

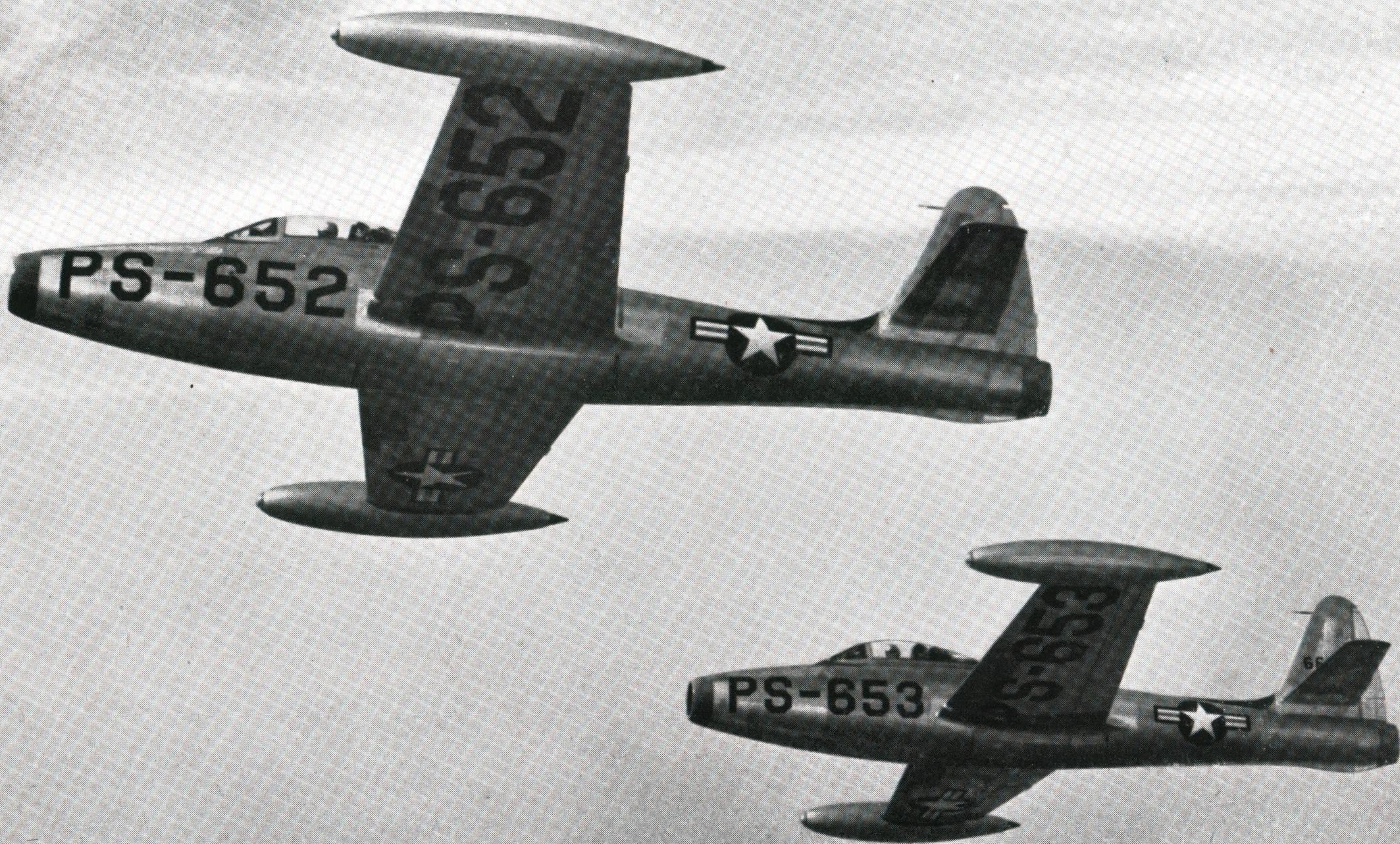
THE INTER



SERVICES

# AIRCRAFT RECOGNITION

*Journal*

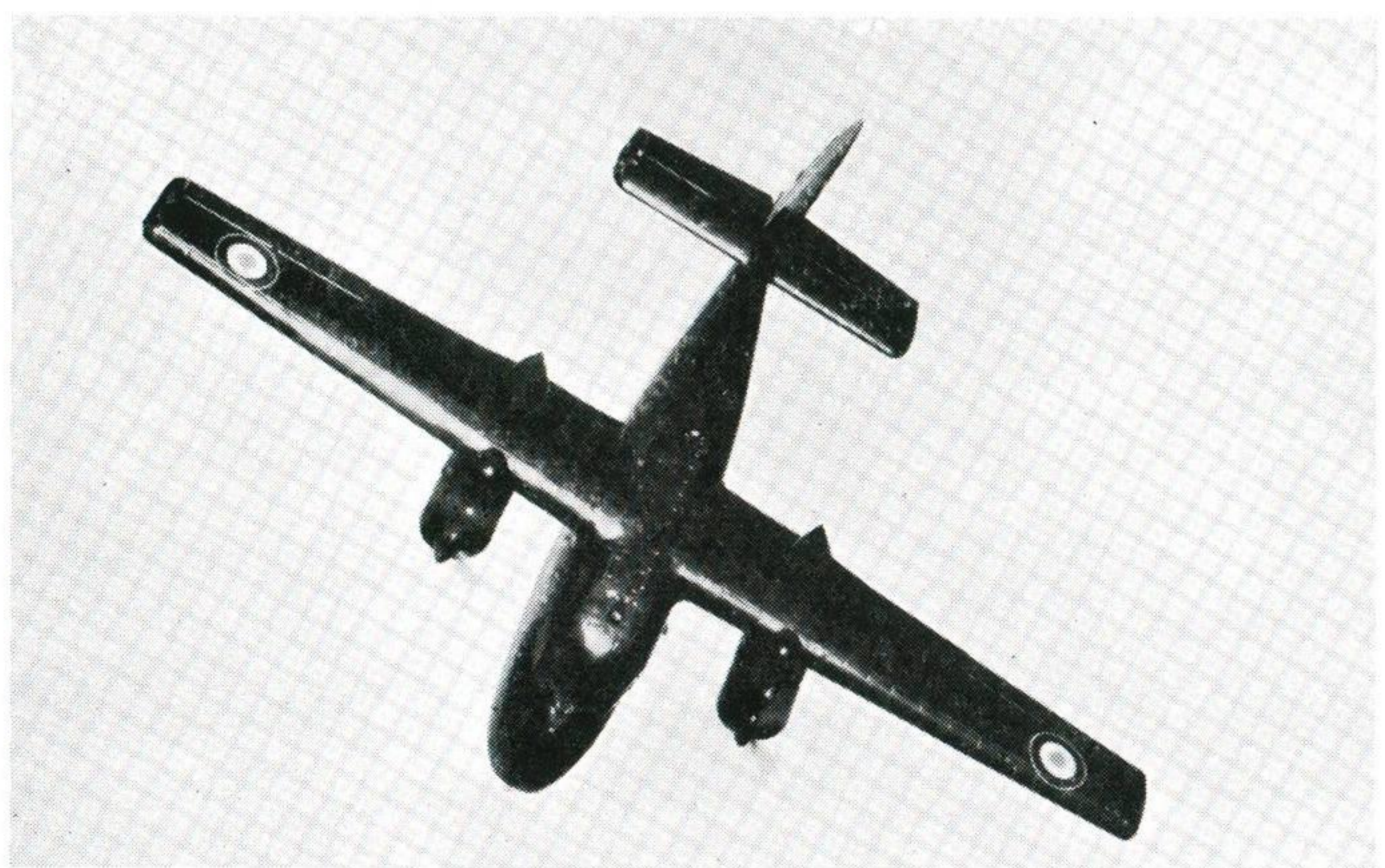
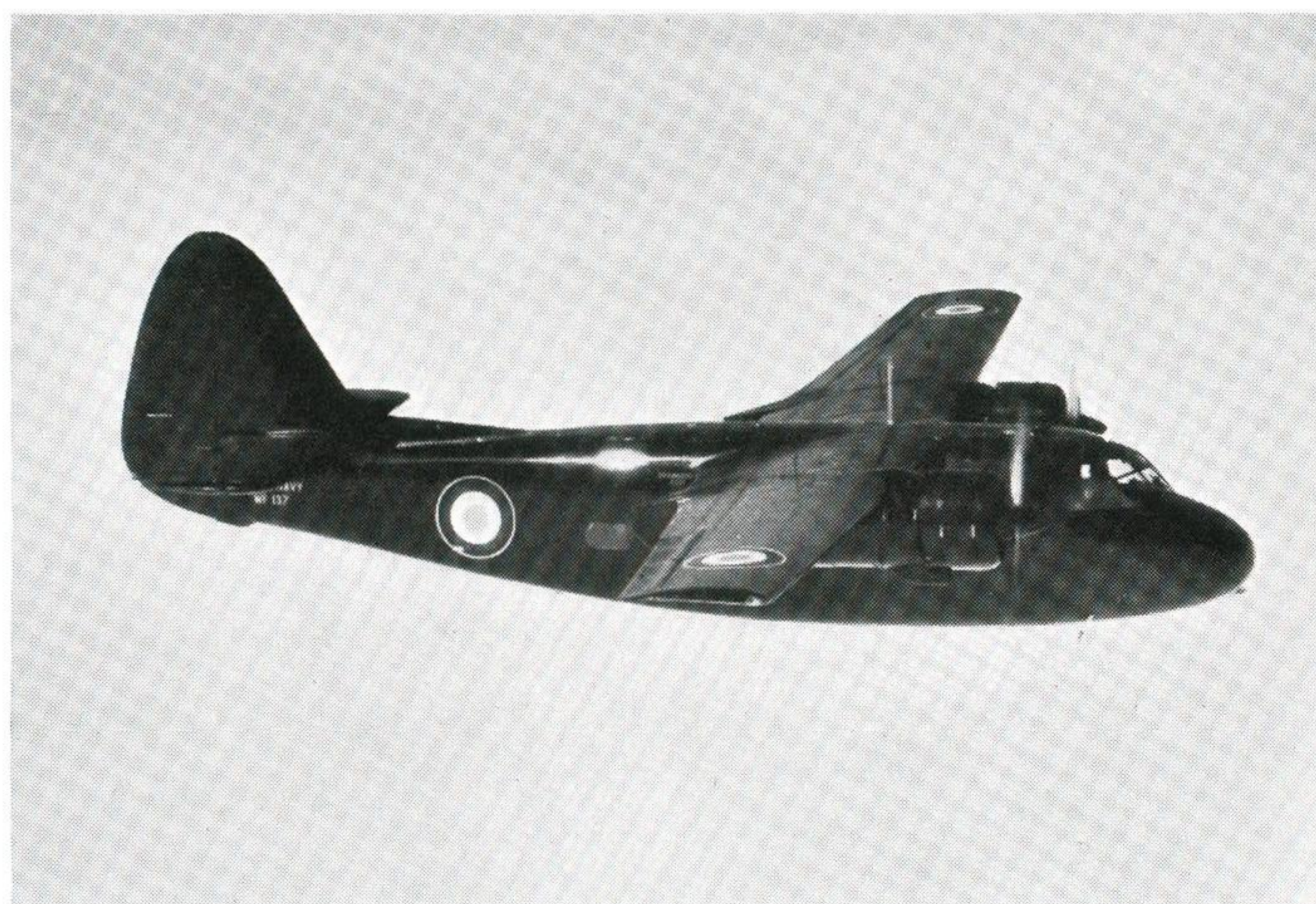
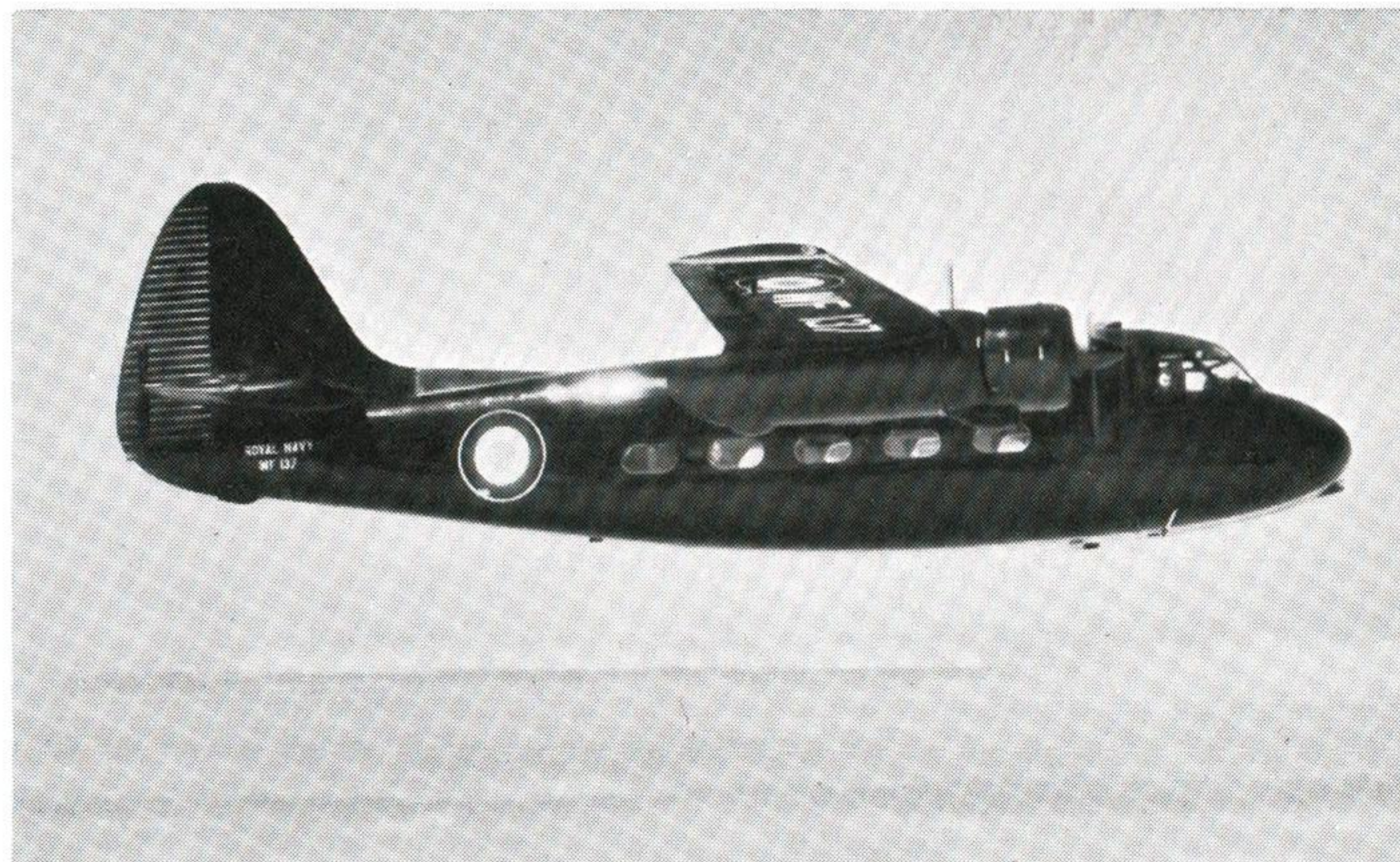
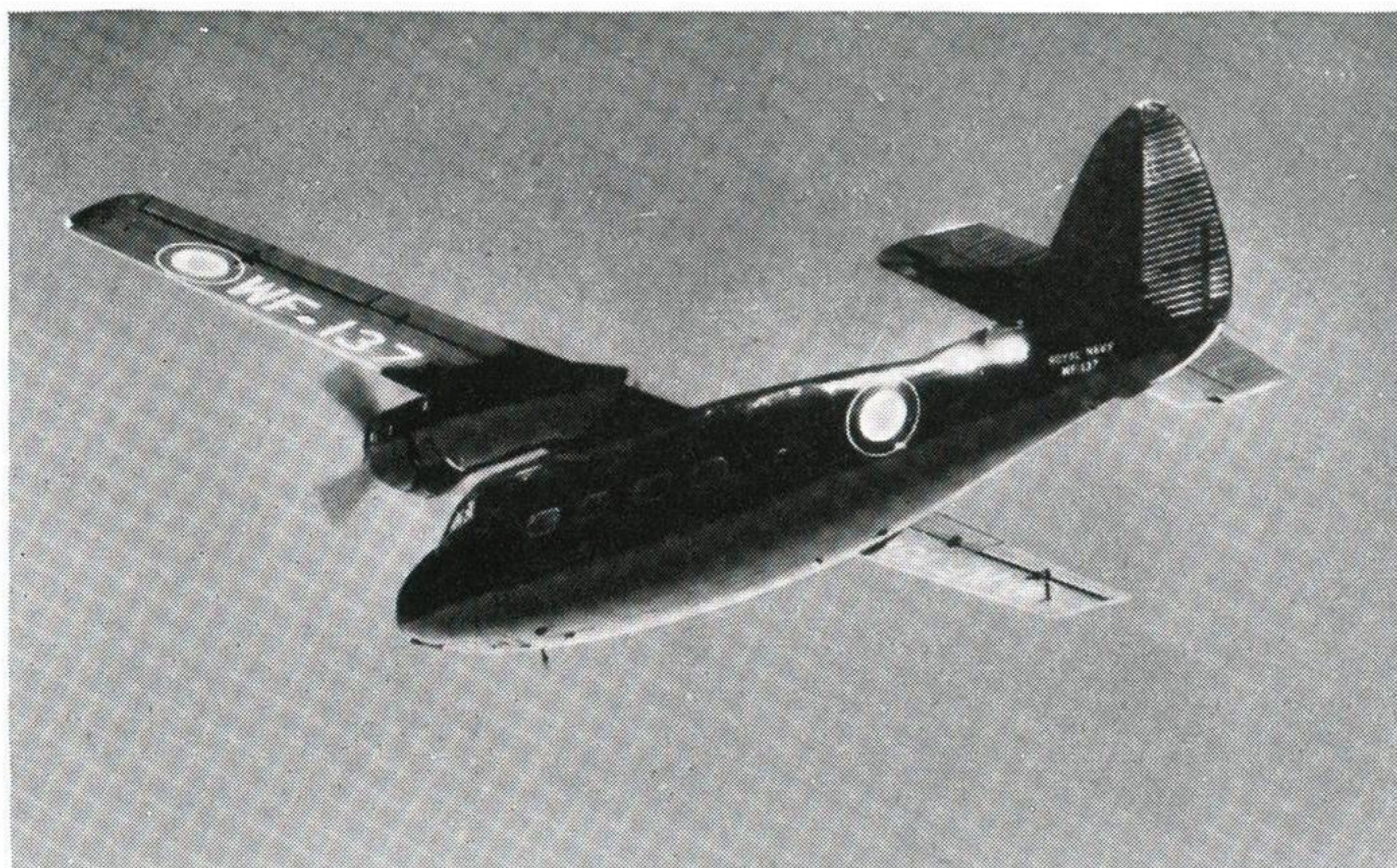


