesignated the XBTD-1.

A radical change in the mission of an aircraft midway through its development is an enormous burden and one under which few aircraft have survived. When compared with the new requirements and checked against Heinemann's Pacific notes, the BTD was clearly in an uphill fight against the competition of Curtiss, Kaiser-Fleetwings and Martin designs then under development. Nevertheless, the Douglas BTD emerged superior to the

reduce fueling, arming and maintenance time by 50 percent and provide improved handling qualities, particularly at low speeds. With these tough goals in hand, Douglas further agreed to deliver this radically-improved new airplane within nine months time!

Here was one of the classic challenges of modern aircraft design history and how it was met is one of the absorbing stories of aeronautical science. Here are the major problems and how they were solved.

LIFT IMPROVEMENT: The new series of NACA laminar-flow airfoils,

root tapering to an NACA 4413 profile at the tip. Stability requirements of the airplane resulted in the use of a straight 6 deg. dihedral angle proceeding directly from the root and the wing was given a geometric twist of 4.22 deg. from root to tip to improve its low-speed handling characteristics. With a span of 50 ft. and a total area of 400 sq. ft., the final wing had an aspect ratio of 6.25 and a taper ratio of 0.503. A root incidence of 3.97 deg. was used to provide quick takeoff characteristics and the thrust axis was pitched down 4.5 deg. to minimize

SPECIFICATIONS

Engine	Wright R-3350-26W
Power, t.o.	2700 hp @ 2900 rpm @ 3500 ft.
Propeller	Aeroproducts 4-blade 13 ft. 6 in.
Span	50 ft.
Length	38 ft. 9½ in.
Height	15 ft. 7½ in.
Wings Folded	24 ft.
Empty Weight	10,550 lb.
Normal Gross	16,500 lb.
Max. Overload	18,500 lb.
Max. Speed	365 mph @ 15,000 ft.
Rate-of-Climb, s.l.	2850 fpm.
Combat Radius, max.	1500 mi.

trim changes with power. This complex arrangement of angles is indicative of the design difficulty of carrier-based aircraft with their overriding necessity for good stability and control characteristics at the low speeds associated with takeoff and landing. However, this wing resulted in a reduction of deck takeoff distance in a 25 knot wind of one-third under that of the BTD *Destroyer* bomber and the new XTB2D-1, although carrying *five-times* the bomb load of the SBD *Dauntless,* actually lifted this load off a carrier deck in a takeoff distance 6 percent *shorter* than the lightly-loaded scout!

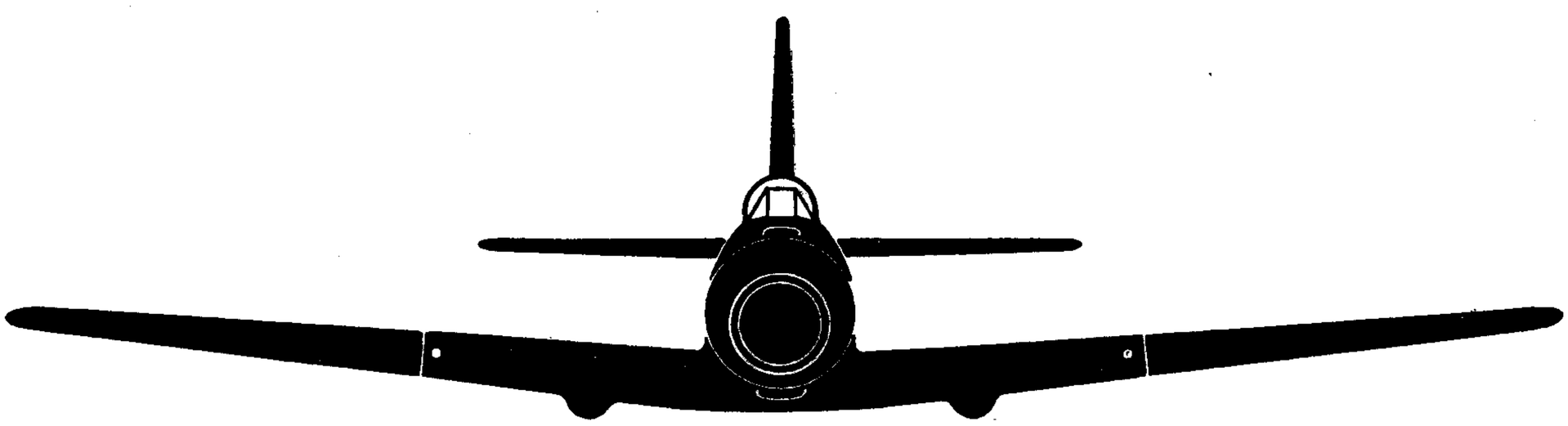
WEIGHT REDUCTION: The science of aircraft design is simply one of building lightweight metal structures and lightweight is the byword of every line made on every drawing of every part of an airplane. It is at once the salvation and the cross of the aeronautical engineer. But in the design of the XBT2D-1 the already weight-conscious design staff was placed under an even greater strain for weight reduction. Douglas had guaranteed that the final airplane would weigh only 16,500 lb. fully loaded as delivered for test flight. The new airplane was to lift *more* bomb load than the BTD and yet weigh 1½-tons *less!*

Just to make certain that this goal was met, Ed Heinemann set the design goal as 750 lb. *less* than even this near-impossible target figure and each engineering group was assigned its portion of this "bogey." A flat rule was made that any part that was overweight had to be compensated by an equivalent weight saving somewhere else. Then, in order to accommodate the recognizable fact that certain structural designs cannot be accurately estimated for weight in advance, it was agreed that statically indeterminant structures would be strength tested and their design finalized on the basis of actual strength determination, rather than the use of arbitrary safety factors.

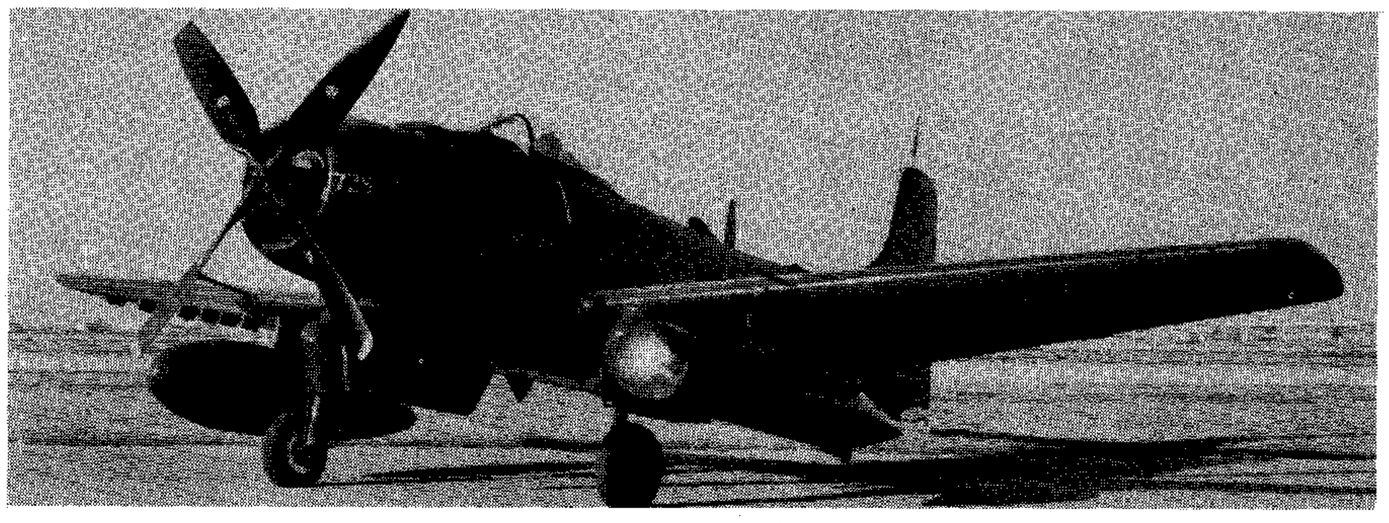
As in all weight-reduction efforts, the major savings are made not in the detailed design of parts but in the major decisions as to systems and design features used. For example, elimination of the bomb bay in the design saved 200 lb.; the elimination of the five separate fuel tanks in the BTD and their replacement by a single fuselage tank in the BT2D saved 270 lb.; the use of continuous, one-piece wing center section and stabilizer saved 120 lb.; the use of fuselage dive brakes saved 70 lb.; the use of a 3000 psi instead of a 1500 psi hydraulic system saved 50 lb. and the simple change from a sliding hatch to a bubble-type enclosure saved 40 lb.