Vol. 5

NOVEMBER 1950

No. 2

# A PRINCE GOES TO SEA !

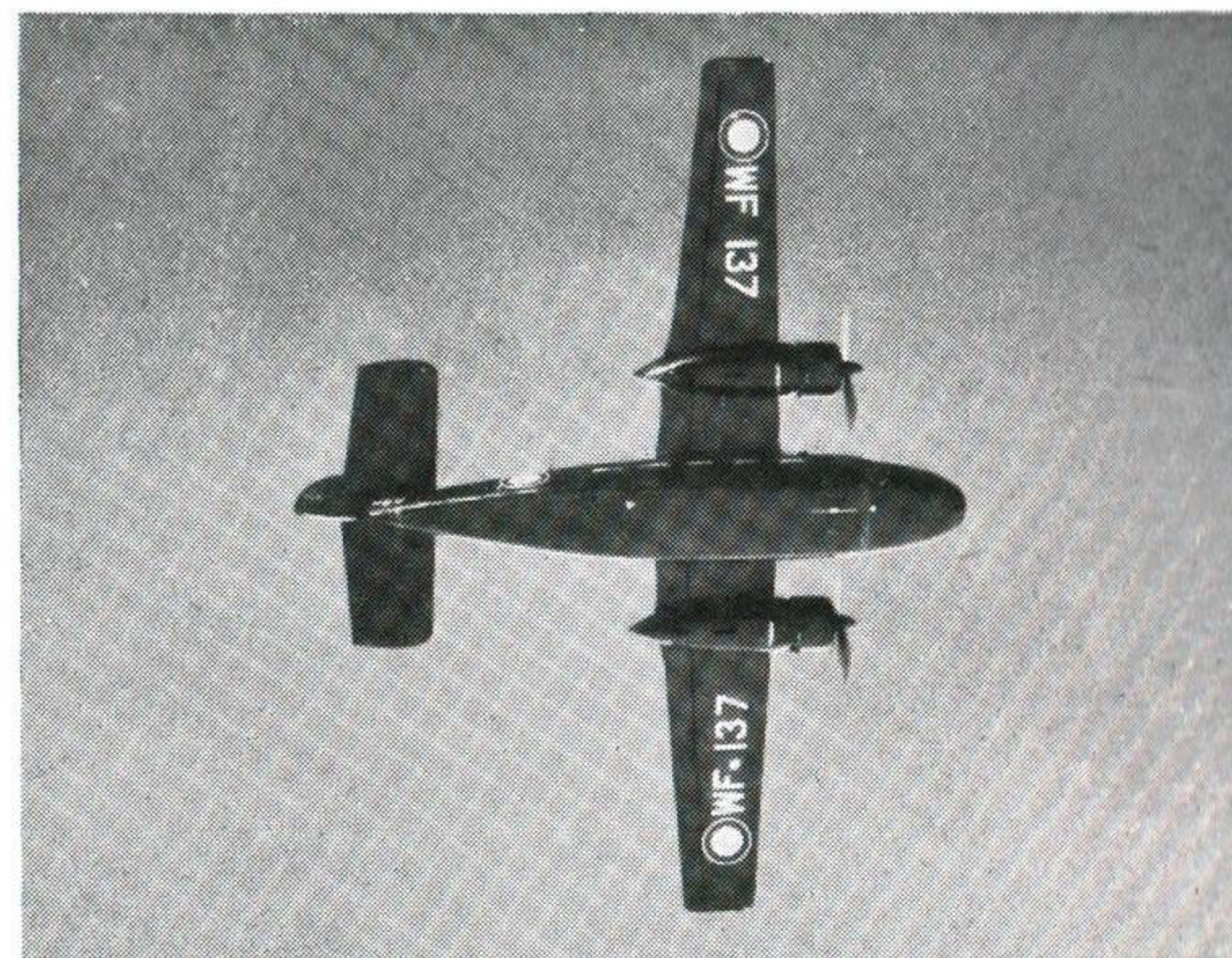


## PERCIVAL SEA PRINCE

(Two Alvis Leonides 501 radial engines)

**Admirals Barge ; or The Prince joins the Navy.** In its new uniform, of distinctive cut, it shows off its points well. The dominant feature is the "egg-shaped" fin and rudder, fin-faired and far beyond the tailplane. The high, narrow, near-rectangular wing supports the neat cylindrical radials close in to the deep roomy cabin. The best word occurring to us for overall description of the Sea Prince is "chubby." Readers will already be familiar with the Survey Prince (it has a very long perspex proboscis) and the feederliner Prince. A further trainer Prince is envisaged with a dorsal turret.

**Other Data** :—Span : 50 ft. Length : 42 ft. 10 ins.



THE INTER



SERVICES

## AIRCRAFT RECOGNITION JOURNAL

The Inter-Services Aircraft Recognition Journal is a monthly publication prepared and produced by the Assistant Chief of Air Staff (Training), Air Ministry, in collaboration with the Ministry of Supply—Controller of Supplies (Air)—Air Technical Publications. Contributions and correspondence should be addressed to the Editor, Inter-Services Aircraft Recognition Journal, Air Ministry, Room 405, Richmond Terrace, Whitehall, London, S.W.1.

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## MAKE THE MOST OF IT!

**T**HE QUALITY OF AIRCRAFT RECOGNITION TRAINING MATERIAL as used by British Forces is second to none ; it also enjoys a reputation for great accuracy. These facts speak for themselves, but they may also be judged from the number of requests for material from all parts of the World. The Armed Forces of many Nations are starting their own recognition training schemes based upon ours and upon the use of similar material. If weight of material means anything, there should be a very high standard of aircraft recognition within the Forces of the Western Democracies.

However, it is always a good plan to take stock and to ask oneself a few straight-from-the-shoulder questions. One such question might be—"Are we making the most of the magnificent material provided?" Another: "Do we tend to lose sight of the fact that it does not use itself? and that it must be *put* to use in many ways and as often as possible, if we are to train efficiently?" Do we think that sheer weight of static material can take the place of active training?

### New Tricks

This train of thought started when we were reading an article on the use of models—published elsewhere in this edition. Having been active in recognition training for more than a decade, we thought we knew most of the tricks of the trade. Some of the methods suggested in this article are refreshingly new. The author, incidentally, has had considerable experience of recognition training of one kind and another during the war and is still in action in this field. We feel, as he does, that in good hands the model can become extremely efficient,

forcing attention and thus positively training, as opposed to the sort of "take it or leave it" idea inherent in more static presentations.

We presented in last month's *Journal* a method of marrying illustration and three-view silhouettes together, thus forcing the student to construct the aeroplane within his own mind as he linked the third dimensional or angular view of the object with its basic shape. This is a method in which the material is made to work very efficiently.

### New Ideas

The thought train sped on. . . . Are there not other ways of using material by which it does more than invite the indifferent gaze of a student? We believe there are.

It is possible to over-train in peace-time. Everyone in every Service cannot know every potential target and be kept in tip-top recognition form. To attempt such a task would end in frustration and would be as bad as doing too little. On the other hand, too much time cannot be spent examining and perfecting training methods and the use of materials ; refining here, sharpening there, so that no matter how many targets may offer themselves for recognition, they can be carefully selected, and those who must know them can be briefed and readied in the shortest time.

We shall be very happy to hear from anyone with ideas for the greater practical efficiency of aircraft recognition training material. We shall be equally happy to endure the slings and arrow of any outraged instructor who feels that he is ahead of us.

# THE DEVELOPMENT OF RUSSIAN BOMBER DESIGNS

by L/Obs. DENYS J. VOADEN

SINCE THE MIDDLE 1920s, bomber development in Russia has followed conventional lines, but it seems possible that the amount of development work may not have been as great as in the U.K. or U.S.A. or France. Standardisation on a few types has always been the rule.

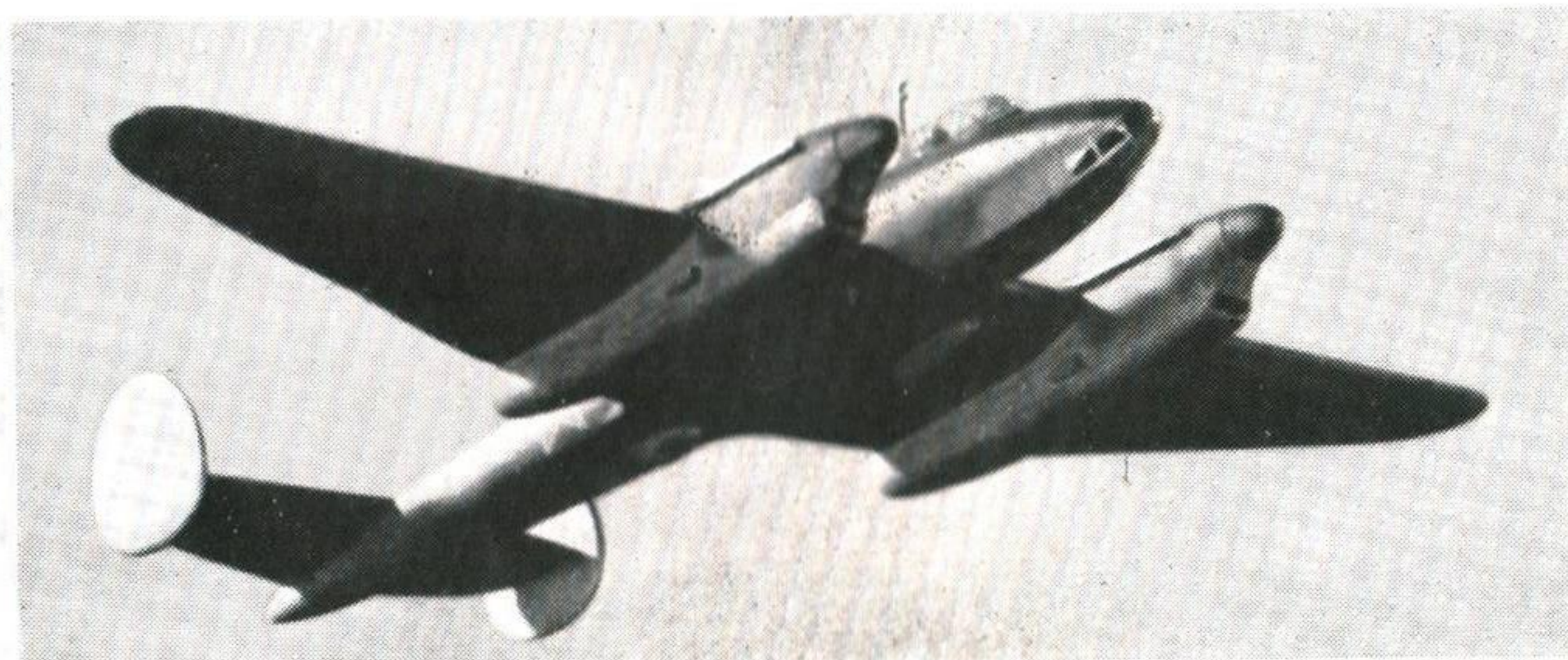
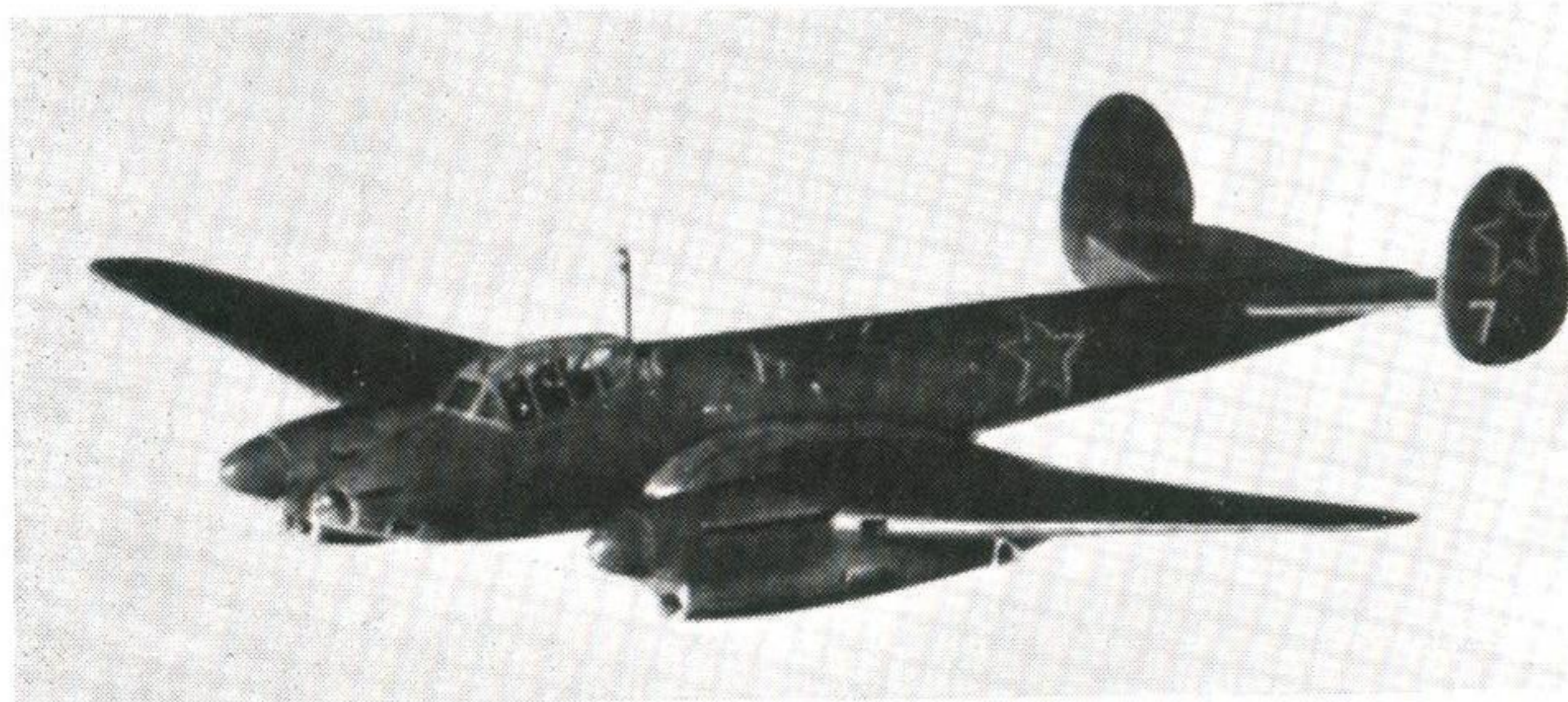
We must, however, look back to the beginning of World War I to see the real genesis of Russian bombing aviation. In 1913 Igor Sikorskii made his fine four-motor biplane "Le Grand", which had an enclosed cabin and many advanced features. By 1914 this had been developed into the bomber type "Ilya Murom'ets", of which 72 were built. Nearly all had four motors. These aeroplanes were of really high quality, considering the early period, and they flew many excellent missions on the Eastern Front, often successfully defending themselves against enemy fighters, as they had good defensive armament, including a tail gun position on some. How-

M-5 Vee motors, designated TB-1 (not to be confused with Tupolev's TB-1). The designer was Kolpakov.

As early as 1925, also, Tupolev produced the prototype of the A.N.T.4 which became the two-motor heavy bomber *monoplane* TB-1. This was a very advanced aeroplane for its day, and continued in use into the 1930s, and as the utility version G-1 and reconnaissance R-6, served even up to 1941.

The TB-2 was a clean-looking two-motor biplane design of N. N. Polikarpov, and had rear-firing guns in the nacelles. Probably not many were made, but it seems to have gone into series production.

Around the period 1928-1930 the Junkers factory in the U.S.S.R. was producing the K-30 three-motor bomber monoplane with corrugated dural covering and a ventral machine gunner's "dust bin". It differed in detail from the Swedish-built K-30.



Petlyakov PE-2

ever, their fate at the time of the October Revolution is at present obscure, and there is only scanty record of their use by the Reds. Some were certainly destroyed to avoid capture by the Germans.

However, the IMs were supported in the First World War almost entirely by foreign-designed bombers. The Whites in 1918 for example, had some Voisin "Avions de Bombardement"—pusher biplanes—probably remnants of the Imperial Russian Air Service.

A few of the World War I bombers equipped the aviation detachments under the RKKA in the period 1918-1920. Among them are recorded the DH-4 and DH-9 captured from the Whites.

In the period before the Soviet aviation industry got under way, types such as the Caudron G.III were bought from abroad.

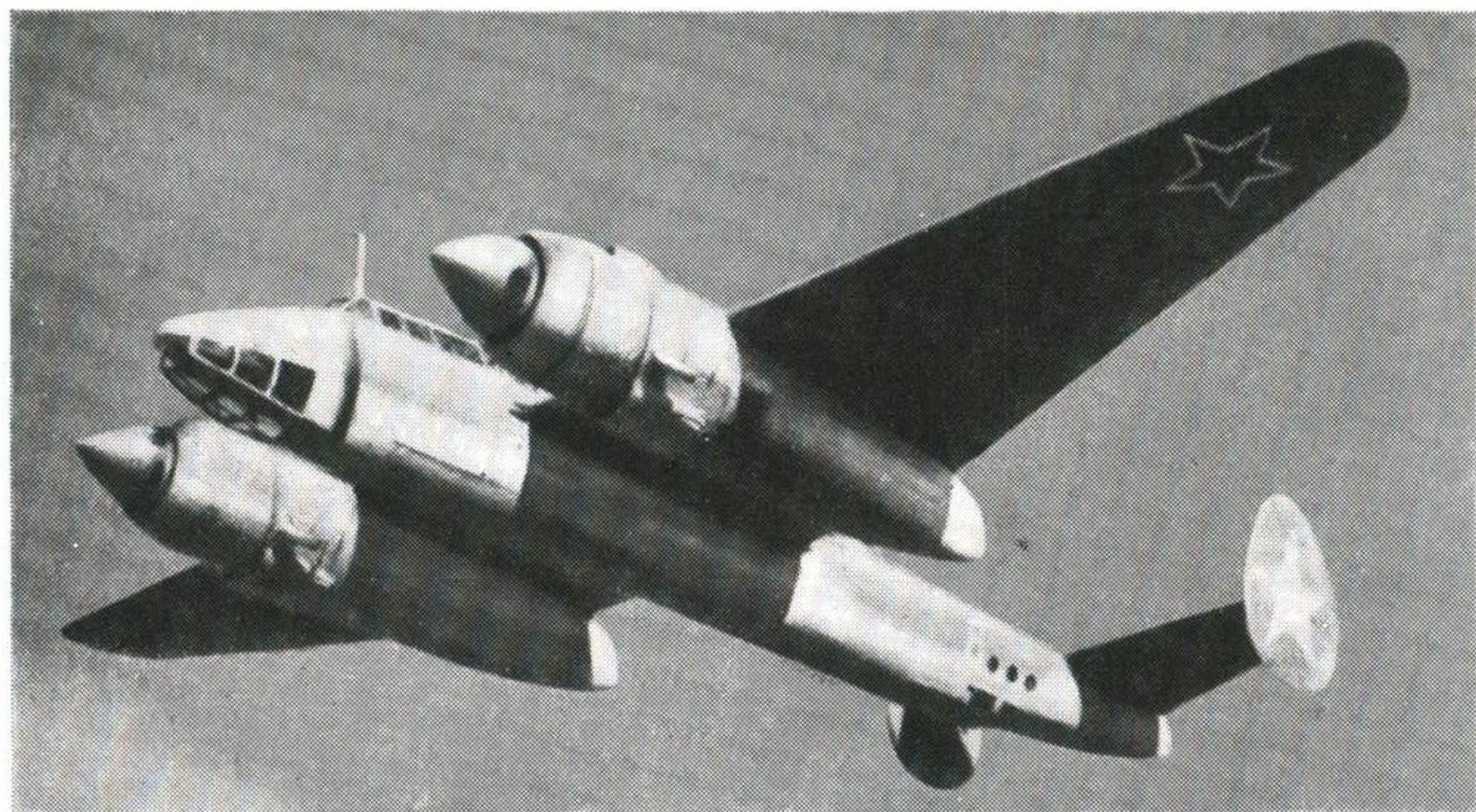
From about 1925 onward the R-1 was built in quantity. This was a reconnaissance aeroplane, and a copy of the British DH-9A. Over 2,500 were built and later they were used as trainers.