As a result of this rigorous weight-saving policy the BT2D weight came out actually a full 1,000 lb. under that guaranteed and 250 lb. below the stringent "bogey" set in advance. This was a remarkable design achievement. However, in all fairness to the designers on the board, who are always caught in the cross-fire between weight-saving and strength critics, it must be recorded that the *Skyraider* structure later proved inadequate and the plane has undergone continuous structural strengthening which has gained back much of the weight saved in the initial design. This is the inherent risk that the chief designer must take in setting his weight target since it requires a careful balance between two intangibles!

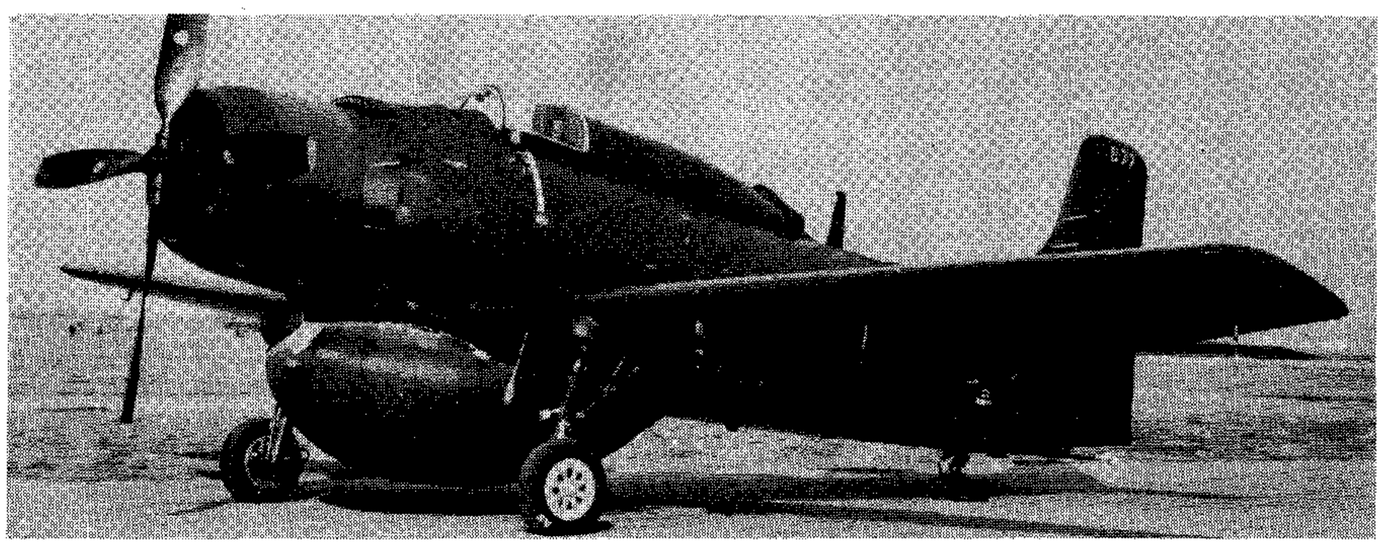
LOAD FLEXIBILITY: Much of the diversity-of-load characteristic of the *Skyraider* is due to the decision to dispense with the bomb bay and to mount all load-carrying items externally. Thus, there are no dimensional limitations on the kinds of weapons and stores that can be carried, as is the case with conventional bombers stowing their bombs internally. The principal advantage of the internal bomb bay is its drag reduction with bombs installed over the World War I practice of carrying bombs externally.



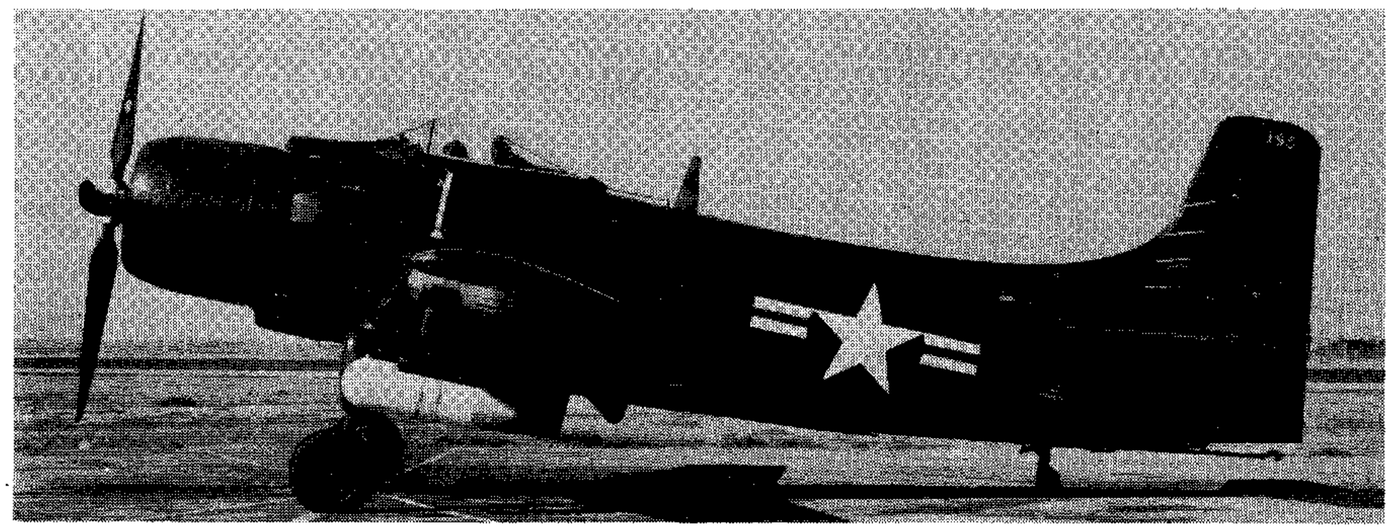
Douglas was convinced, however, that whereas the external load would obviously slow the airplane on its way to the target, once the load was dropped, the resulting airplane was a cleaner, faster craft than its bomb bay-equipped counterpart. And it is obvious that the speed is much more needed on the way away from the target than on the way into it. How-