Rather more specialised bombers soon appeared. In 1925 there appeared a heavy biplane bomber with two

One of the most familiar of the "between-wars" Russian aircraft must be Tupolev's TB-3. The prototype (A.N.T. 6) of this huge four-motor monoplane was flown in 1930 by Mikhail Gromov, and the advanced date is worthy of special note. Many examples of the TB-3 were produced. It had a large bomb capacity and a long range. It was well-armed (believed four double machine-guns) but was very slow. Later it was used as the G-2 utility version, which served as a paratroop trainer and as a troop and supplies transport. Some flew into the North Rumanian provinces in 1940 with light tanks fastened between the undercarriage legs. As late as 1942 the G-2 was in use on the Eastern Front.

When the TB-1 and TB-3 had formed the backbone of the Soviet Union's strategic bombing force, more attention was paid to lighter bombers. Already the R series of light reconnaissance aeroplanes, especially the R-5 and LR had done some work as assault bombers. And in about 1930/33, two heavy "shturmoviki" were built by Grigorovich.

However, it was Tupolev again, with the assistance of A. A. Arkhangel'skii, who produced the famous SB series of medium bombers. The SB-2 was the principal



**Tupolev TU-2**

early version, and it had "Vee" motors with car-type radiators. It was used in Spain, Finland, China and in the Great Patriotic War. Versions with more powerful liquid-cooled motors in normal cowlings were the SB-2 bis and SB-3; the latter was a standard medium bomber in 1941-45.

The long range bomber DB-3 was developed by Il'yushin in about 1937 and the later versions DB-3F and IL-4 are well known. The DB-3F was the only two-motor Russian bomber suitable for long-range attacks during the Great Patriotic War.

On a smaller scale, it was assisted by the Ye R-2 and Ye R-4 of V. G. Yermolaev, and Lend-Lease acquisitions which were used in some numbers included the A-20, and B-25 and a few Hampdens. Some B-25s are even now (1950) still in use.

To replace the TB-3 and reconstitute the strategic air arm, the design seized upon was the TB-7 (later PE-8) of V. M. Petlyakov (perhaps assisted by Tupolev). This four-motor giant was used only in relatively small numbers, however, and it too was later relegated to the rôle of transport.

The well-known PE-2, IL-2 and IL-10, together with the smaller series of SU-2 and YAK-4, rendered much valuable close-support work in 1941-1945.

The study so far of Russian bombers shows us little that is unusual in the designs themselves, and it is possible that initial advances such as the early building of the TB-1 and TB-3 were nullified by over-standardisation. We should, however, note the doctrine which after about 1933/34 abandoned the mass production of heavy



**Tupolev TU-4**

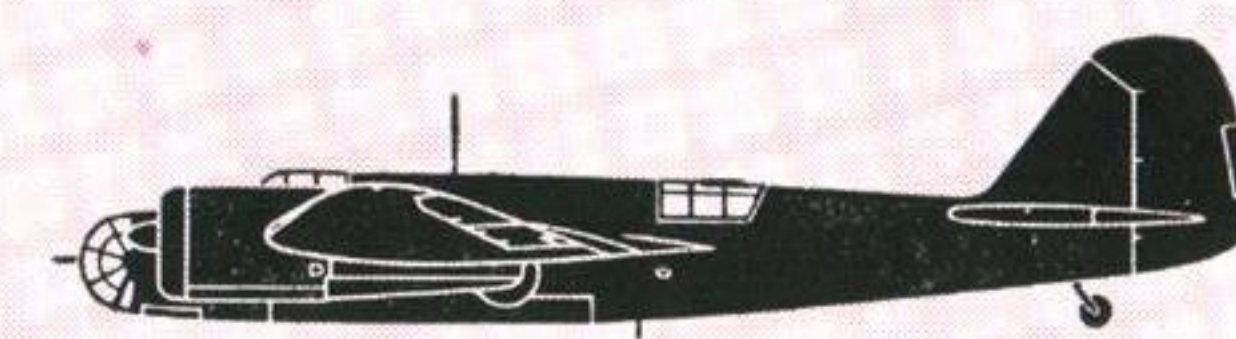
bombers in favour of tactical types. At that time, and indeed until 1945, the Soviet Union could not afford to build enough bombers of all types to have both an army support and a long-range striking force.

But now we must examine the post-war production of aircraft, and especially of bombers in the U.S.S.R. Many PE-8s are said to be still in service, but since 1945 they have been supplemented by copies of the Boeing B-29, which is apparently designated TU-4. There appears to be no external difference between the TU-4 and the B-29.

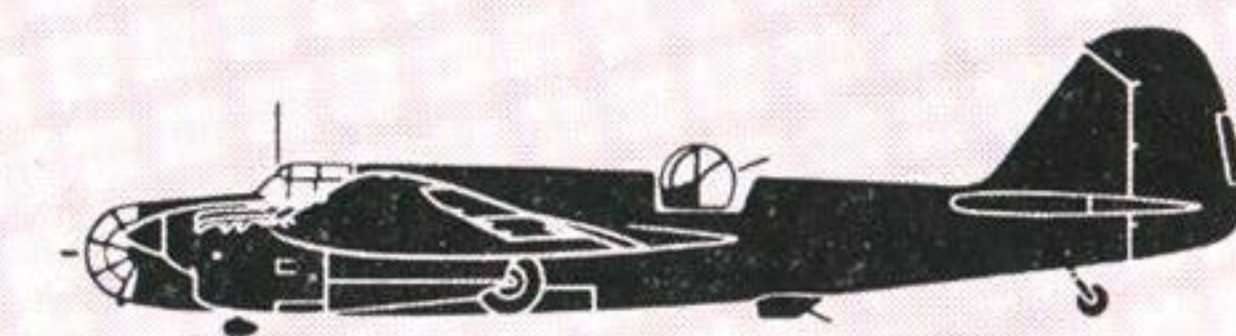
The lighter bombers in these post-war days are still represented by the IL-10 and TU-2, both of which have often been described in this *Journal*. But a consideration of the very latest Russian bombers cannot exclude jet designs.

Since 1947 various prototype twin and four-jet bombers have been reported as being flown in displays over Moscow, and in the May Day Parade this year one twin-jet bomber was reported in the Russian Press to have been flown in numbers.

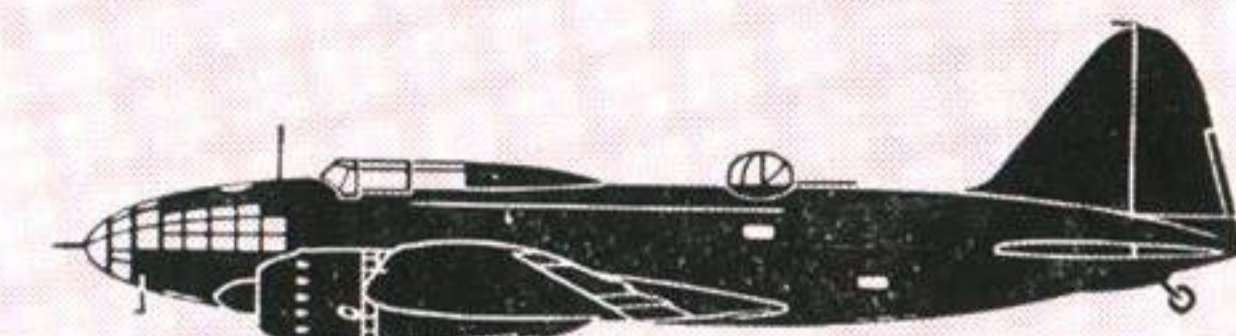
At the present time the backbone of the Soviet Bomber Force is the TU-4, supplemented in the tactical role by the ubiquitous TU-2. Although the PE-2s and IL-10s are obsolescent, or even obsolete by Western standards, they probably still have a part to play in the close-bombing support of the Russian ground forces. Time alone will show (Russian censorship permitting) how successful the Soviet will be in bringing jet-bombers into service.



SB-2



SB-2 bis



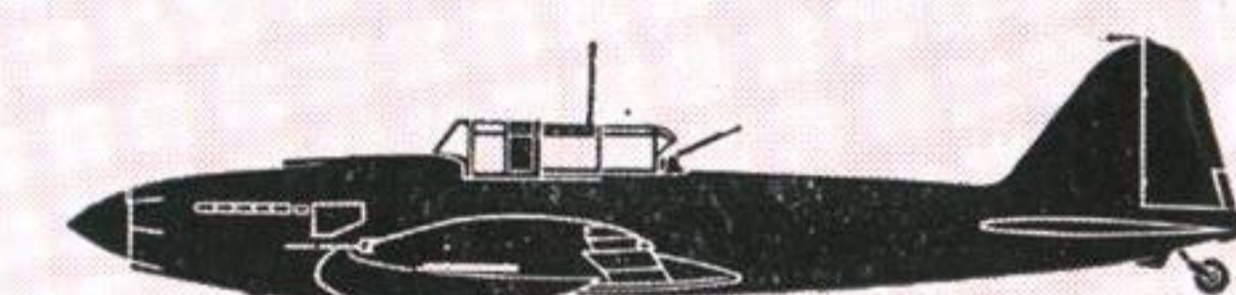
IL-4



Douglas A-20



North American B-25



IL-2



YAK-4



TU-2



PE-2



IL-10



PE-8



TU-4

# CHARACTER STUDY

## No. 9—F-80 Shooting Star

**T**HIS is a nosy and inquisitive American fighter, searching, peering and prying about the sky. It might be appropriately dubbed with a newly arrived Americanism and called a "nosy-poke". The long smooth snout, with its tip about to twitch any minute like a rabbit's, sets the main visual character of the whole machine.

The F-80 is a low-wing aircraft and its main planes, nearly equi-tapered, are bold broad surfaces set well amidships. This wing position is very significant as it gives an almost see-saw balance to the whole structure. Aircrew and observers would be well advised to forget the wing-tip drop tanks as much as possible. This may sound difficult, but with so many aircraft now carrying them—and often *not* carrying them—it is essential to discount these excrescences at all times as recognition features. The eye and mind can be trained to do this quite efficiently. There is moderate dihedral which of course tends to straighten up the leading edge for under approach views. At the roots there are fillets at the trailing edge and their equivalents meeting the jet intakes on the leading edge. Collectively these fillets give a specially bulky feeling amidships from nearly every view.

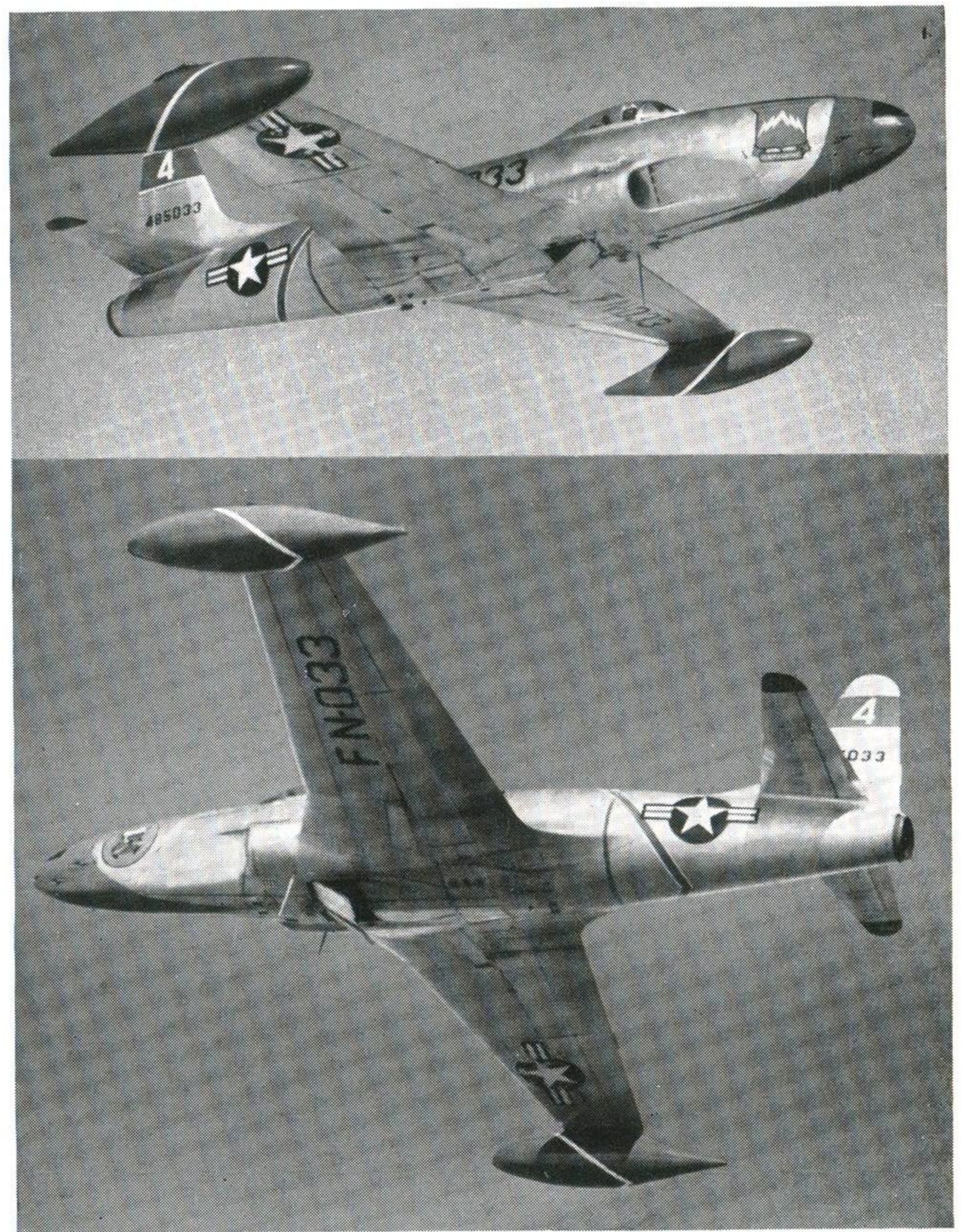
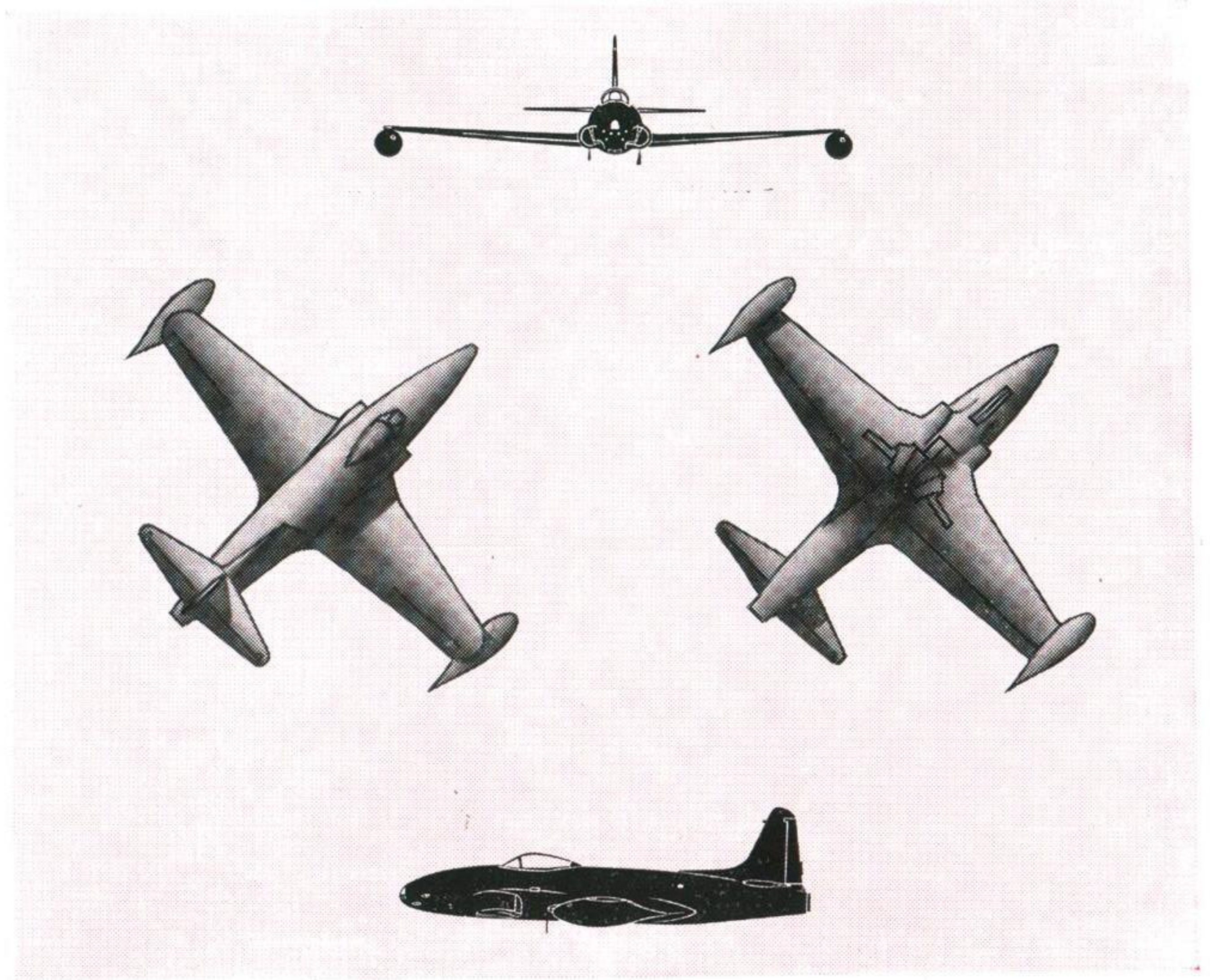
The fuselage is a rather strange shape. Of chief importance is its long reach forward of the wings, the main determining feature of the whole shape. From the side it is a rather nondescript, deep structure with top and bottom lines parallel. The sniffing, inquisitive look of the nose is helped by the greater sweep-down on the top. But from above or below the fuselage takes on quite a different feeling. The broad spread of wings amidships accentuates the sharp wedge-like look of the nose as it sweeps forward to a point in front of the jet intakes. Rearwards it is stumpy and sawn-off. This curious feeling is only apparent from directly below or above as any other view shows up the depth of the fuselage and re-establishes the aircraft's more normal appearance.

Owing to the jet intakes gaping to either side of the fuselage and merging with the wings, the head-on view is of a spreading and bulky body between substantial wing shapes.

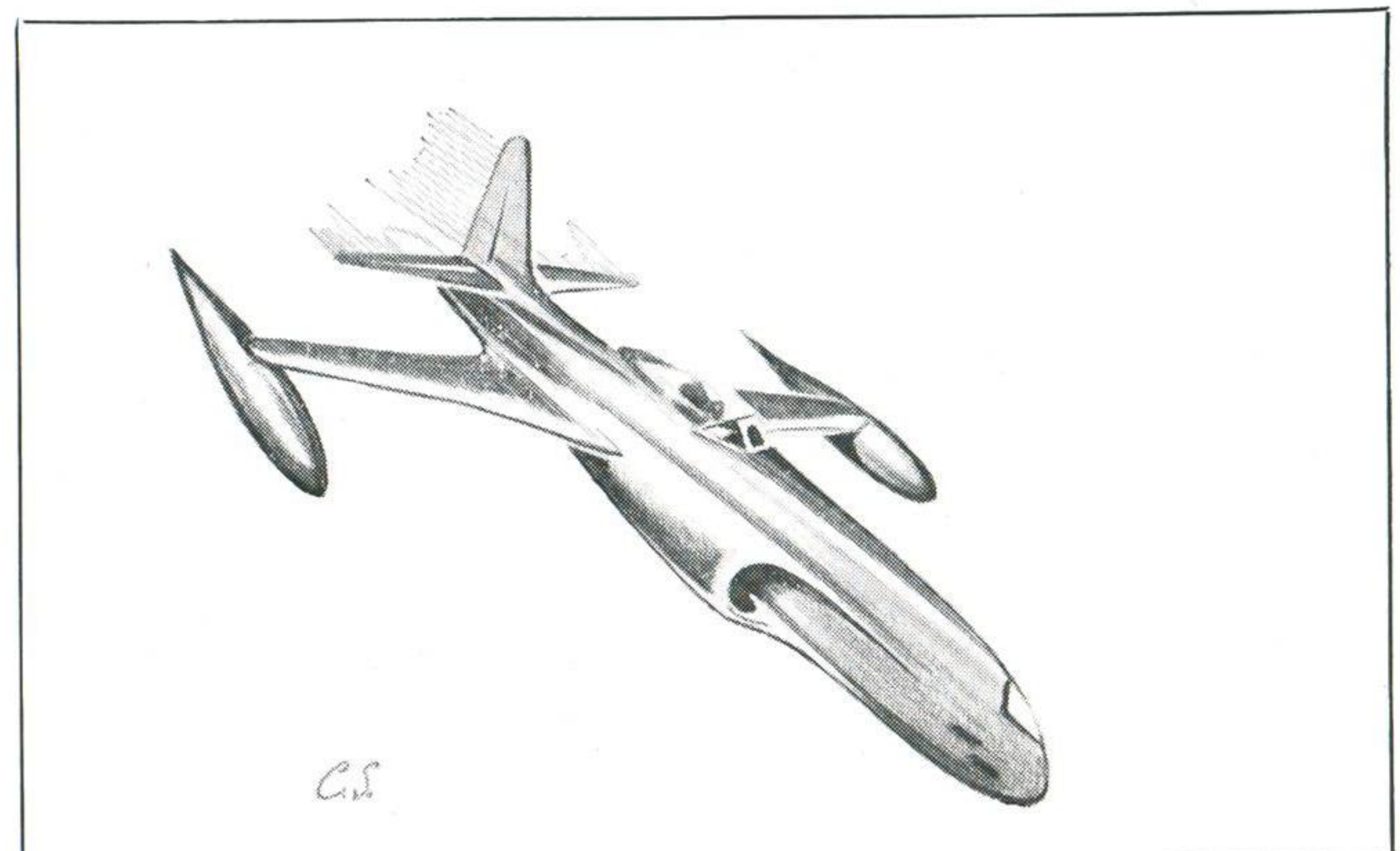
The fin and rudder combine is upstanding, perky and undistinguished, with the top sloping sharply down rearwards. Tailplane has pronounced taper to narrow rounded tips. Special note should be taken visually of its nearness to the main planes, and the way in which this relationship forces the nose into still greater prominence.

The F-80 first flew in 1944 and is standard equipment with the United States Air Force. It is to be seen in considerable numbers in this country. The maker is Lockheed; its origin the U.S.A. Span 38 ft. 10 ins. Length 34 ft. 6 ins. Maximum speed is over 600 m.p.h. There is a photo-reconnaissance version—the T-33.