AD-4N is current production model, features improved radar, has auto pilot



AD-3W is "guppy" version sporting huge search radar unit in belly. Two radar men are mounted in aft fuselage



AD-2 improved structural strength for carrier landings, more powerful engine, new cockpit

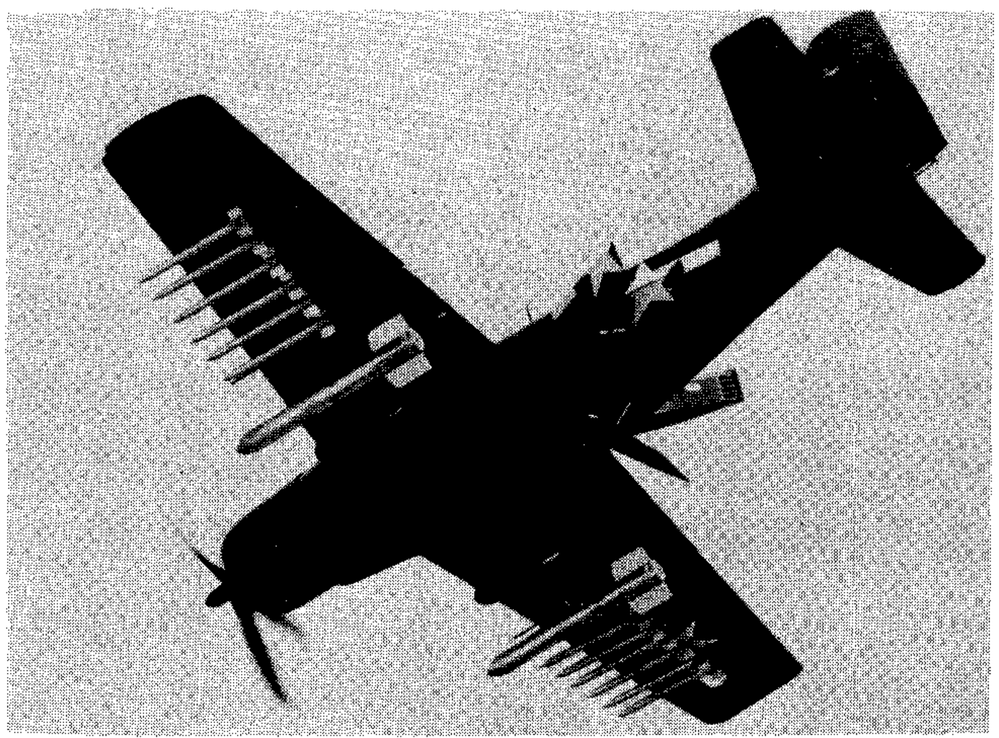
AD-3Q is special countermeasures version, received new windshield and enclosure for improved pilot vision

ever, the net effect on the combat radius is practically nil, since the increased fuel consumption on the way to the target is accommodated by the reduced consumption on the way home.

COCKPIT EFFICIENCY: Ed Heinemann's trip to the carrier groups in the Pacific taught him that combat pilots wanted one thing more than anything else in any new aircraft sent to the fleet: cockpit comfort and simplicity. These demands were accompanied by requests for improved visibility—both on the deck and in the air—and increased cockpit strength for survival in crash landings. These requests were carried directly into the TB2D cockpit design and a total of five separate full-scale cockpit mockups were "hanger flown" before the final design was selected. This involved considerable expense and time but the result has more than warwanted the expenditure.

DIVE BRAKES: Since the principal tactical problem of the dive-bomber pilot is too keep his airplane speed in the dive and pull-out from exceeding structural limits, the dive brake has proved an increasingly important design element in the type. Four possibilities were available for the new design: reversing propeller, wing brakes, fuselage brakes or parachutes, the latter obviously impractical. Douglas experience with wing dive brakes, used on the SBD *Dauntless* series, showed several disadvantages: severe tail buffeting when extended, reduce control in the dive and reductions in wing lift when retracted over comparable "clean" wings. The reversing propeller system, while demonstrably practical, was abandoned because at the time there were no production propellers having the required rate-of-change of pitch necessary for such operation.

Aft fuselage dive brakes had been pioneered on the BTD design and these were adopted for the new design. Experience and analysis had shown that airplane trim and controllability was unaffected and that wing lift was unchanged. With these large, flat panels extending from the



Characteristic pose of *Skyraider* in action shows extended dive brakes on sides and bottom of fuselage. Note heavy rocket battery