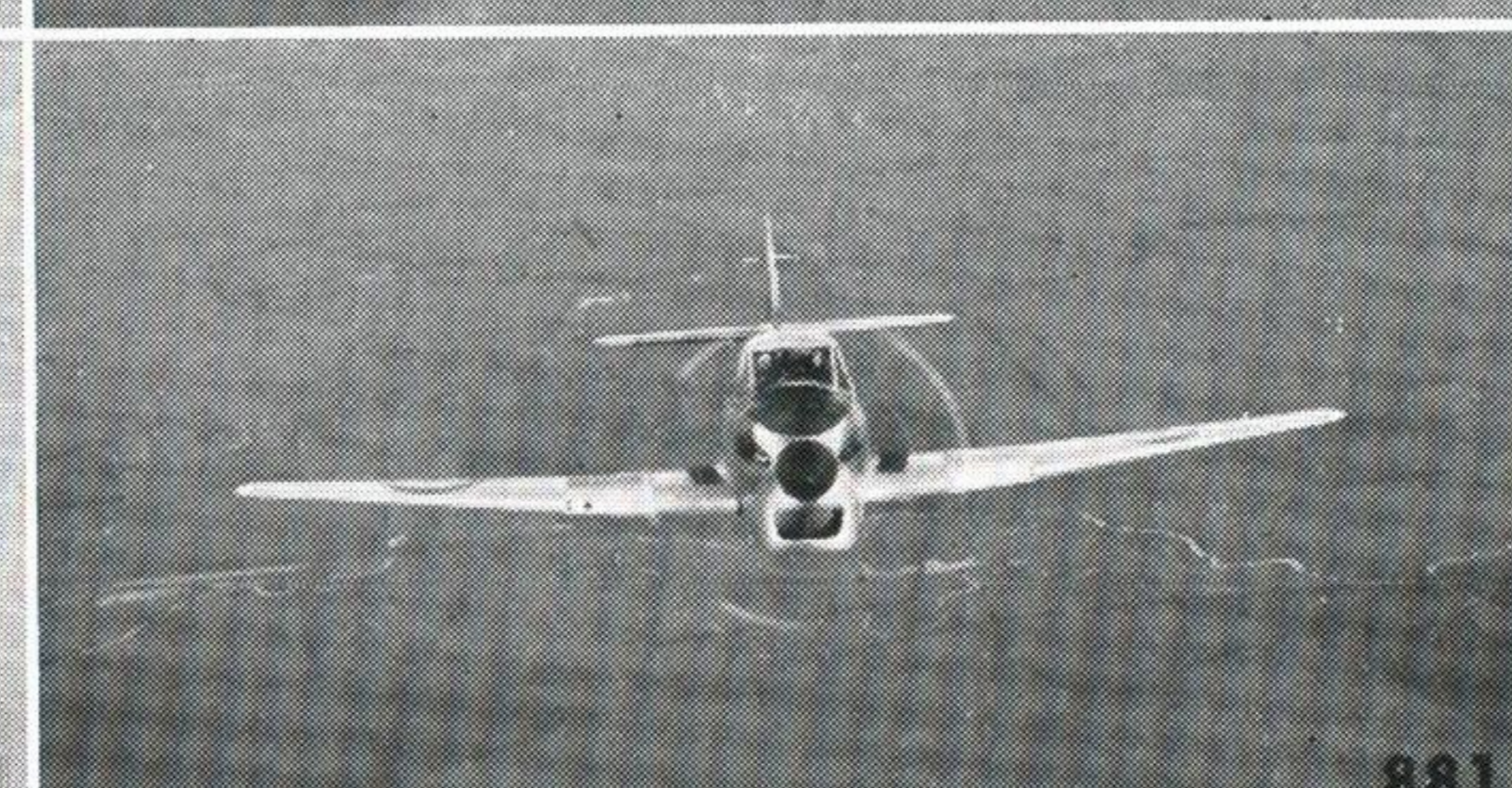
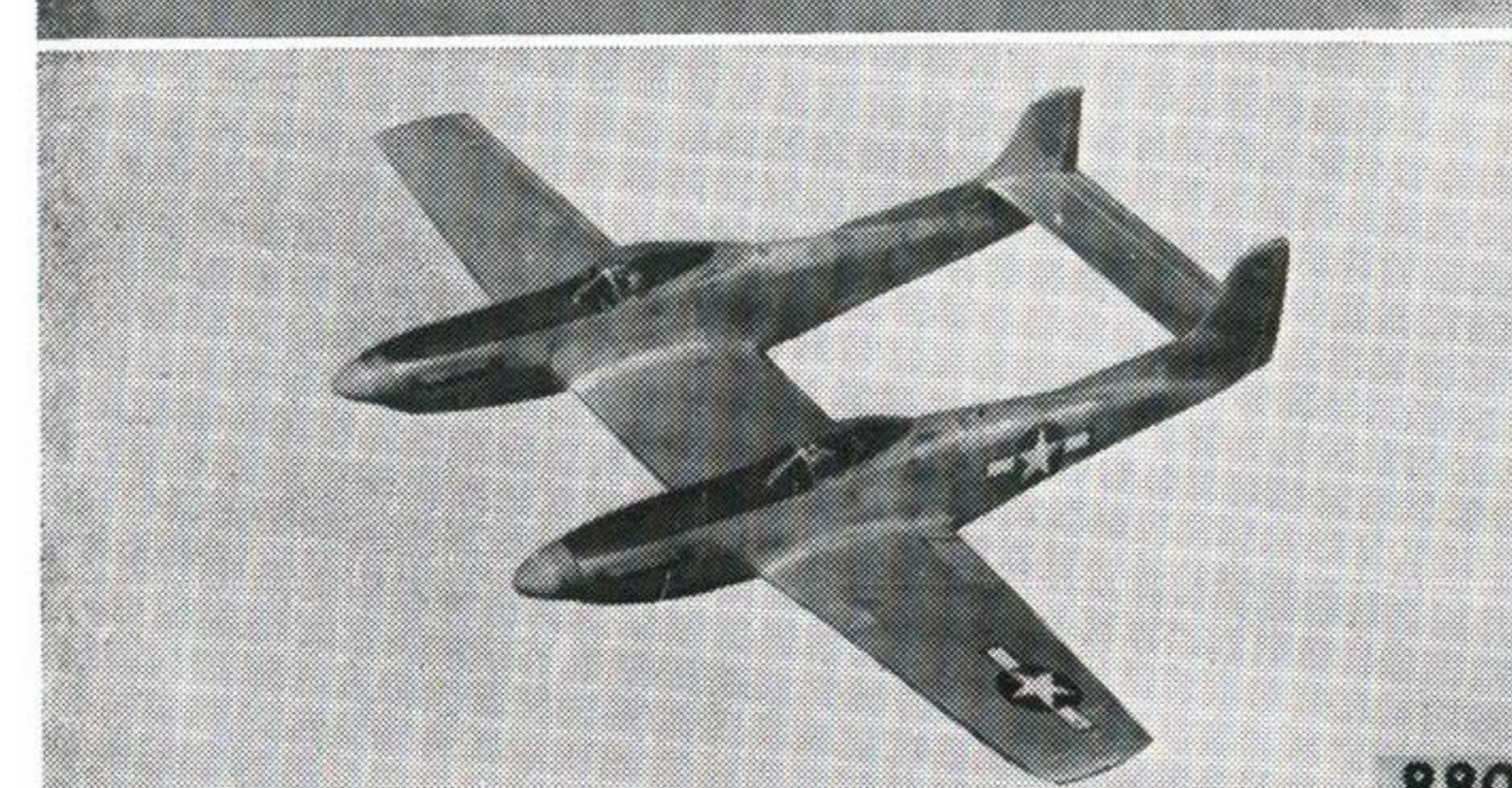
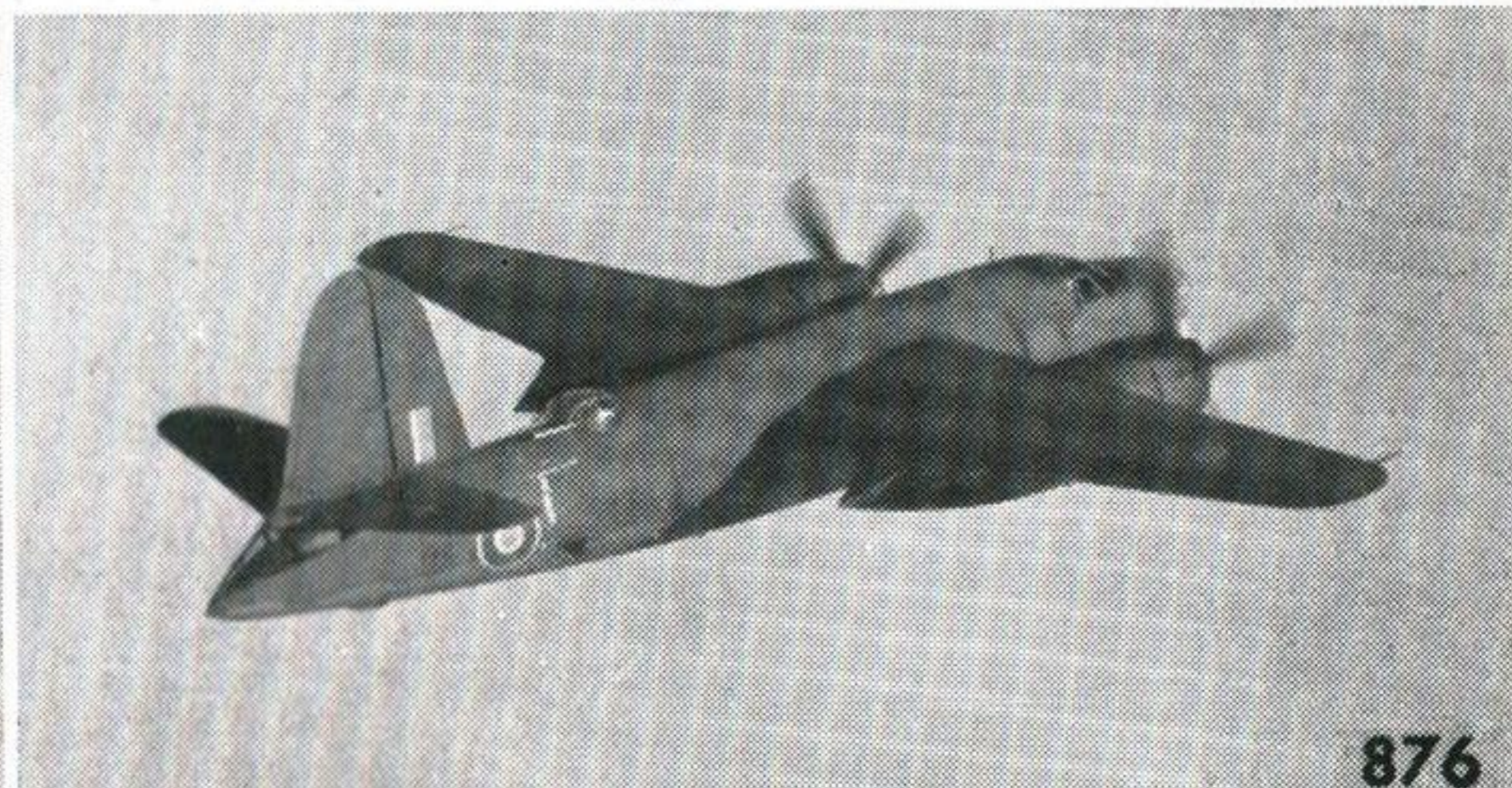
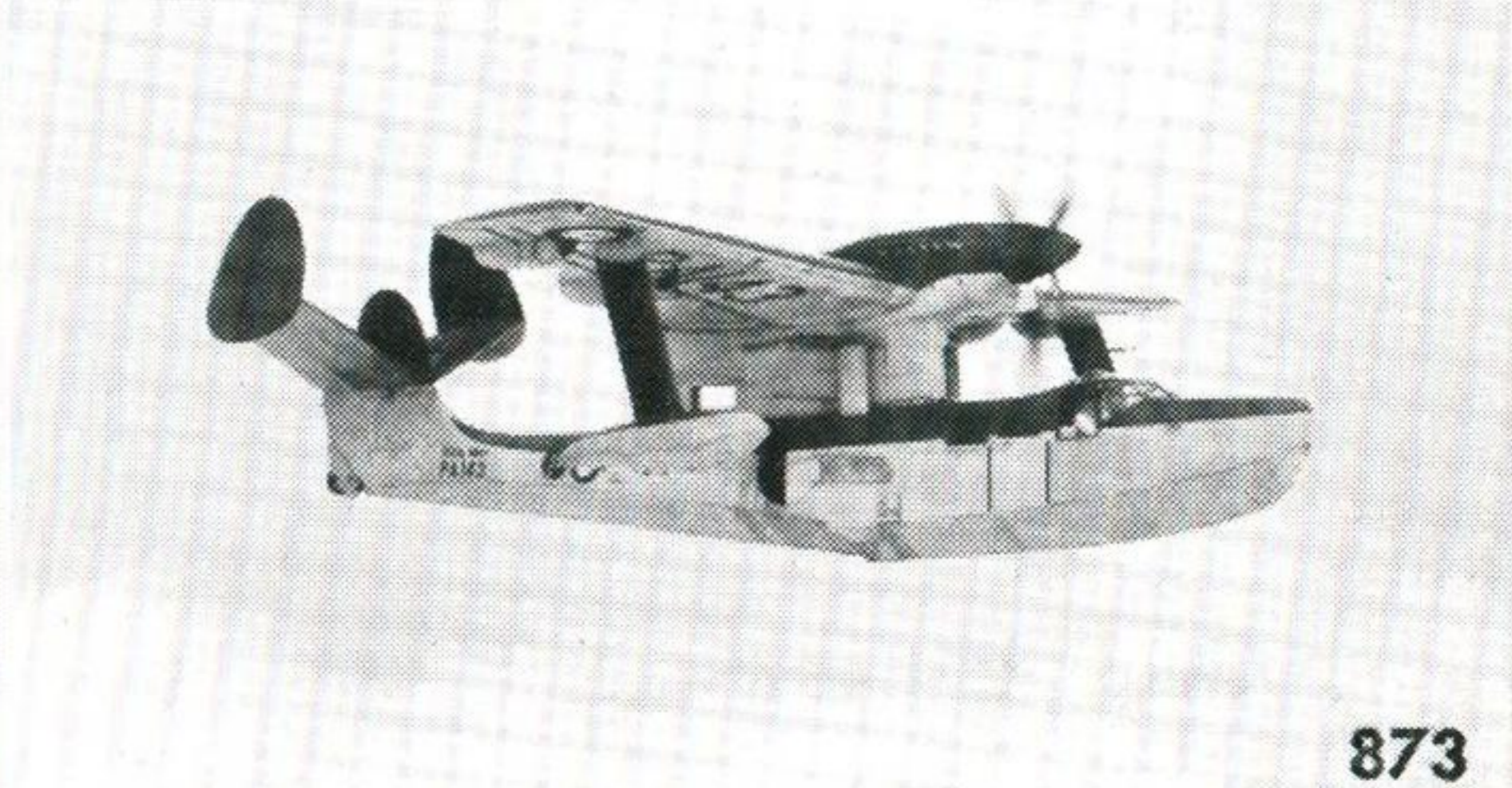
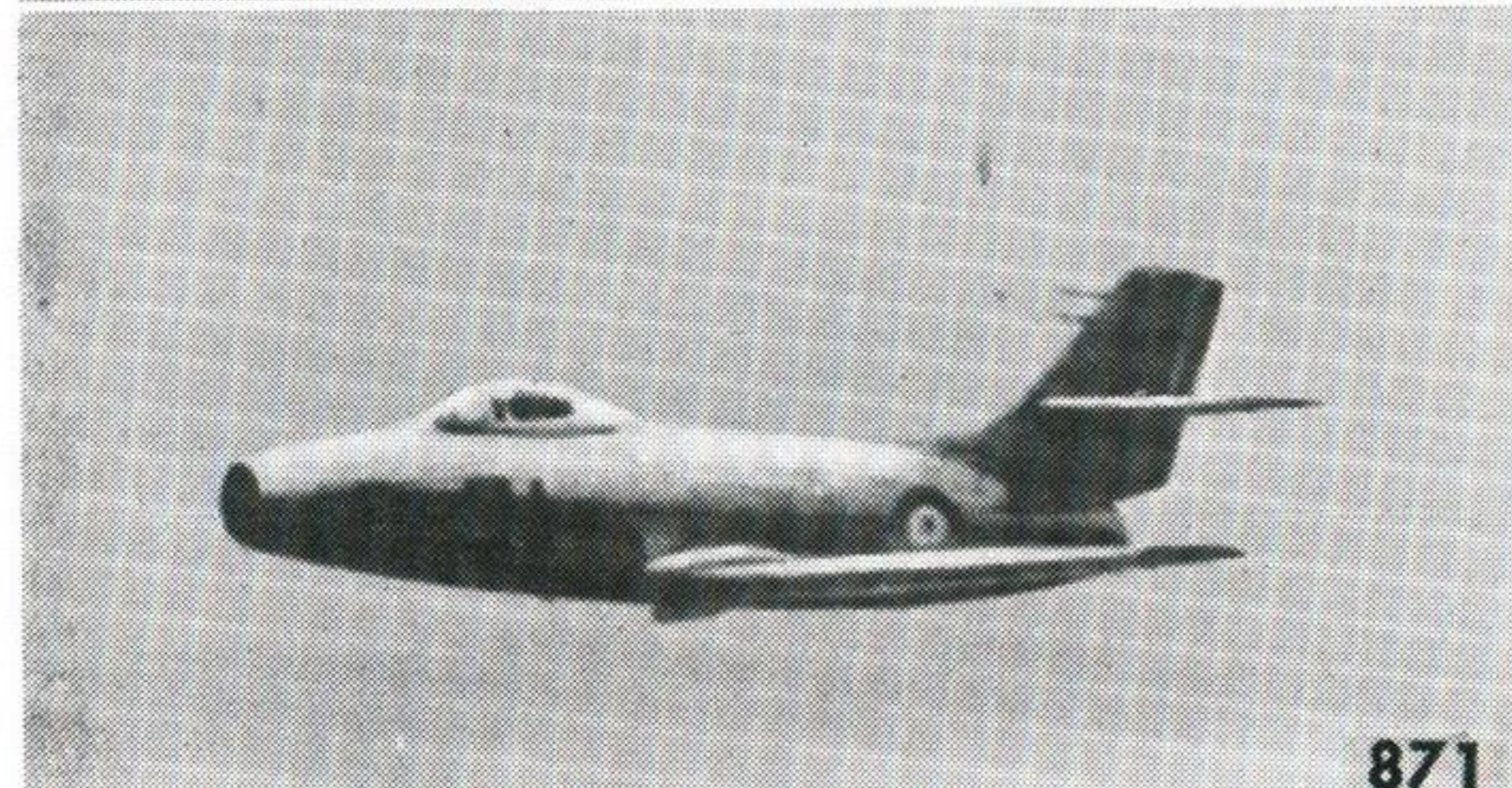
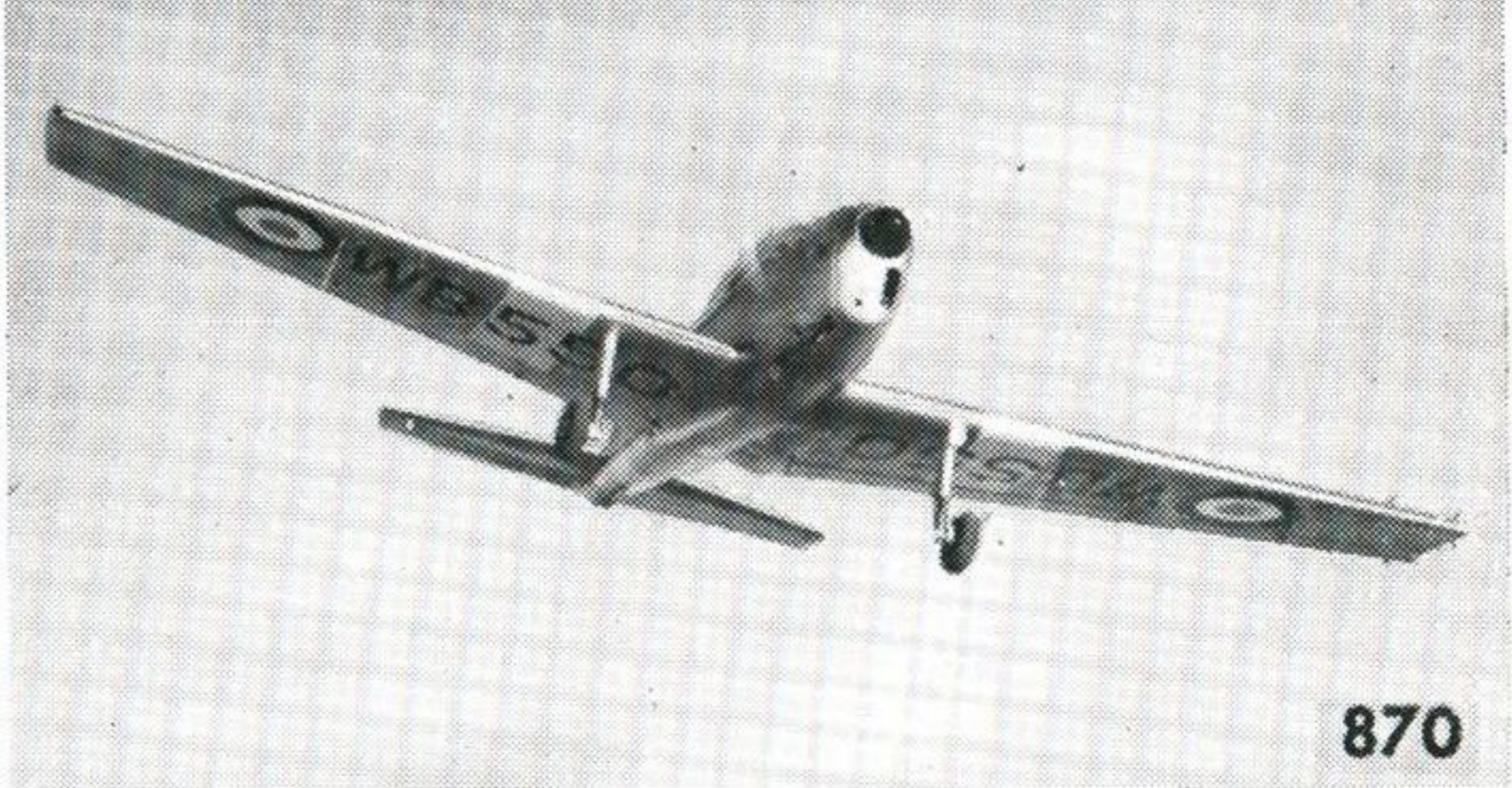
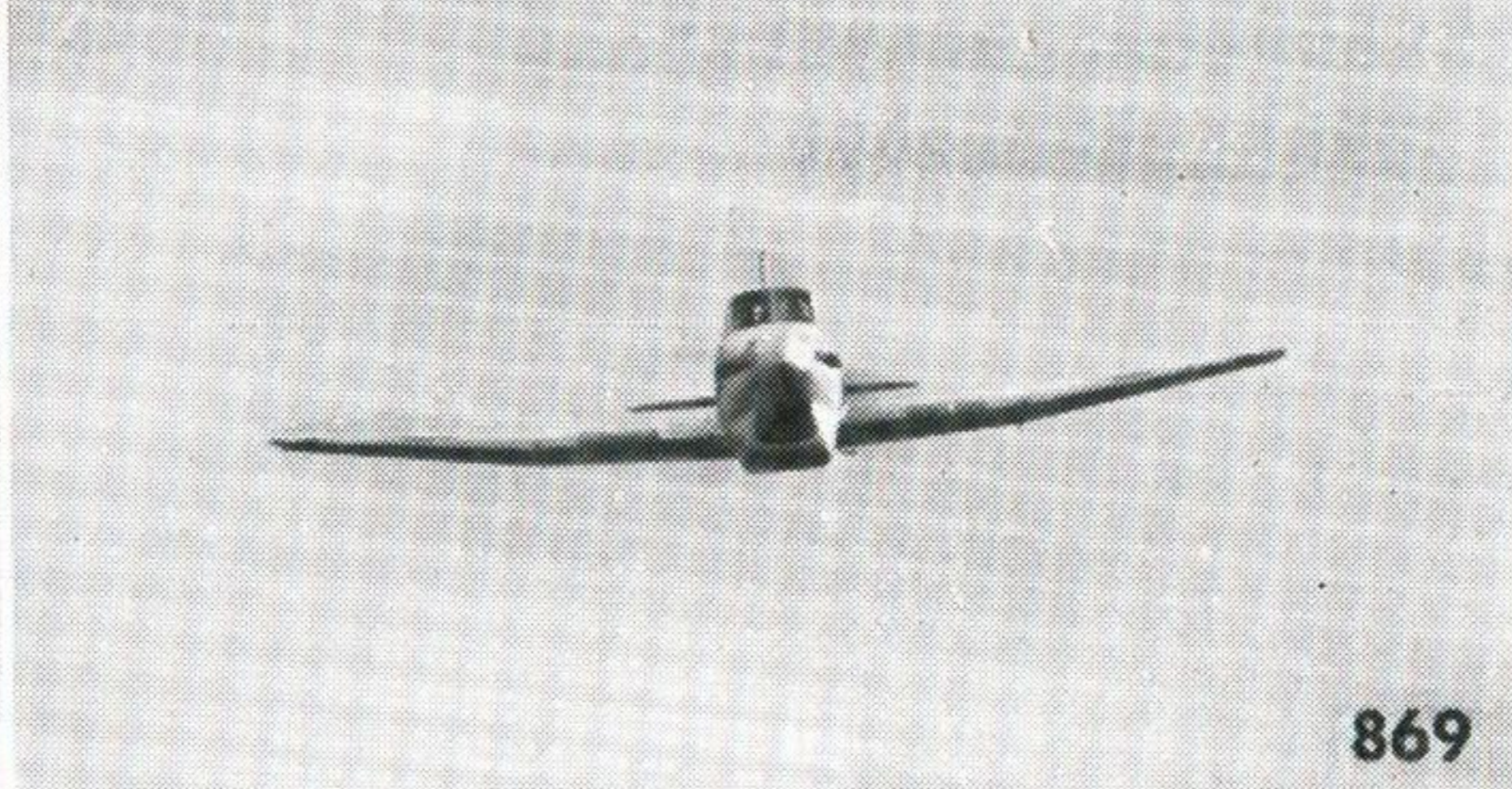
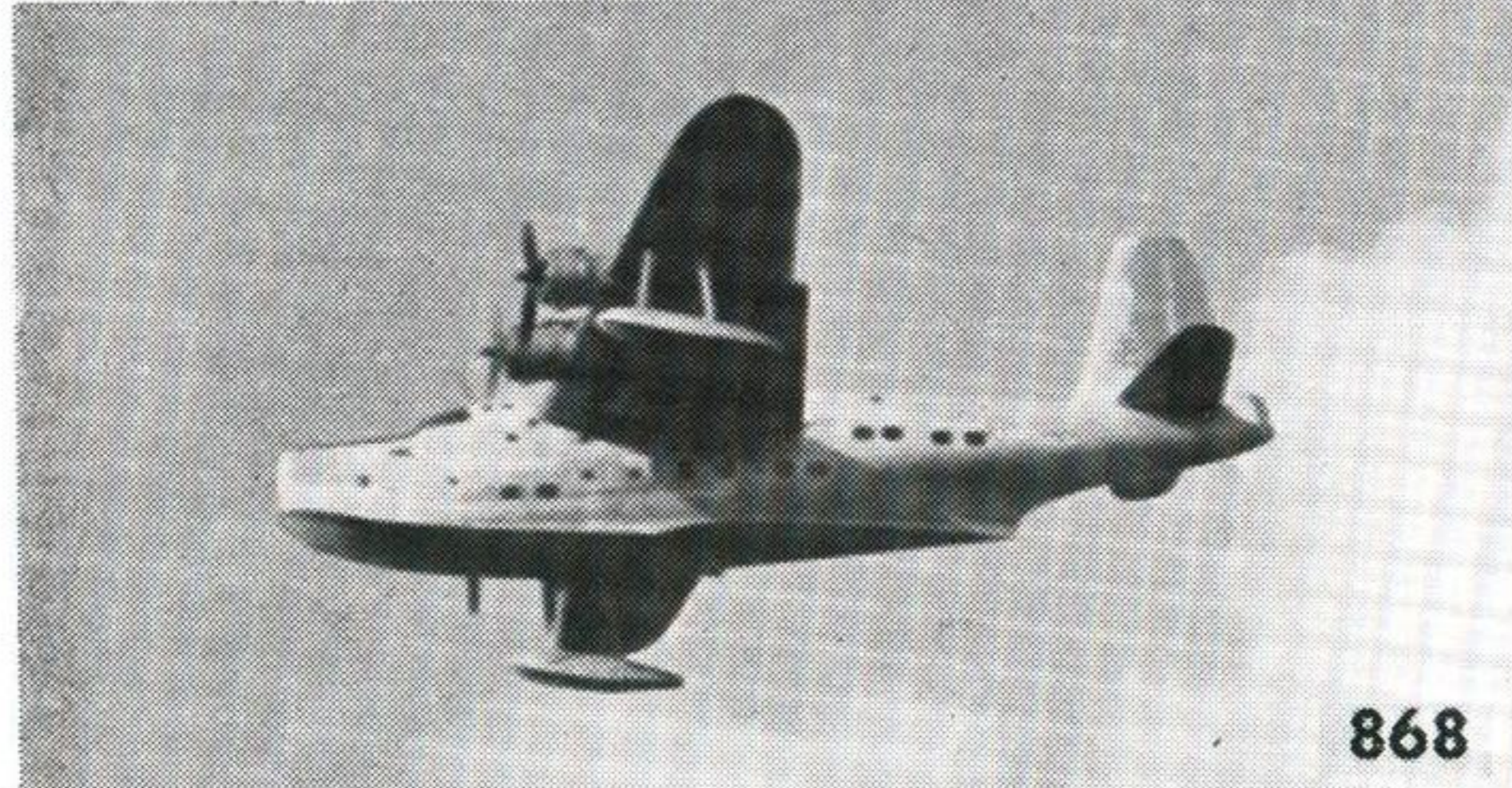
C. H. GIBBS-SMITH



.. "nosey poke"



# ELEMENTARY SPOTTING



# INTELLIGENCE

## Avro Ashton

Developed from the Tudor 8 and originally known as the Tudor 9, the Ashton is the latest Avro aircraft to be ordered by the Ministry of Supply for jet research. Four Rolls-Royce Nene 6 turbojets which replace the Nene 5s of the Tudor 8 are mounted as before in two "double cigar" nacelles. The Ashton has a tricycle undercarriage and a redesigned blunt tipped fin and rudder. Wing span is 120 ft.

## Tail Tailoring

Three other aircraft which have also undergone fin and rudder alterations are the Grumman Panther, the Armstrong Whitworth Apollo and the Bristol Freighter. That of the new F9F-5 Panther is cleaner and more triangular. The Apollo and the Freighter Mk. 31 have both succumbed to the latest taste for dorsal fairings.

## Canuck

The Avro (Canada) CF-100 all-weather long range twin-jet fighter has been christened the "Canuck." Twenty have been ordered by the R.C.A.F.



## Supermarine 535

New fighter research aircraft amongst the individual demonstrations at the S.B.A.C. Show 1950 was the Supermarine 535 development of the 510. The 535 has a modified nose and wing roots to accommodate a tricycle undercarriage, and a fatter rear fuselage to accommodate a Rolls-Royce Nene turbojet plus an afterburner. All flying surfaces are swept-back.

## Basic Trainer

Two Beechcraft YT-34 basic trainers are now undergoing service tests with the U.S.A.F. Descended from the Mentor, the YT-34 is powered by a six-cylinder Continental engine and has a top speed of 188 m.p.h. Wing span is 32 ft. 10 ins.