AD-5 DAY ATTACK

AD-3E ANTI-SUBMARINE SEARCH

AD-5 AMBULANCE

AD-5W AIRBORNE EARLY WARNING

AD- 1Q RADAR COUNTERMEASURES

AD-5 TOW-TARGET

AD-4 DAY ATTACK

AD-3 DAY ATTACK

AD-2 DAY ATTACK

AD-5 CARGO

AD-5 TRANSPORT

AD-2Q RADAR COUNTERMEASURES

AD-5 PHOTOGRAPHIC

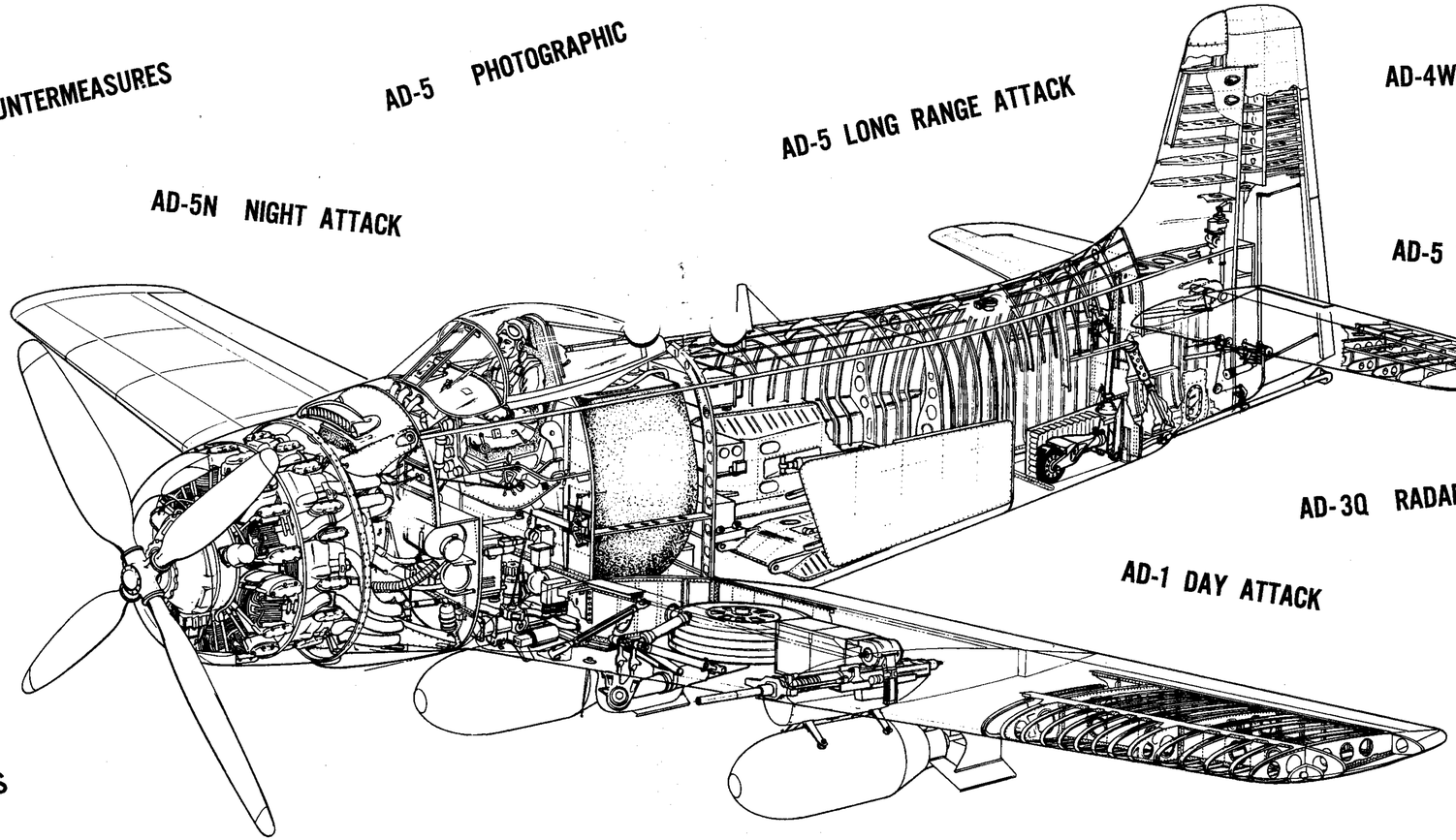
AD-5 LONG RANGE ATTACK

AD-4W AIRBORNE EARLY WARNING

AD-5N NIGHT ATTACK

AD-5S ANTI-SUBMARINE ATTACK

AD-5 TROOP TRANSPORT



AD-3S ANTI-SUBMARINE ATTACK

AD-3Q RADAR COUNTERMEASURES

AD-1 DAY ATTACK

AD-4N NIGHT ATTACK

AD-3N NIGHT ATTACK

AD-4Q RADAR COUNTERMEASURES

AD-3W AIRBORNE EARLY WARNING

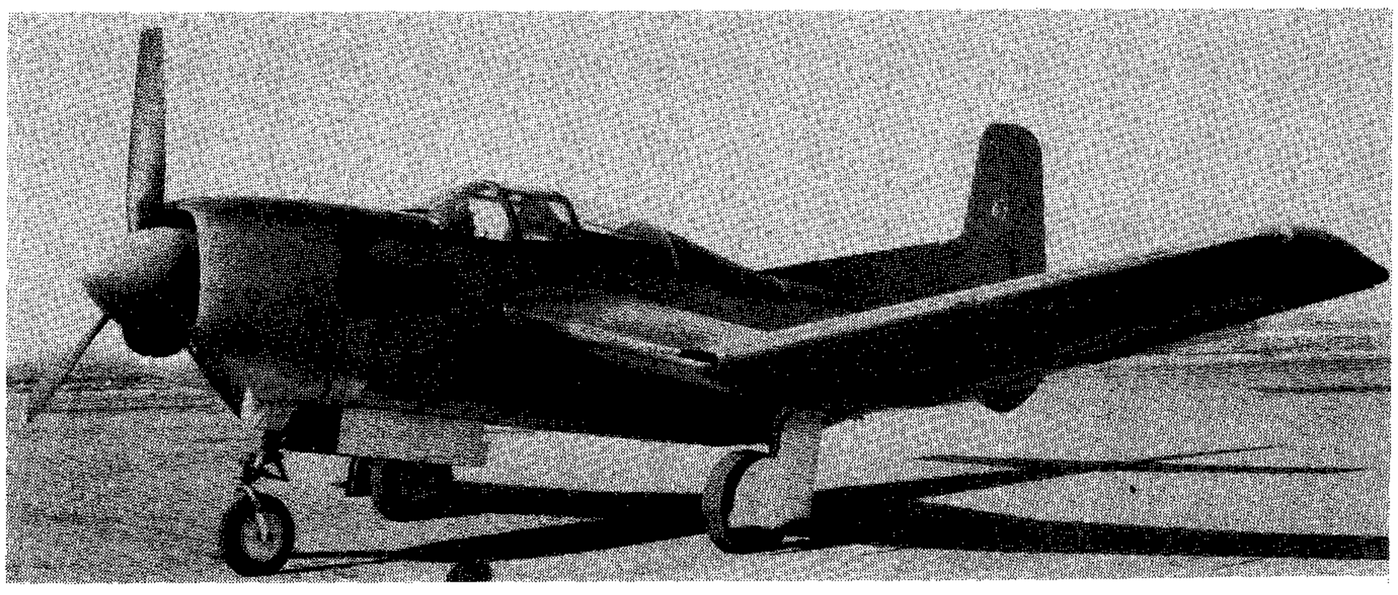
Never before in history has one basic airplane served such a multitude of purposes as has the Douglas AD *Skyraider*. Since its inception in June 1944, the *Skyraider* has evolved through the past eight years into the Navy's most potent carrier-based airplane.

Various adaptations of the AD *Skyraider* perform missions of search, anti-submarine, countermeasures and night operations and many others as noted on this page.

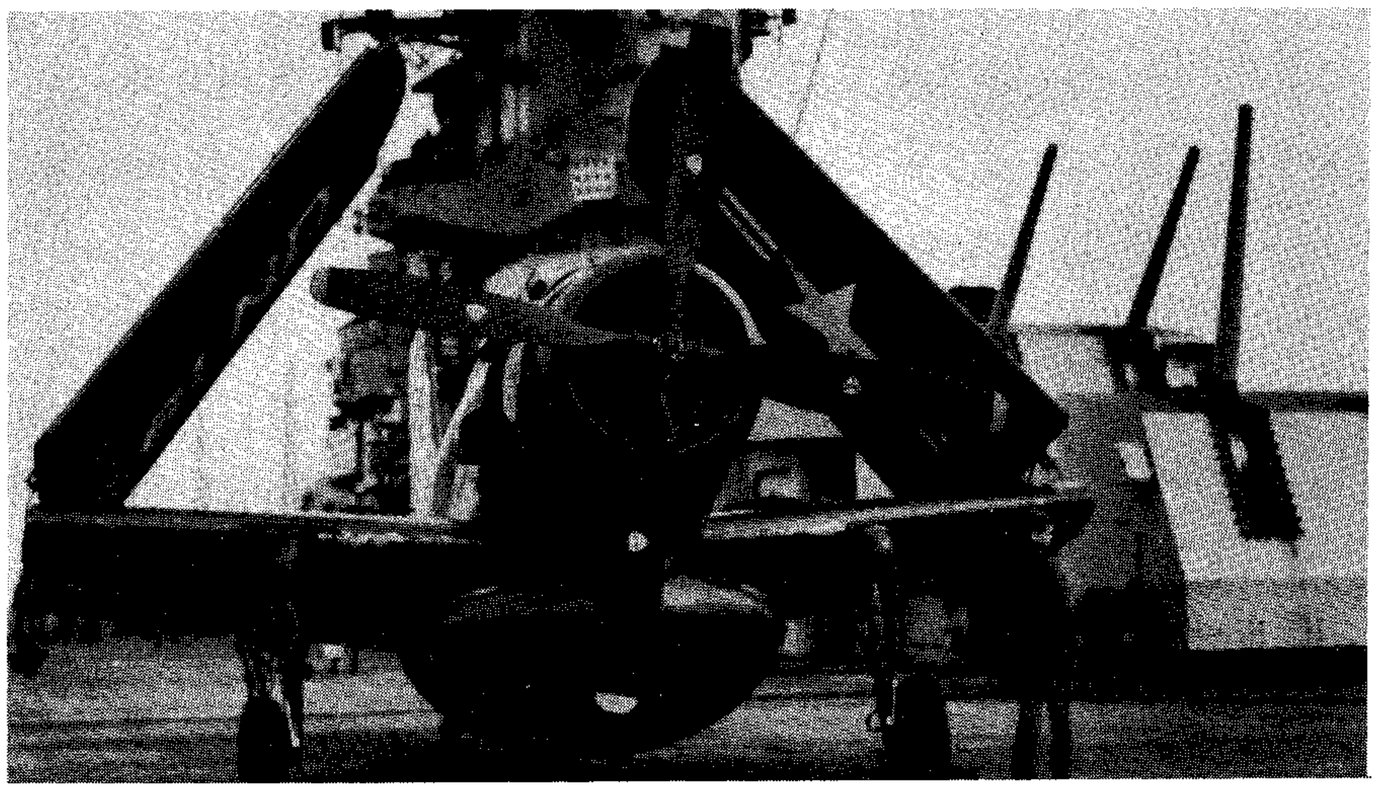
The AD-5, newest member of the *Skyraider* family, is heralded as the most unique airplane ever built. From a basic, single "chassis," the AD-5 may be readily converted to perform twelve distinct missions including ambulance, twelve place transport, cargo and photographic, in addition to carrying out all the missions of previous models.

sides and bottom of the aft fuselage, the *Skyraider* is able to dive vertically at a speed of less than 300 mph, whereas without these brakes the airplane terminal velocity would be well over 500 mph with structural danger inherent in the pull-out.

LANDING GEAR: The new BT2D design included the "old fashioned" tractor landing gear and this has unconsciously stamped the airplane, for all its newness, as an old design. Actually, the BTD was equipped with a tricycle gear and there were long conferences among El Segundo engineers before the decision—based on a 100-lb. weight saving—was made to go to the conventional main gear and tailwheel combination.



Douglas BTD-1 was predecessor of *Skyraider*. Built in limited quantity only, it contributed fuselage dive brakes, other design features to successor AD-1



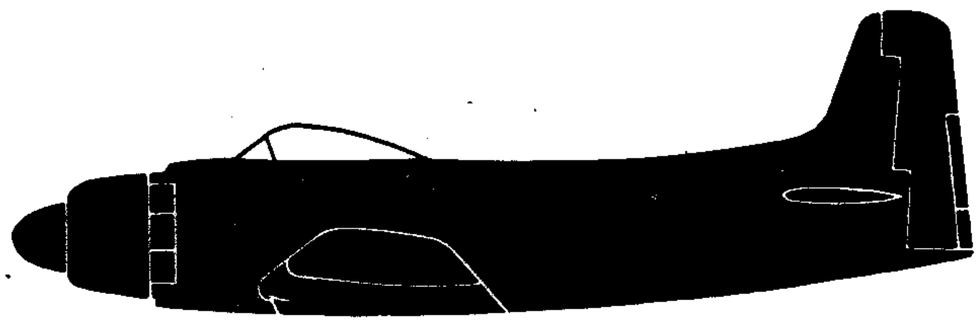
AD-4W search radar scout on flight deck of *U.S.S. Boxer* in sea of Japan as part of Task Force 77

The general arrangement and detail specifications of the new aircraft were completed and delivered to the Navy in June, 1944 and the current production contract for the BTD model was extended by the Navy to cover a service test group of the new BT2D model—provided the prototype was completed within nine months time. By establishing the simple rule that no design or fabrication decision was to be allowed to remain overnight, the engineering and experimental departments completed the prototype airplane in just 8½ months and the radical new Douglas XBT2D-1 *Skyraider* made its first test flight on March 18, 1945 with test pilot Verne Browne at the controls. The prototype airplane was delivered to the Navy just as V-J Day brought an end to hostilities and the pressing need for the airplane in the Pacific.

However, V-J Day did not mean an end to the Navy's need for the airplane. The original contract for 25 airplanes had been augmented by the award of BuAer contract No. 6539 for 548 of the new models during the Spring of 1945. Following V-J Day, the original contract was allowed to stand and the production contract was only cut from 548 to 277 airplanes, the largest quantity of airplanes remaining on standing order after V-J Day in either of the services.

By January 1, 1946 the Navy Bureau of Aeronautics had completed its exhaustive flight tests of the new airplane—including highspeed dives—and six additional prototype airplanes were on their way to the (then) Navy Proving Ground at Patuxent River, Md. (now the Naval Air Test Center). In April, 1946 a total of 20 production airplanes was delivered to Pacific Fleet air headquarters at Alameda, Calif. and the airplanes put through their rugged service tests.

It was in these deliberately rigorous service tests that the unexpected consequences of the vigorous weight-control system used in the *Skyraider* design were manifest. Simulated hard deck landings resulted in repeated main gear fitting and supporting structure failure. Additionally, the usual "bugs" in a new design were flushed out of hiding and these augmented difficulties were further enlarged by first flight tests of the Martin XBTM-1 in November, 1946. This airplane was produced to the identical specification as the *Skyraider* and was a directly competitive airplane with the substantial advantage of being powered by the huge Pratt & Whitney R-4360 engine.



Gloom pervaded Douglass throughout 1946 and '47, the notorious black post-war years of the aircraft industry, compounded by the difficulties with the new airplane, the sole military production of any consequence in the entire organization. Heinemann, fully supported by Donald Douglas, guaranteed the Navy that not only would the required modifications be made on

the 25 airplanes scheduled for return but that the regular production schedule of 140 airplanes by June 30, 1947 would be met.