## Sub Sinker Section

New twin-engine anti-submarine aircraft for operation from aircraft carriers is the Short S.B.3. It is a high-mid wing monoplane with a short drooping nose and two under-slung Armstrong Siddeley Mamba turboprops. The "droop snoot" effect is accentuated by a stepped-up cockpit cover and a large bulge below the nose, reminding us visually of a hound "on the scent." Tailplane is set across the top of the fuselage, and the fin and rudder is pointed with a shallow "S" bend in the leading edge. Wing shape appears to be similar to that of the Short Sturgeon from which the S.B.3 is descended.

A third prototype of the new Blackburn "sub-chaser" is now flying. It is designated the Y.B.1. Powered by an Armstrong Siddeley Double Mamba turboprop, the Y.B.1 is a three-seater and has a swept-back outer wing section. The other two prototypes, both designated Y.A.5 have Rolls-Royce Griffon piston engines. The first is a two-seater with the original wing shape, and the second a three-seater with a wing similar to the Y.B.1.

Successful deck landing trials have been completed by the Fairey 17. Unusual feature recently revealed was the "Z" type double-fold wing.

Anti-sub. news from America is the order by the U.S. Navy for Martin P5M-1 Marlin anti-submarine flying-boats. The Marlin is similar to the PBM-5 Mariner except for a single fin and rudder and a one-step planning hull with a more pointed nose.

## New Numbers

The undermentioned changes of designation have been made by U.S.A.F. :—

Boeing YB-56A	now B-47C
Lockheed F-97	now F-94C
Republic YF-96	now F-84F
North American F-95A	now F-86D
Lockheed RF-80	now T-33

## McDonnell XF-88B

It is understood that tests are to be made with a turboprop version of the McDonnell XF-88. The new model will be called the XF-88D.

## Stratospheric Tornado

New version of the North American B-45 Tornado recently announced is the RB-46C. The aircraft is designed for high altitude photographic reconnaissance; performance figures are said to be a considerable improvement on those of the B-45 bomber. The RB-45C has a modified closed-in nose somewhat reminiscent of an upturned banana.

## Attacker Trainer

A two-seat (tandem) jet-trainer version of the Attacker has been projected.

## Flying Boom

It is now understood that the Boeing KB-29P flying boom tanker is in quantity production for the U.S.A.F.

## Turbo-prop Flying Boat

U.S. Navy patrol bomber flying boat powered by four Allison T-40 twin turbines is the Convair XP5Y-1. These engines, which drive contra-rotating propellers are mounted in four cigar shaped nacelles, the outer ones protruding fore and aft of the wing. The wing is set high and well back on the two-step hull; balance floats are fitted inboard of the squared-off tips. The tailplane has dihedral and the fin and rudder a dorsal fairing; both have straight taper and square-cut tips. Gross weight is in the region of 60 tons.

## Prestwick Pioneer 2

Shown and flown at the S.B.A.C. Show 1950 was the new version of the Prestwick Pioneer fitted with an Alvis Leonides radial engine. Classed as a light transport, the Pioneer seats five passengers and has a range of 400 miles.

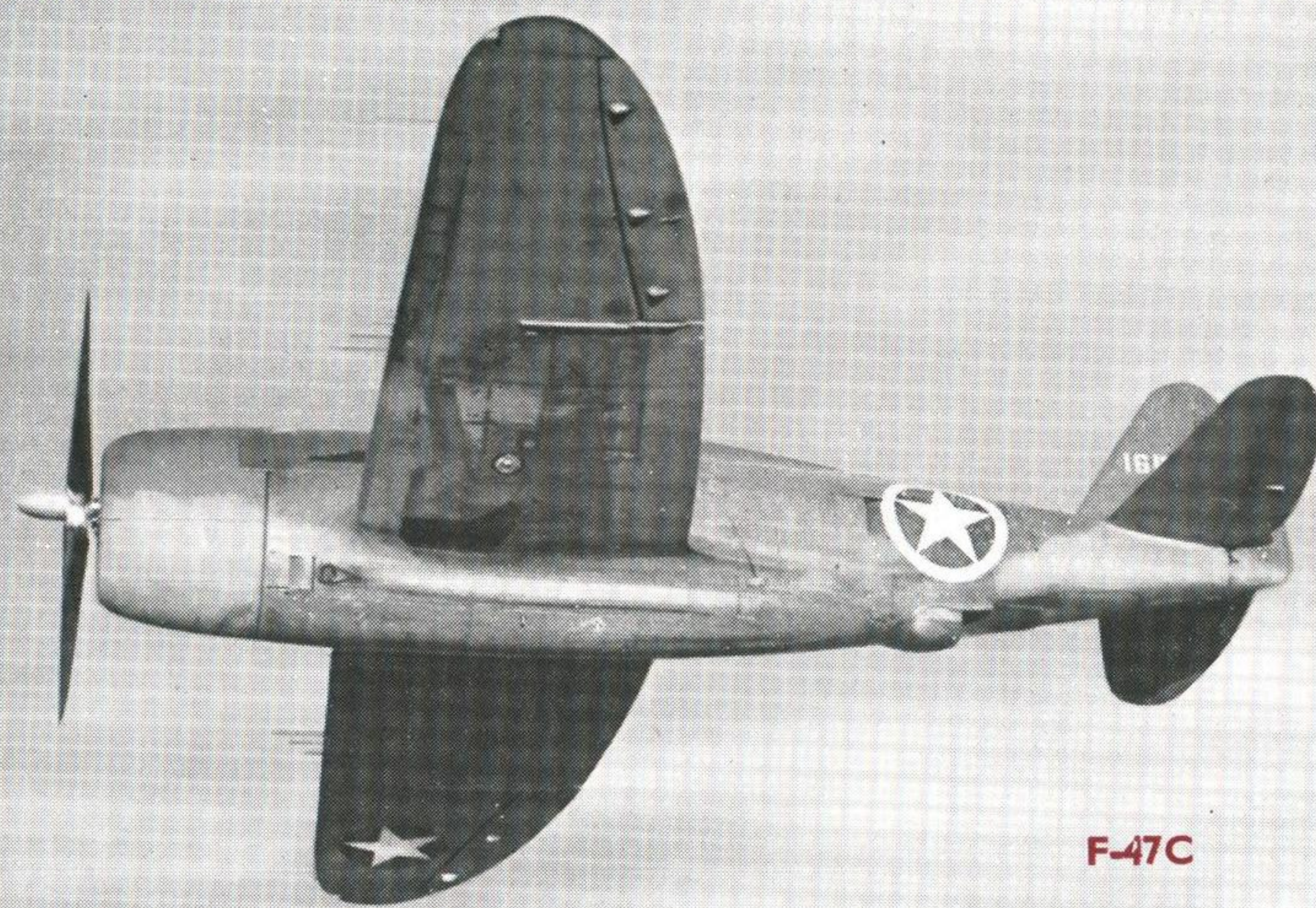




**MIG-15**



XF-84 prototype



F-47C

## THEME FOR THUNDER

—by Obs. ROY McLEAVY—

ALEXANDER KARTVELI, Republic's chief engineer and vice-president, is one of the world's foremost designers of fighter aircraft. The design ancestry of his formidable family of jet-fighters—the Thunderjet series, the unique rocket-boosted XF-91 and the new F-84F—dates back to the P-35 Guardsman of 1938. Besides being Kartveli's first design to be adopted in quantity by the U.S. Army, the P-35 was also the first American fighter to exceed 300 m.p.h. in level flight.

From the P-35, Kartveli evolved the XP-41, which was not entirely successful, and then entered fresh fields with the heavier P-43 Lancer. The Lancer, powered by a 1,200 h.p. turbo-supercharged Twin Wasp, went into service in 1940 as the standard U.S. Army Air Corps' high-altitude fighter, retaining that status until 1942.

Construction of the first prototype of a replacement for the Lancer—the XP-44—was progressing in June, 1940, when the U.S. Army Board held a meeting at Wright Field and evolved an entirely new fighter specification. The Board, basing their requirements on lessons learnt from Allied and German air strategy during the invasion of France and the Lowlands, cancelled their order for the XP-44, demanding instead a fighter that could not only outclimb and outgun hostile bombers, but also escort high-altitude bombers deep into enemy territory and chase off their interceptors. Items that had previously been almost ignored in America—heavy armament, self-sealing tanks, armour protection and high altitude supercharging, all had to be housed in the airframe, besides an exceptionally powerful engine. A high all-round performance, coupled with a maximum level speed of about 400 m.p.h. was considered essential.

Kartveli, who likes beautiful aeroplanes, was bitterly disappointed at the cancellation of the contract for the P-44,

which he described at the time as being his loveliest design. He was also appalled, not unnaturally, at the Falstaffian proportions that had to be assumed by its successor to meet the extensive needs of the Army. When the cancellation was finally confirmed, Kartveli was up all night working on data for the new project and flew to Wright Field the following morning. He returned to Farmingdale the next day with rough plans for the new fighter—later to emerge as the P-47, one of America's greatest military aircraft in World War II.

The Thunderbolt presented many design difficulties (the greatest being the installation of the hefty turbo-supercharger) but the first flight of the XP-47, in May 1941, took place less than a year after the U.S.A.A.C. had ordered the drawings to be prepared.

During the early stages of development a number of modifications were introduced and these led to the first production model being designated P-47B. From May 1943, when the P-47 received its baptism of fire over France, until the end of the war, Thunderbolts of varying shapes, power and deadliness ranged the skies of Europe and the S.W. Pacific, destroying many hundreds of Axis aircraft. They flew 545,575 operational sorties. Their duties included escorting bombers to the heart of the Reich; carrying out low-level fighter bomber missions and performing tactical-support work with rocket-projectiles.

In May 1941, the XP-47 was the first U.S.A.A.F. fighter to fly at 400 m.p.h., and in August 1944, a flight development model, the XP-47J, became the first American fighter to fly at 500 m.p.h. More than 15,000 Thunderbolts were built.

The Thunderjet was conceived when the U.S.A.A.F. asked Republics to re-design a P-47 to conduct tests with the then new General Electric TG-180 (J-35) turbojet. However, conferences between Republic and the U.S. Air Material Command



F-47D (integral canopy)



F-47D (bubble canopy)

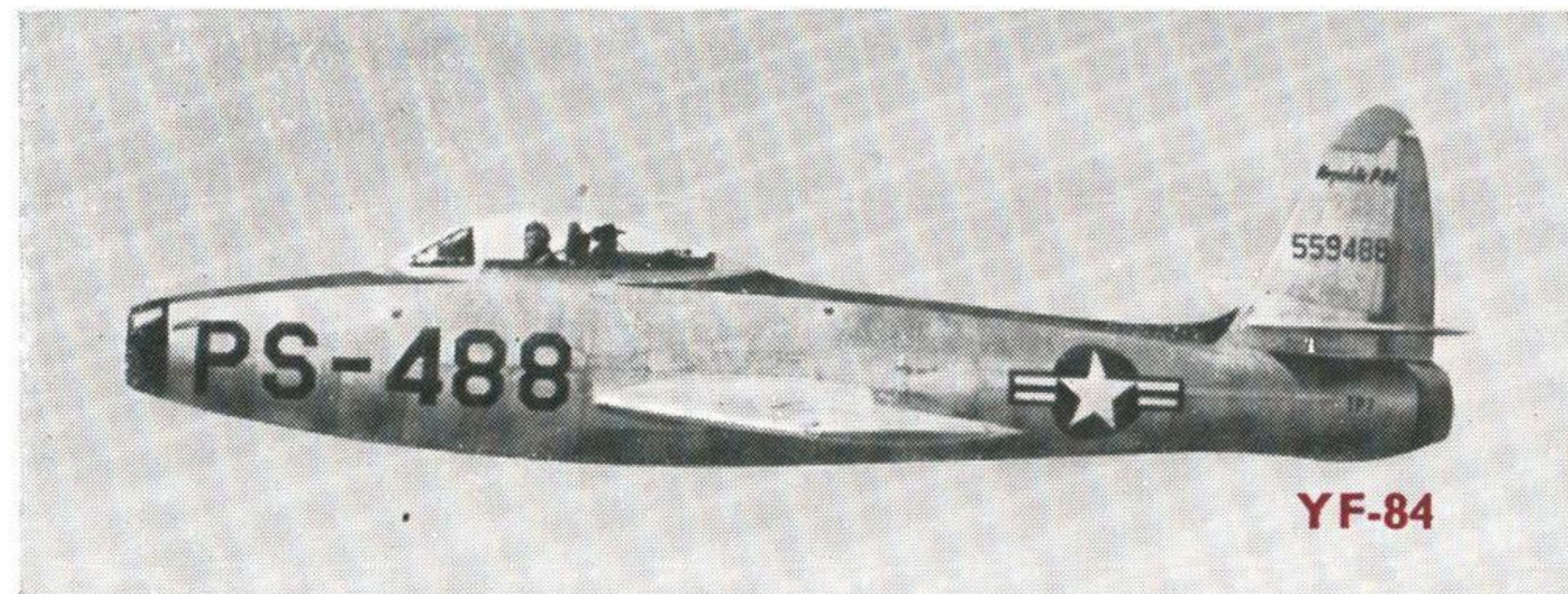
resulted in a decision to produce an entirely new aircraft. Though visualized in the first instance as a flying "test-bed", it was not long before the U.S.A.A.F. realized that in the XP-84 lay a potential jet-successor to the Thunderbolt, and orders for an operational fighter, the P-84 Thunderjet, were soon forthcoming.

The first prototype performed its maiden flight from Edwards Air Force Base, Muroc, on February 28th, 1946, after "flying" there from Republic's plant on Long Island, in the hold of a Stratofreighter. In much the same way as its elder brother, a variety of minor modifications during teething stages led to the first production model being designated F-84B. Armament on this version was increased from four to six .5 machine guns, an air conditioning system was installed in the cockpit and later models were fitted with retractable rocket mounts—now a standard feature.

A change-over to the more powerful J-35A-13 turbojet with a short tail pipe, resulted in the F-84C.

F-84Ds then succeeded B models on the production lines. Improvements included the reinforcement of the metal skins on the wings and ailerons, the installation of a winterized fuel system and changes to permit the use of gasoline instead of kerosene. Serviceability in cold climates led to the adoption of a mechanical method of undercarriage retraction instead of the previous use of hydraulics. In addition, the pitot tube was removed from the fin to the nose duct divider to make it more accessible for covering.

Substantially benefited by a 25 per cent increase in thrust from the Allison J-35A-17, the current production model of the Thunderjet is the F-84E. The thrust has been raised from 4,000 lb. to 5,000 lb., providing a materially improved performance. As a result the whole airframe had to be



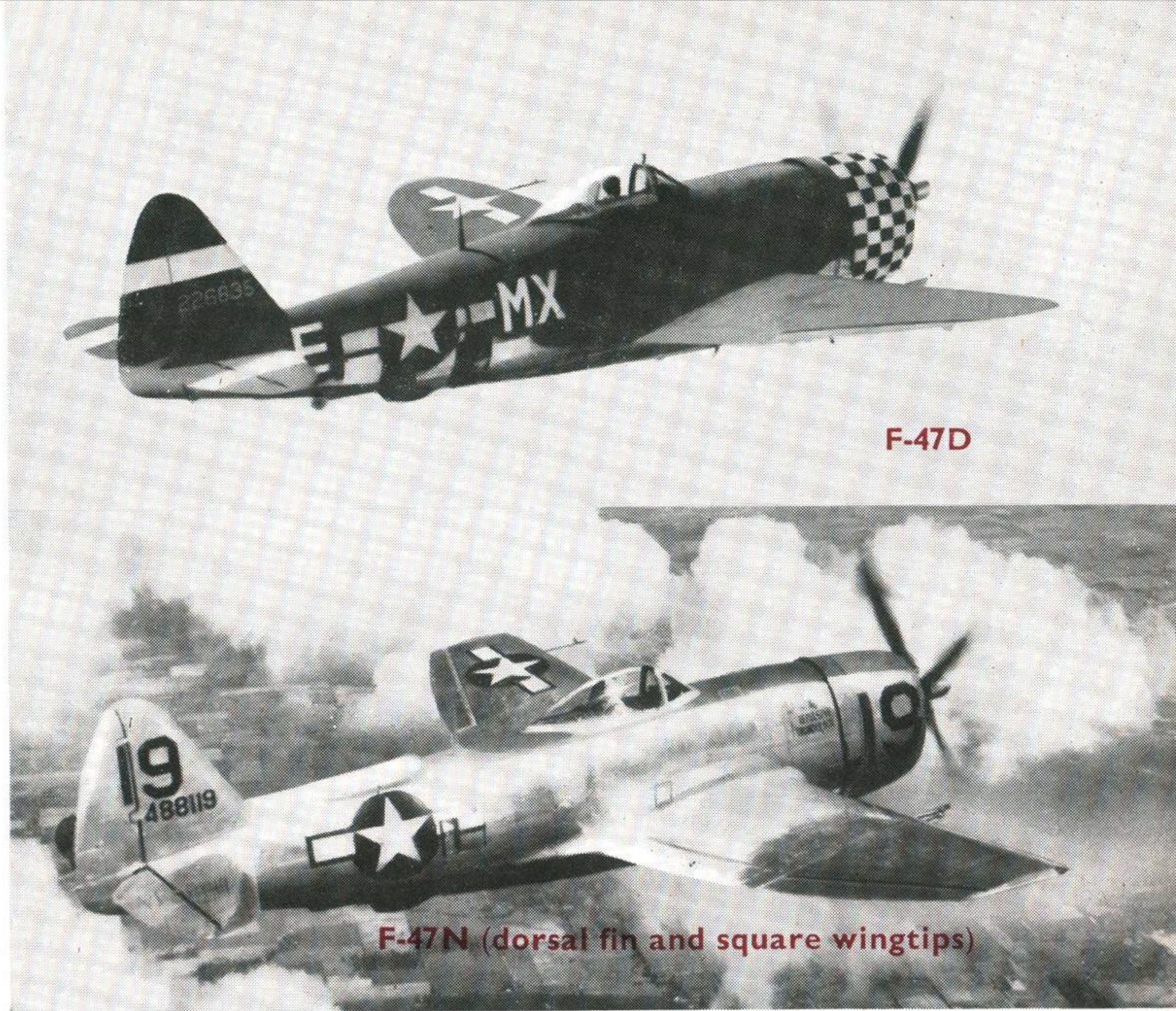
strengthened to withstand the greater 'G' loads likely to be imposed. A more advanced cabin pressurization and air conditioning system is fitted and, to allow more room for the pilot, the length of the nose has been extended by 15 in.

Employed by the U.S.A.F. as the standard fighter-bomber, the F-84E packs a veritable arsenal of weapons in addition to its fixed armament of six .50 machine-guns. According to the type of mission required, these may include: twelve 140 lb. HVAR rocket projectiles, six mounted below each wing, together with two 1,200 lb. Tiny Tim projectiles; thirty-two HVAR rockets; two 1,000 lb. bombs; two 500 lb. fragmentation bombs; incendiaries, or napalm tanks.

Kartveli's breed undoubtedly goes a long way towards disproving the Old English theory that "Thunder hath but its clap".

With any of these combinations, two 230 gallon wing-tip tanks may be fitted, but under such conditions, JATO is used to assist take-off.

Fins on the tanks enable them to be carried throughout combat periods.



From nose to tail, the slim, aggressive lines of the F-84E should cause no difficulty in recognition. The wings, slightly stubby in plan, are sited in a low-mid position well back along the fuselage, emphasizing the long nose as it sweeps up to the small, blunt air intake. Disregarding the pilot's electrically-operated full-vision canopy, the flowing curves of the fuselage closely resemble those of an Indian club. Fin and rudder outlines bear the unmistakable "Kartveli" stamp, handed down from the P-35. Note the small dorsal and ventral fin areas. Brief particulars of the F-84E are as follows: Span: 37 ft. 5 in.; length: 36 ft. 5 in.; max. loaded weight (as fighter-bomber): 15,500 lb. Max. speed at sea level: about 615 m.p.h. Service ceiling: over 45,000 ft. Max. tactical radius of action (with four 230 gallon drop tanks): over 1,000 miles.

Well over a thousand Thunderjets are now on order. Those based in this country at present, for overseas training, belong to the 20th Fighter Bomber Group. Others are destined to re-equip F-47 and F-80 Groups in Germany. A license for the manufacture of F-84's has been granted to Italy.

Flight development models of the Thunderjet include the two aircraft employed by Flight-Refuelling Ltd. for tests in this country under a contract given by the U.S. Air Material Command and the "solid nose" version, produced in co-operation with the U.S. National Advisory Committee for Aeronautics. Success of the former experiments has been confirmed by the recent transatlantic crossings.

The "solid nose" Thunderjet was constructed by Republics at their own expense to compare the efficiency of side intakes with the nose-type duct. No changes in stability resulted, and the rate of climb showed a promising increase.



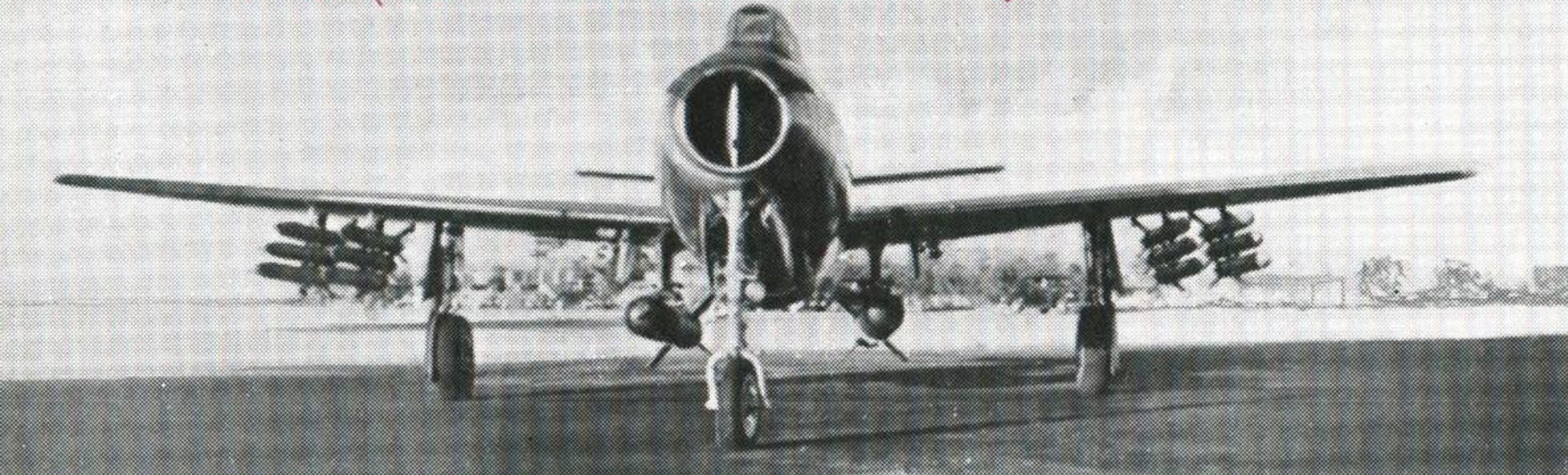
F-84E (extra long range)



F-84C (8 rockets)



F-84E (12 5 in. rockets and 2 "Tiny Tim" rockets)



F-84E (32 5 in. rockets)

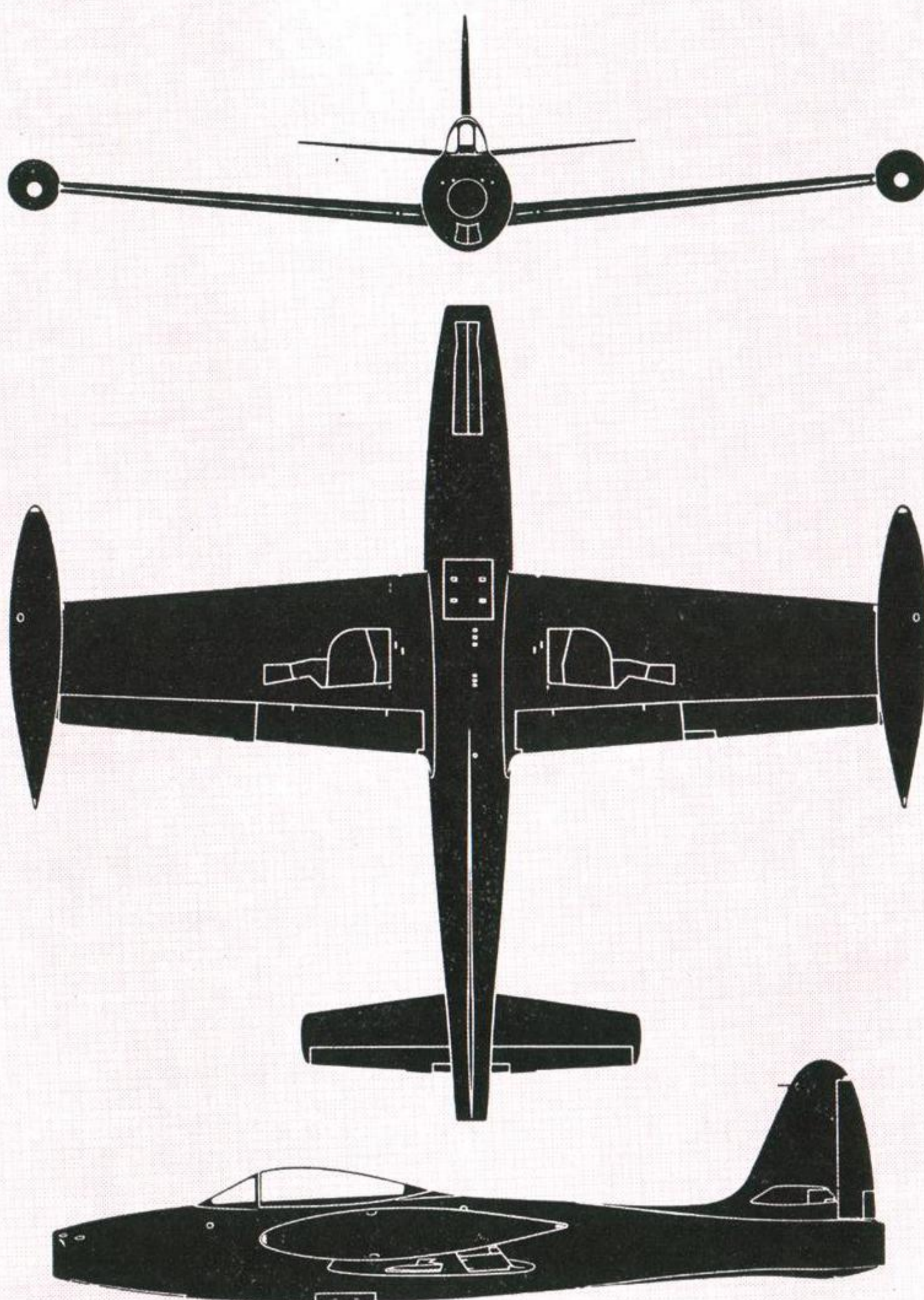


Furthermore, the tests proved that radar equipment could be housed in the nose without loss of performance—should such a development be required by the U.S.A.F.

Confronted with the vast assortment of outlandish shapes already in the skies or adorning drawing boards nowadays, it would be difficult to describe any fighter as being completely "revolutionary", either in outline or conception, but the term "unique" can at least be applied to the XF-91.

A swept-wing high-altitude fighter, the XF-91 completed its manufacturers' trials early this year, and is now being evaluated by U.S.A.F. pilots. A variety of unusual features, collected together for the first time in one airframe, include inverse tapered wings with variable incidence, rocket combat boost and a tandem-type landing gear that retracts into the wing tips.

To analyse these novelties one by one, as they may well portend future developments, the inverse taper reduces the wing-tip stalls (due to loss of lift at low speeds) experienced with conventional swept-wing contours. Combined with leading edge slots it enables the XF-91 to fly at lower speeds than are possible with any other jet fighter. Variable incidence wings permit a high angle of attack during take-offs and landings and a low angle for high-speed flight, thereby increasing the speed range. Additional boost for the 5,200 lb. s.t. J-47



F-84 Thunderjet

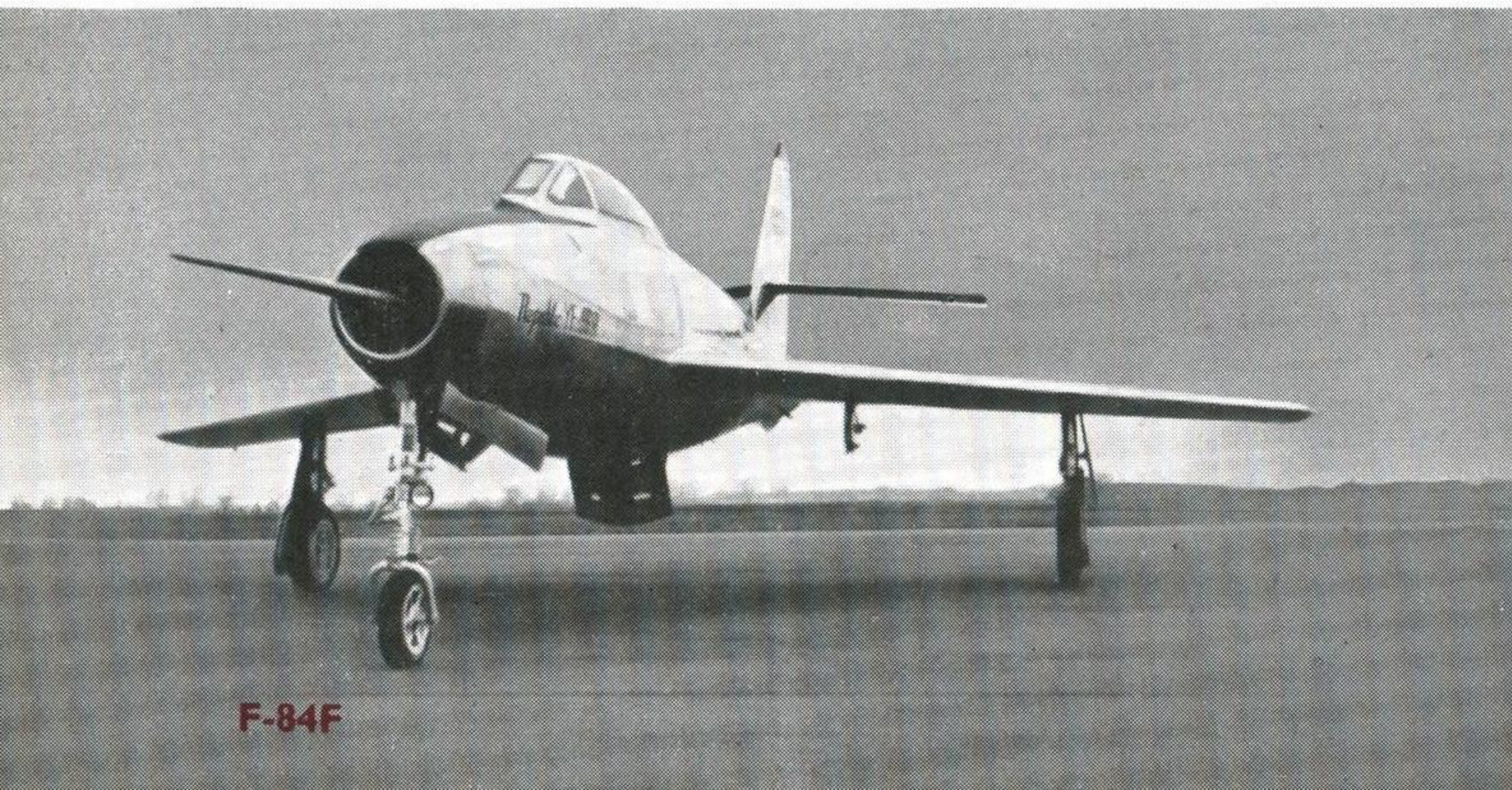
turbojet and its afterburner, is provided by four rocket motors—mounted in dorsal and ventral fin fairings—to obtain an extremely rapid rate of climb for high altitude interception. Finally, the undercarriage has been developed to enter the cramped space in the thin-section laminar-flow wings. While the nose-wheel retracts forward into its nose duct divider compartment, the four thinner main wheels, mounted one behind the other on single legs, retract outwards to the wing tips.

The most recent design to emerge from Farmingdale is the F-84F, built to enable the U.S.A.F. to test a swept-wing version of the Thunderjet. It was designed, constructed and flown in just under six months. About 60 per cent of the tooling is the same as that used for the F-84 since their fuselages are almost identical, and this will greatly facilitate production. No performance figures are available, but the attainment of higher Mach numbers

with the revised wing surfaces is a foregone conclusion. Thrust is derived from an Allison J-35-25 developing 5,200 lb. s.t. The first prototype has no provision for an afterburner.

Provisional details are :

Span : 34 ft. ; Length : 38 ft. ; Height : 14 ft. ;  
Max. Gross take-off Weight : 25,000 lb.



F-84F



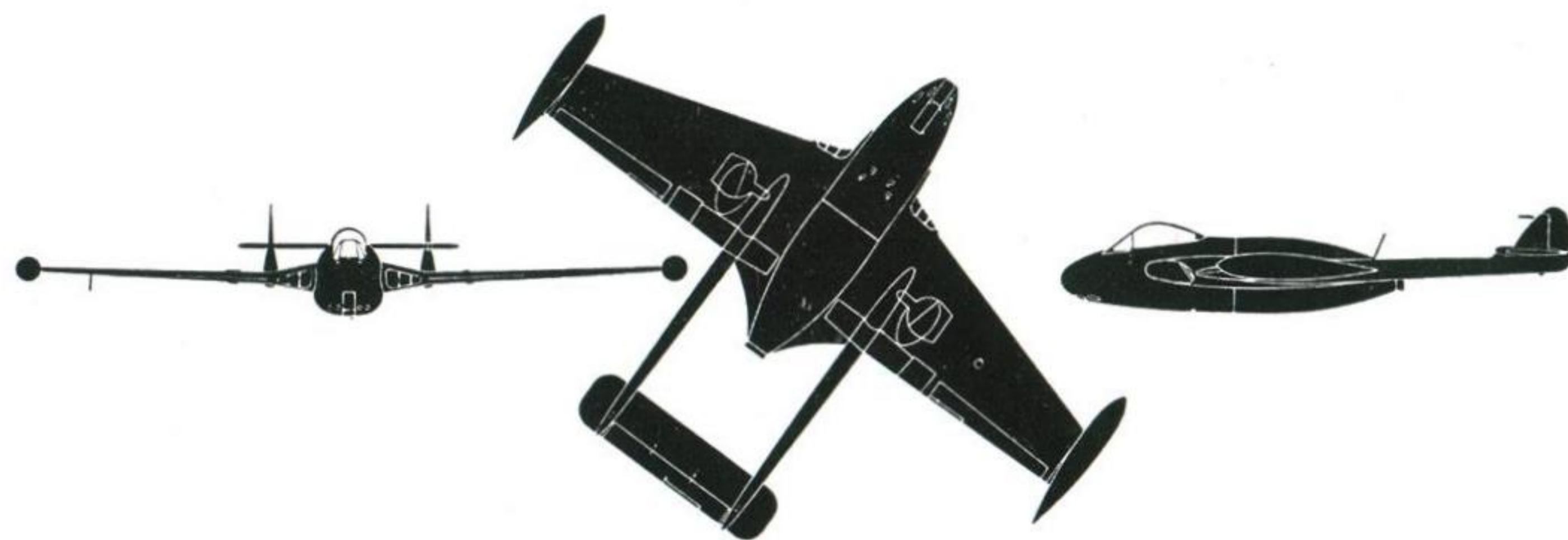
XF-91

# FOR THE RECORD

A further selection of three-view drawings of aircraft worthy of recognition (see *Journals* for August 1949 and February 1950).