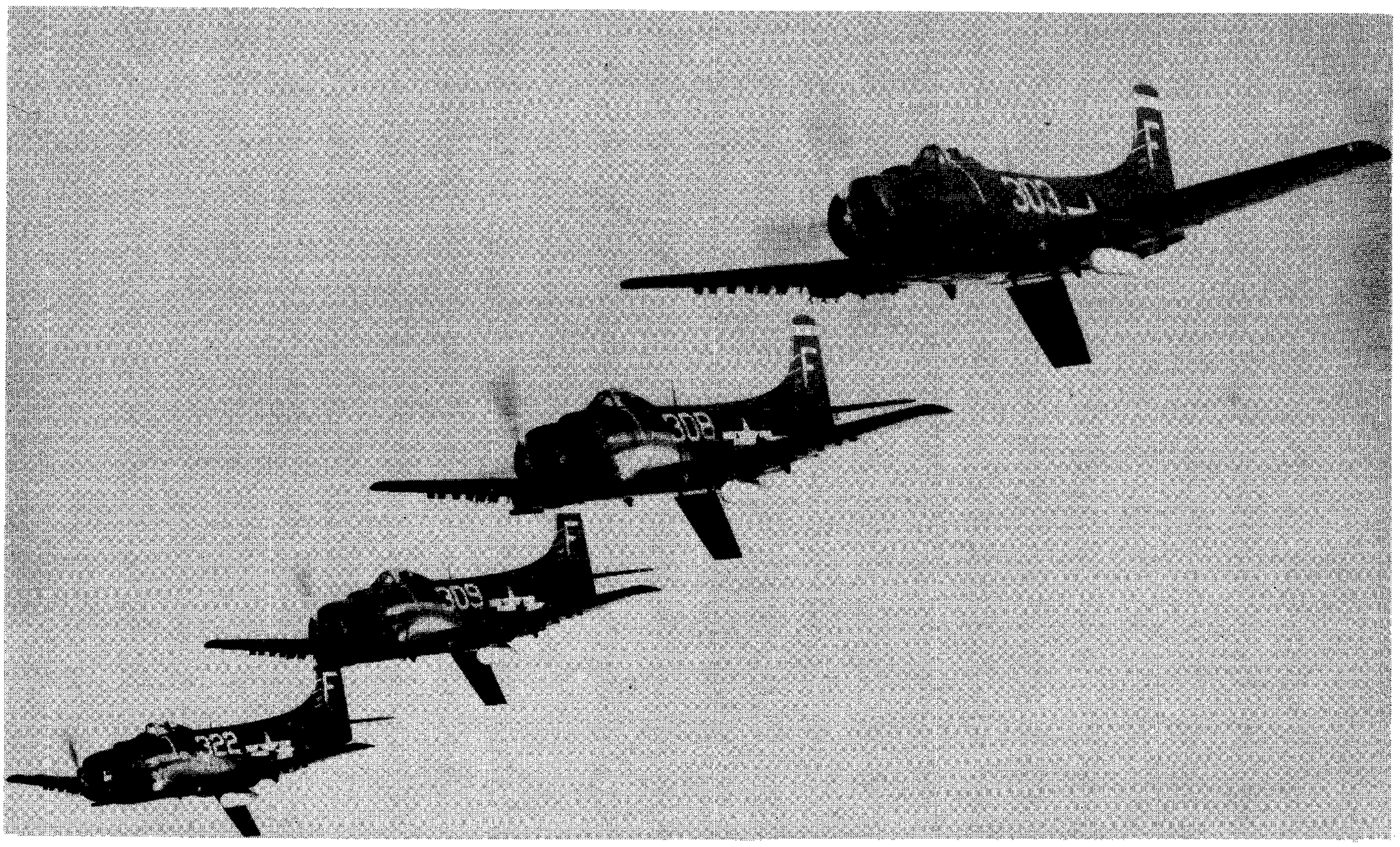
The situation brightened quickly and the structural modifications were made and the airplanes restored to the Navy in scheduled time. (Martin also ran into extensive difficulties with its big new carrier plane during its service period.) Meanwhile, the Bureau of Aeronautics had completely revised its aircraft designation system eliminating many of the complex series of mission letters and tactical aircraft were reduced to only two types: attack planes and fighter planes. Thus, the Douglas BT2D-1 was redesignated AD-1 in accordance with the new system.

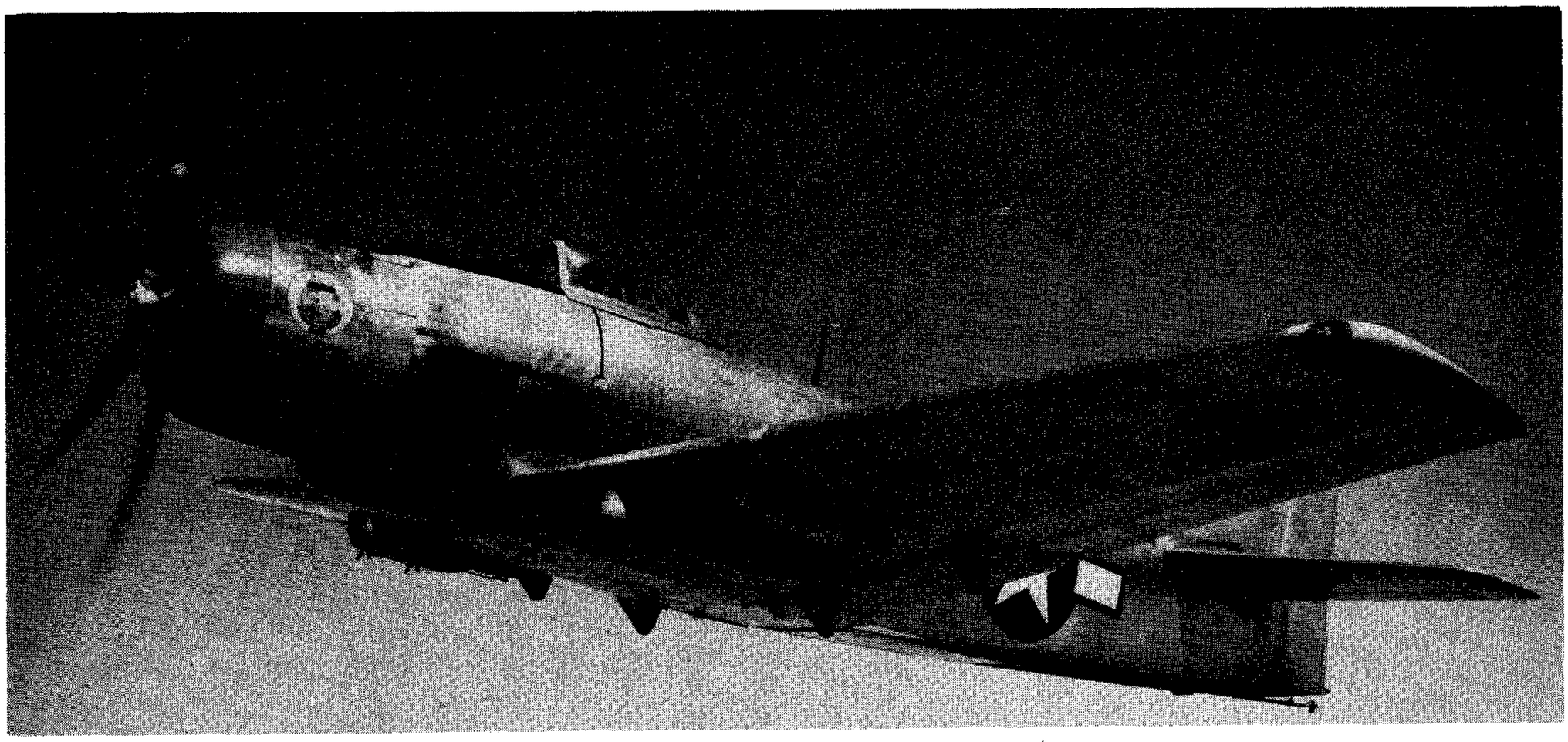
Production AD-1's were delivered to squadrons VA-3B and VA-4B attached to the carrier *U.S.S. Franklin D. Roosevelt.* These squadrons were shore-based at Norfolk, Va. while the FDR was in drydock undergoing inspection and repairs. For this reason, the squadrons conducted carrier qualification trials of the new AD-1 aboard the *U.S.S. Sicily* off the Virginia capes in June, 1947. Actually this was a more severe trial of the airplane since the *Sicily* is a small escort carrier. In October, 1947 squadron VA-1B aboard the *U.S.S. Midway* qualified with the AD-1 and the big carrier went on a five months cruise of the Atlantic and Mediterranean lasting through the winter. Again, however, inner wing and landing gear failures began cropping up even with the strengthened aircraft, reflecting the heavy loads and rough usage to which the airplanes were subjected. Further structural modifications were made in subsequent models until the AD-4 put a finish to the difficulties. Current production aircraft not only meet normal carrier operational requirements but have far exceeded their designed stresses in unbelievable rough operation in Korea.

MODEL DEVELOPMENT: Fiscal 1949 procurement funds provided for a total of 356 model AD-2 airplanes, reflecting not only Navy confidence but enthusiasm for the fully-developed airplane. The new AD-2 model featured a greatly strengthened inner wing structure to accommodate the previously reported difficulties. Additional skin doublers were applied to the wheel well, the center section nose skin was increased and rib flanges were strengthened. A hinged door was added to the landing gear to seal the area in the retracted position in order to reduce air leakage in the area. The results of the cockpit mock-up studies, previously mentioned, were applied to the new model. The new seat was designed on the basis of extensive aeromedical studies to reduce pilot fatigue. The flap, landing gear and tailhook controls were fashioned in the shape of these surfaces to minimize the chances of error. A new instrument panel was installed with edge-lighting to improve night vision and the entire cockpit was designed in accordance with the "standard" arrangement developed by Bu-Aer studies. In addition, the Wright R-3350-26WA engine was installed, offering a takeoff power of 2700 hp @ 2900 rpm @ 3000 ft. and a rated power of 2300 hp @ 2600 rpm @ 6200 ft., an improvement over the 2500 hp takeoff output of the –24W engine used in the AD-1.

The AD-2 model realized the initial production development of the astonishing load versatility of the *Skyraider.* One AD-1 had been modified experimentally into an XAD-1W accommodating the huge search radar unit fully enclosed in a plastic form suspended under the airplane nose. This giant installation was immediately dubbed the "Guppy" and subsequent models have been so-called. This aircraft served as the prototype for the AD-3W production airborne early warning model, which features the addition of two crew members in the aft fuselage to handle the radar gear. In order to accommodate these two operators, the dive breaks are omitted,

Douglas AD-1's from Squadron VA-75 aboard huge *F.D.R.* demonstrate king-size fuselage dive brakes in this formation view. Brakes hold speed to 300 mph in dive





Prototype XBT2D-1 was wartime design planned for Japanese invasion, remained in steady production after V-J Day. Exterior remains little changed in current production models but interior has been revolutionized

the armament is removed and no auxiliary fuel tanks are carried. In addition, a P-1 automatic pilot is fitted to relieve the pilot on long patrol missions.

The countermeasures version carries one additional operator in the aft fuselage to handle the special radar countermeasures equipment, which includes detector equipment to isolate and identify the frequency of enemy radar and special transmitters to produce interference frequencies designed to jam the enemy radar.

The night attack version of the *Skyraider* carries special radar equipment and provides accommodations for two additional crew members in the aft fuselage. Thus, the dive brakes are omitted but complete armament is carried. The aircraft can also be operated at night by the pilot alone, although his own short-range radar display requires close ground control of his operation.

An additional model, the AD-2Q (U) was developed for tow-target duties, adding another notch to the long belt of *Skyraider* missions.

The AD-3 model was originally studied as a possible version powered by the Wright R-3350-30W *Turbo Cyclone* compound engine but this proposal was abandoned in favor of continued production and use of the standard –26W model. The new model incorporated still further strengthening in the landing gear carry-through structure and, to further alleviate the landing difficulties, the landing gear oleo strut travel was increased from 10 in. to 14 in. to provide increased shock absorption. The cockpit enclosure and windshield were modified and an improved propeller fitted. A new tail wheel was designed and an emergency air system provided for the canopy.

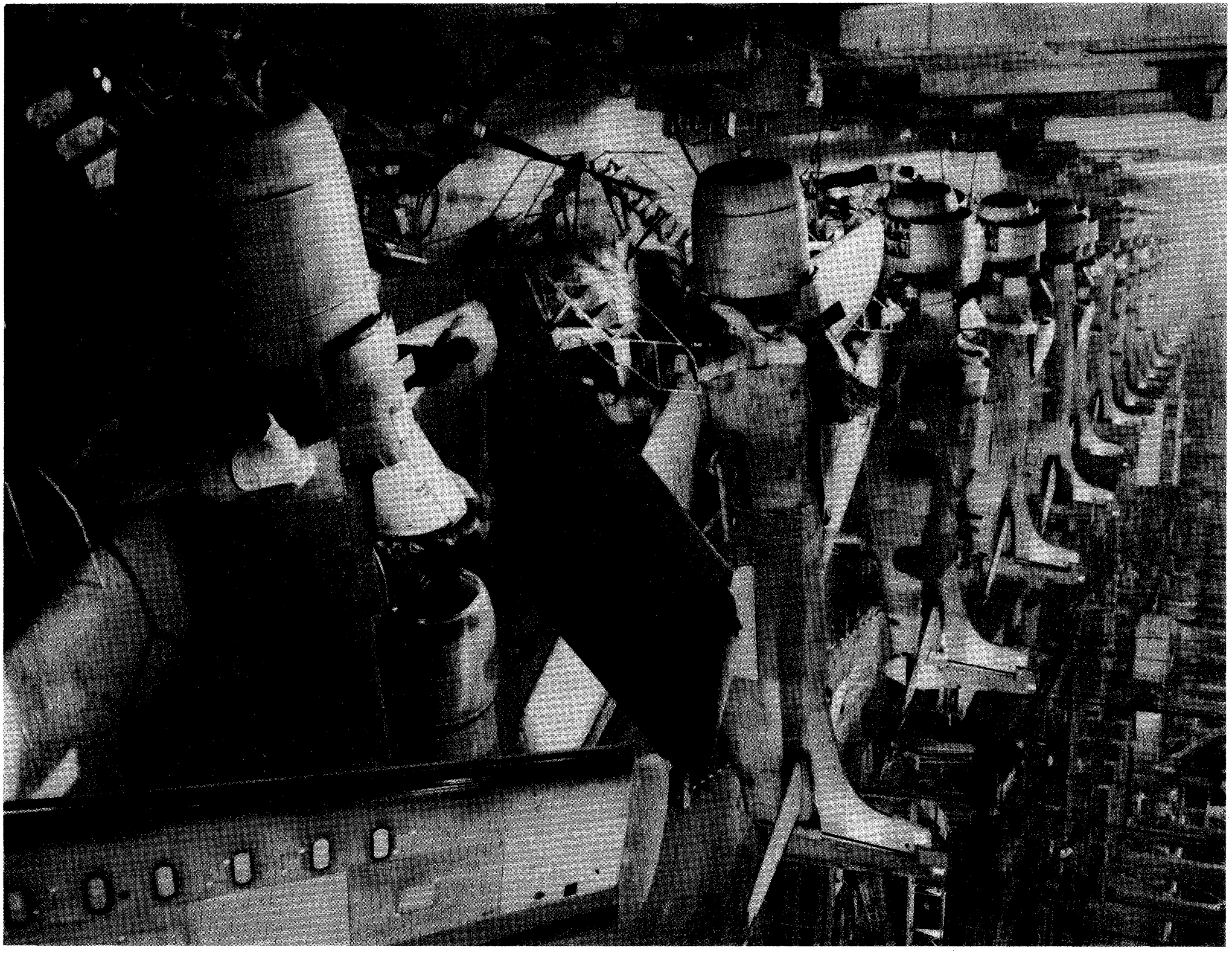
The AD-3 further added to the list of *Skyraider* missions by providing not only attack, search, countermeasure and night attack equipment but a specialized model equipped to serve as a weather scout plane through the use of special electronic gears. Two AD-3 planes were modified into AD-3E models and served as a prototype for the subsequent AD-4W model.

The AD-4 model emerged as the fully-developed airplane and brought an end to the structural strengthening program. It was equipped with the P-1 automatic pilot as standard equipment in all models and included new APS-19A radar equipment, the larger scope of which required relocation of instruments and design of a new instrument panel. The windshield was further improved and a modified arresting hook was fitted. The fiscal 1950 procurement program included a contract for 53 of the new models but the outbreak of hostilities in Korea resulted in a substantial increase in this quantity to several hundreds. All of the various multi-seat and special equipment versions of the preceding models are also present in the AD-4 model, including AD-4Q, AD-4W and AD-4N models.

Armament aboard the *Skyraider* includes every weapon ever carried aloft save the atomic bomb—and laymen are not certain it cannot carry even this weapon. Fixed armament is two 20mm cannon mounted in the wing center section at the wing fold line. This location provides complete access to the guns with wings folded, thereby removing the necessity for extensive access doors. The three pylons can accommodate either a 300-gal. fuel tank, an 11.75-in. *Tiny Tim* rocket, a 2000-lb. bomb, a 2150-lb. torpedo or such light stowage items as mines, depth charges, smoke tanks, searchlight, or packaged machine guns. The twelve small wing pylons accommodate either a dozen 5-in. HVAR or a dozen 250-lb. bombs.

The new AD-5 model brings full circle the development story of the single most versatile combat airplane ever created. It is, in essence, a basic airframe. To it may be applied any of a dozen special groups of equipment furnished in compact kit form for fleet installation. These include special radar equipment, countermeasure items, and the entire gamut of versions developed to date. In addition, the new AD-5 adds an emergency evacuation and litter function to the already long list of *Skyraider* capacities. Either ten passengers or four litter patients may be accommodated in the spacious aft fuselage. These are in addition to the new two-man, side-by-side flight crew located up front, which brings the radar operator and/or co-pilot up to the pilot's elbow. Thus, the new AD-5 provides an unique function for the peculiar problems of the Korean action and permits the swift transport of VIP's between carriers or ship-to-shore, permits rapid evacuation of wounded and/or sick personnel and *simultaneously* permits the airplane to carry out its rugged combat and special electronic missions with a quick-conversion capability rendering it the essence of utility in the combat zone.

There has been no front, no action and no day of the Korean war that the Douglas *Skyraider* has not been carrying the brunt of the sea-going attack against the enemy, working low-down directly against troops, tanks and ground installations while the more glamorous fighters spent their time upstairs. It has been a dirty job and one requiring guts and backbone—and that is precisely what the Douglas AD *Skyraider* has provided in Korea! END

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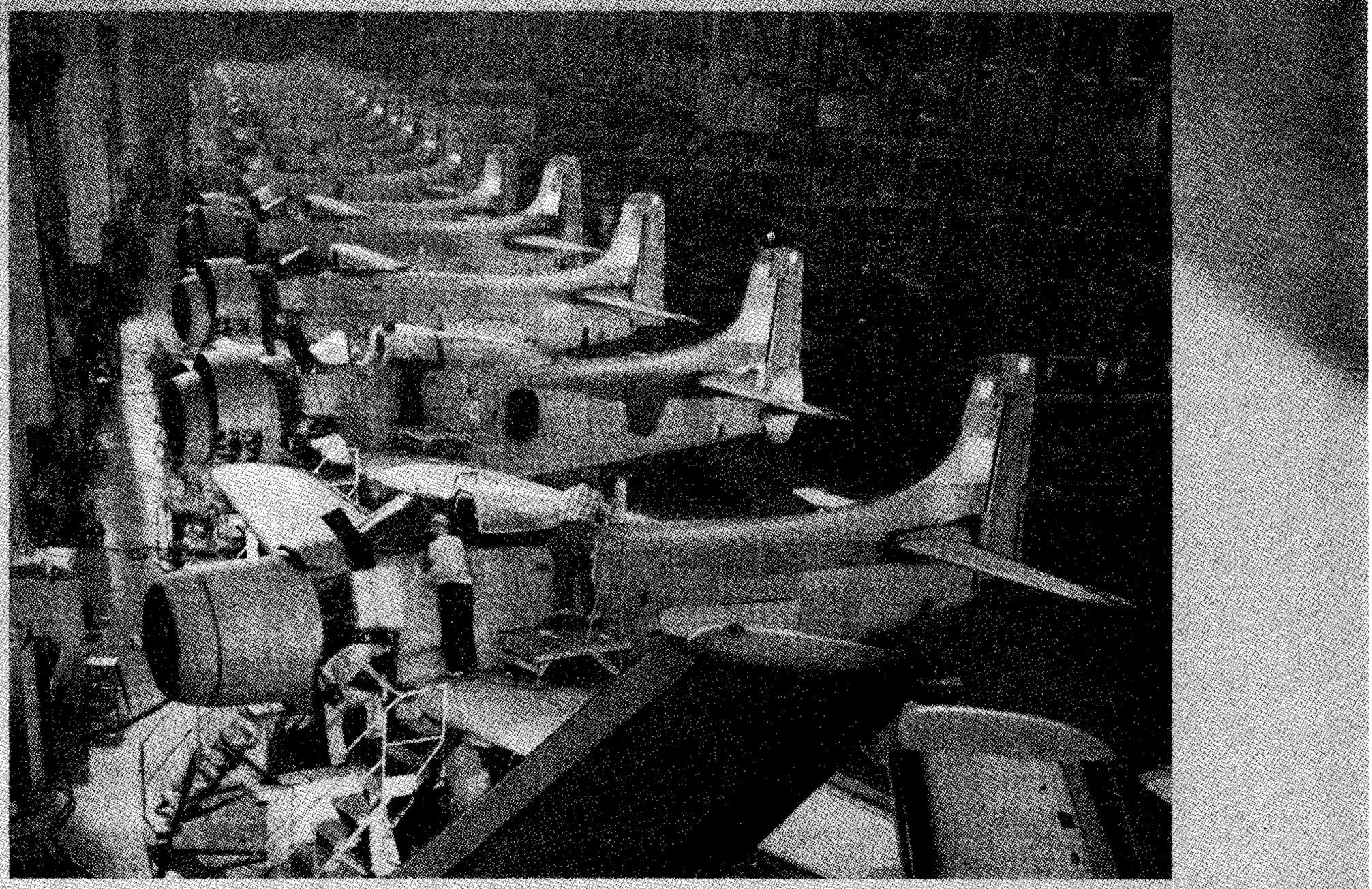

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Our SBD *Dauntless* dive-bombers, launched from U. S. carriers, turned the tide of victory at the Battle of Midway.

In Korea, Douglas AD *Skyraiders* provided effective tactical support for UN troops.

Now Douglas is meeting the expanding need for defense aircraft. Newest of the AD series, for example, is the A2D *Skyshark*, the world's most advanced turbo-prop attack bomber.

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