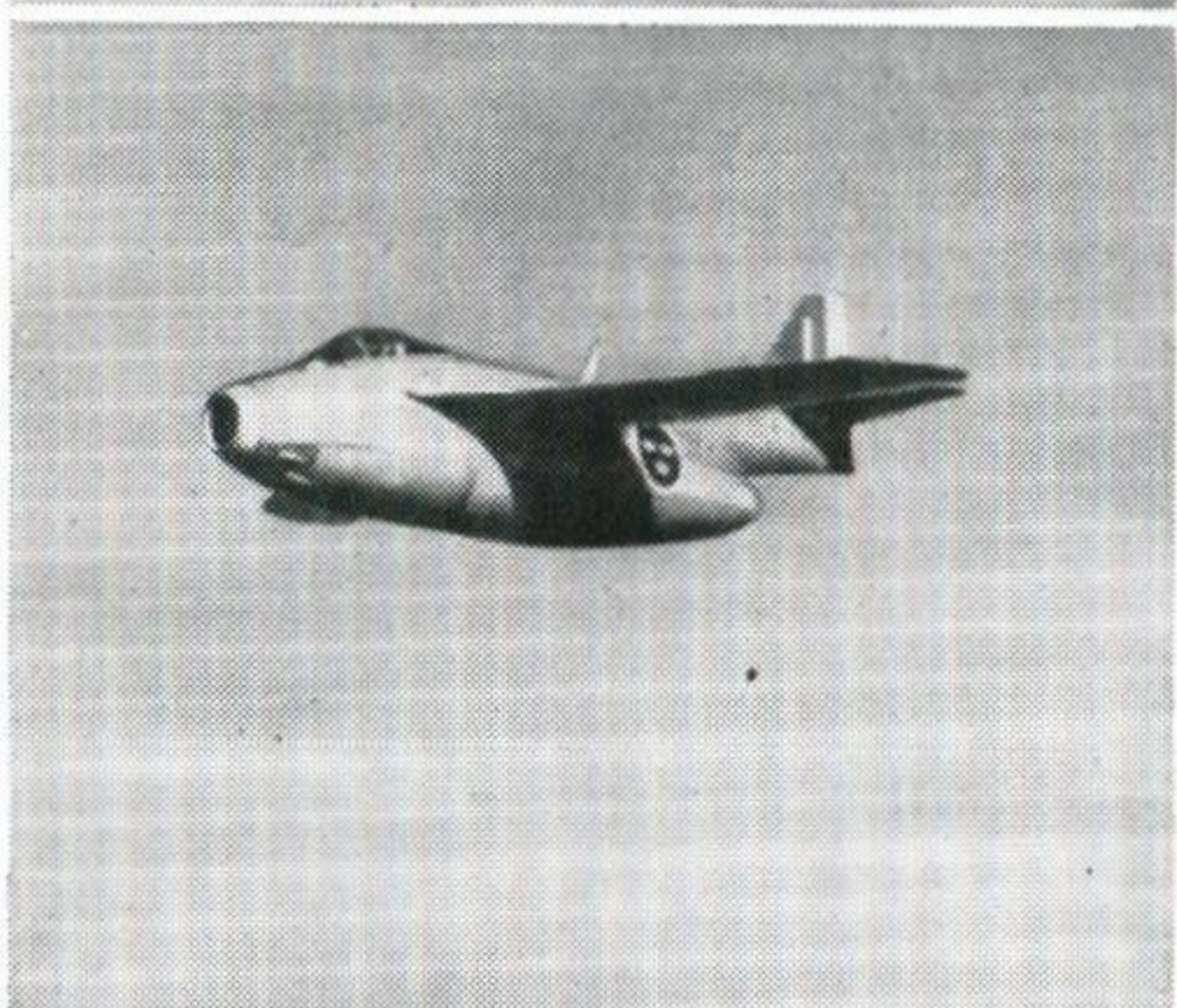
De Havilland  
**VENOM FB Mk. 1**  
 (1 D.H. Ghost)  
 Span 41' 9"      Length 31' 5"



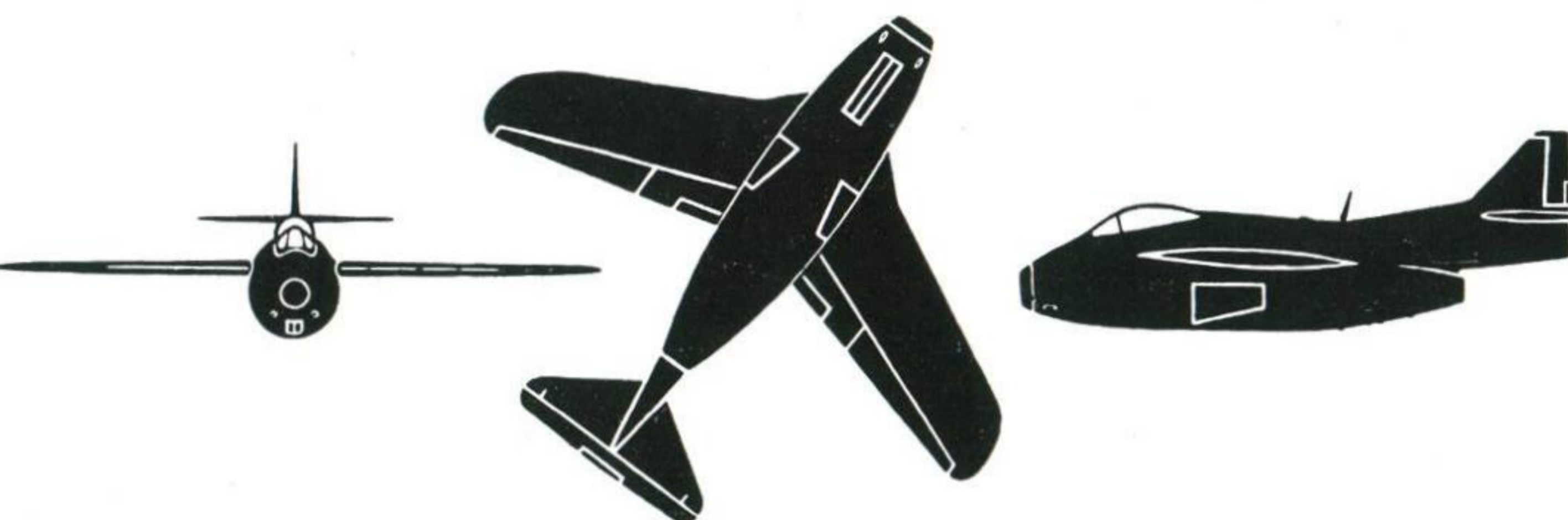
Hawker  
**P.1081**  
 (1 R.R. Nene)  
 Span 31' 6"      Length 37' 3"



Mikoyan-Gurevich  
**MIG-15**  
 (Engine unknown)  
 Span 34' (app.)      Length 32' (app.)



Saab  
**J.29**  
 (1 D.H. Ghost)  
 Span 36'      Length 33' 5"



Lockheed  
**F-94**  
 (1 Allison J.33)  
 Span 38' 10"      Length 40' 1"



Gloster  
**METEOR NF Kk. 11**  
 (2 R.R. Derwent 8s)  
 Span 43'      Length 48' 6"



# MODELS IN RECOGNITION

by

C. H. GIBBS-SMITH

THE OFFICIAL MODELS issued to the Services are perhaps the most useful items of all the material or equipment used in recognition training and testing. They are not tricked out with the fascinating detail which attracts one to the cases in the Science Museum, and they have no glamour. They are not intended to titivate our senses, any more than a dual control trainer is intended to give a comfortable joy ride to the pupil. The official models are intended to present accurate essentials of structure and outline with nothing to distract the eye from the *shape of the aircraft*. Once allow the student to look into the cockpit window to admire the cockpit layout, or encourage him to count the rivets on the fuselage skin, and you might as well give up the task of teaching. These plain accurate models force us to look at *shape*, and shape is our business.

As a teaching aid the model can be used as a direct accompaniment to the silhouettes and it is handy enough to encompass with the eye without effort. From the outset it can be used to perform slow manoeuvres so that the learner can have a close-up of the effect of perspective and of the mergence and overlapping of shapes. When this process is in action it is a useful exercise, especially for aircraft, to watch the machine upside down and in every conceivable attitude in which it can be held. Much more of this "upside-down" recognition should be indulged in both when training and testing with all kinds of material, as it is an excellent mind-sharpener.\*

After "manhandling" the model it is very useful to rig two or three wires across a room and hook the models on. They can either be towed by black cotton (the best method) or the wires can be sloping to let the model run down them. In this way the students get an excellent idea of the ever-changing and merging shapes of an aircraft in motion.

Before looking at the model as testing material there is a much neglected practice which is valuable for both learning and testing. It is the feeling of the models. A completely different set of nerves and mental pathways are brought into use in this process and they go to reinforce the visual training, treading the shapes into the mind more firmly. As a testing method, feeling aircraft models, with eyes blindfold, is not only an entertaining business but an excellent test in co-ordination and imaginative synthesis. Incidentally, an alternative testing method is to cut two armholes in a piece of hanging cloth so that the competitor need not be blindfolded, and the model is presented to his groping hands behind the screen.

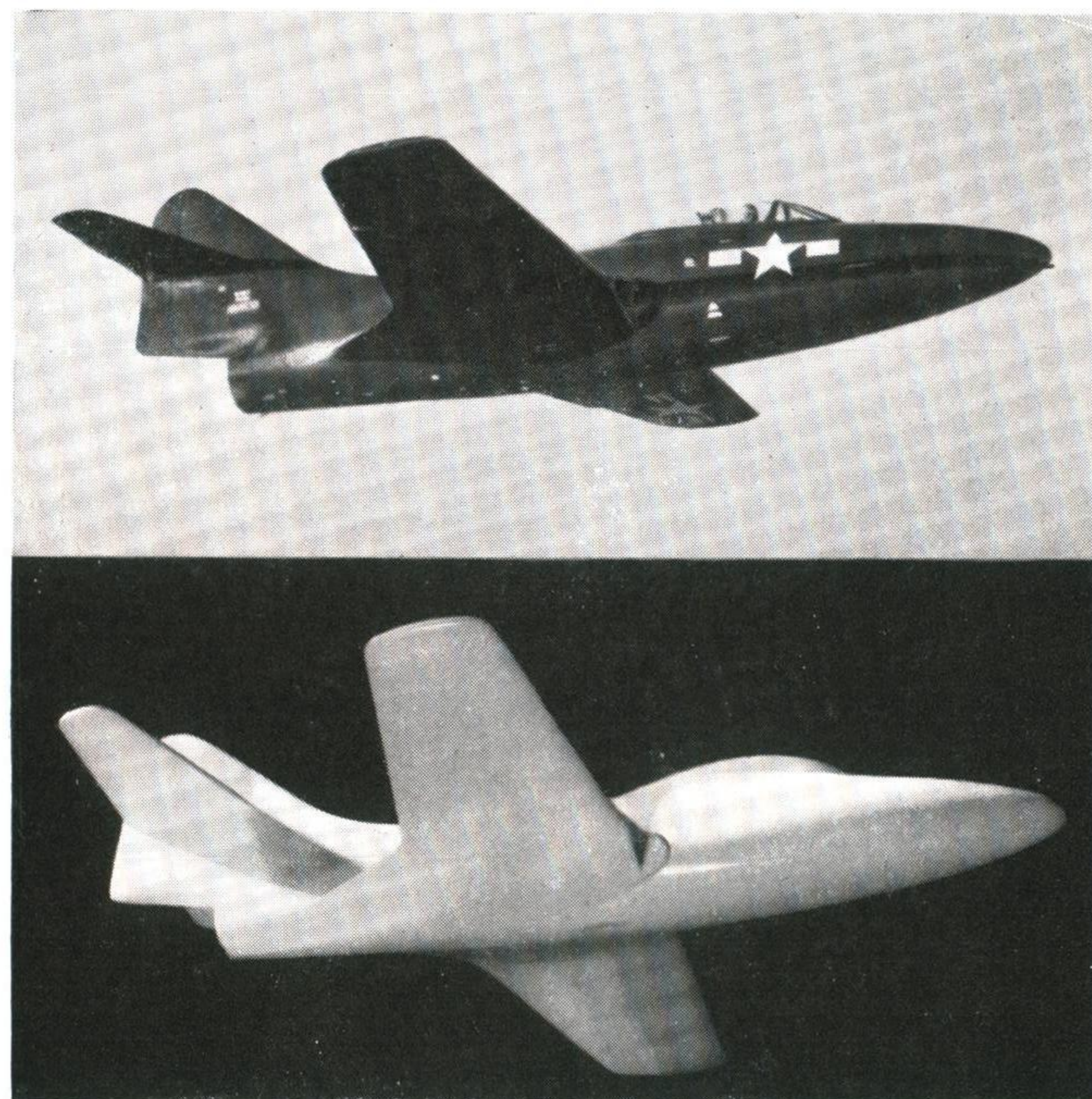
In using models for recognition testing, a variety of ways can be found to cater for differing grades of severity and to keep interest alive through novelty.

First there is the "substitute" flash trainer method in which a hole is cut in a curtain and the model, suspended on a wire, is allowed to pass by the hole at varying

speeds—incidentally use screw hooks, not eyes, for holding the model on its wire. Much ingenuity can be exploited in varieties of this scheme. The model itself can be brightly lit, or it can be sent across against a distant bright background and so appear in dead black sillograph form. Or it can be sent across upside down, (though one may not necessarily be called upon to recognize an aeroplane upside down, it is a good training exercise), or it can be fixed to an oblique wire and so pass the hole in three-quarter view perspective. And so on.

Stiffest test of all, but quite legitimate and apposite for advanced testing, is simply to drop the model past the hole from above on to a cushion. This may be done from varying heights, and in varying lights.

Variations on the theme may be endless. For example, either for teaching or test, put the room in darkness and set the models moving on the long wires. Then light them with a small concentrated flashlight beam. Or put three or four models on the wires at once—in darkness—and light up the room for a second or two and see how many types the class can identify. This can be turned into a version of the flash-trainer, the light-up time being reduced to just a flick on and off.



Grumman F9F-3 Panther

In the open air, rig a large net across the ground with a screen on one side, seat the group on the ground so that the screen hides the net. Then from behind them throw the model over their heads and high up in the air, so that it lands in the net, but out of sight. If properly organized this is excellent "flash" training.

For top view recognition, use the wire teaching and tests if possible under conditions in which the men sit *above* the wires, either on raised benches or in a gallery. The greatest possible variety of aspect-tests should be designed for aircrew training, so that they learn to identify aircraft with ease whether they are seen upside down, falling like leaves or just flashing past.

The official models in skilled hands provide the most varied and entertaining scope for every stage of recognition teaching and testing, from the first slow careful scrutiny to the ultimate mastery of lightning recognition.

\*NOTE.—When demonstrating models it is important to keep the form-destroying hand as far out of the picture as possible. A stout wire "stalk" in the bottom of the fuselage is a help. Smaller models are best demonstrated by holding a wing-tip.

# LIGHT TYPES

A selection of light aircraft which may be seen over Great Britain



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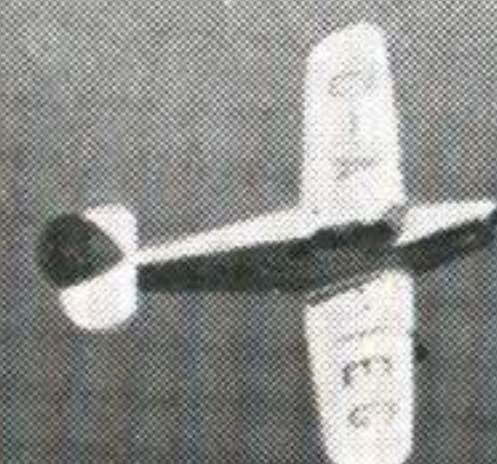
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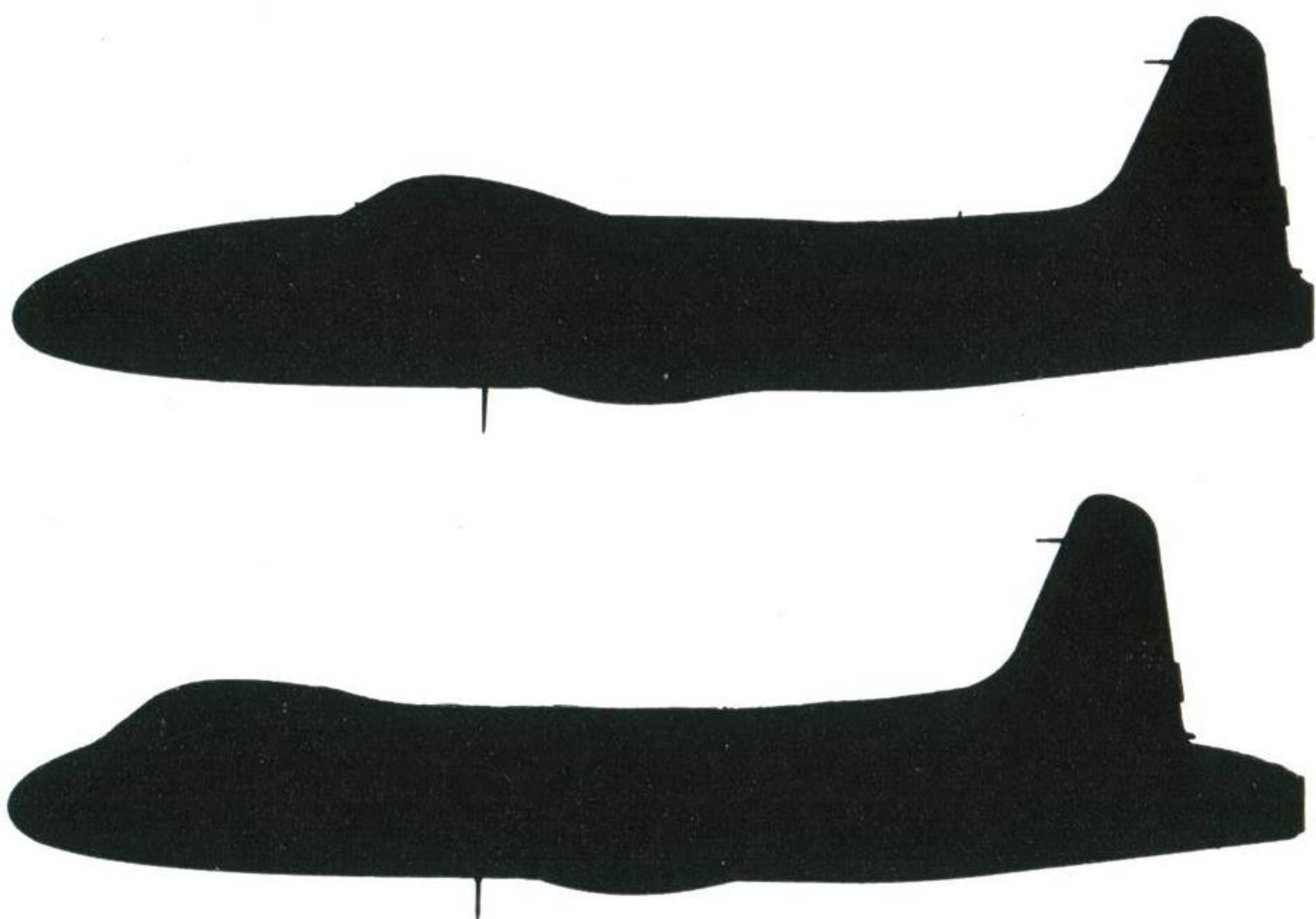


45



### Useful Definitions

There are several words and terms which are used in connection with Recognition Training of one kind or another, which have special significance in that subject. We are putting one in each month with a full definition and, if necessary, an illustration. The first word we have chosen is "GESTALT". This is a German word, meaning "form" or "configuration". It is also given to a school of modern psychology, one of whose main doctrines is that it is impossible fully to understand the nature of shapes by breaking them up into separate parts. It says that the whole is always greater and different in character than the sum of its parts. Applied to Recognition it could be said that every shape is modified by those near to it, and the total overall shape of an aeroplane is invested with a composite character built up not only of the individual parts but of their *relationship* one to another. It is these *relationships* which stamp the final shape with character. Thus, using the same parts but a different arrangement, a completely different character is



revealed. To illustrate this, we show a side view of the Lockheed F-80 as Dr. Jekyll; and below it, with the parts in different relationship, the same aeroplane posing as Mr. Hyde.

### Sound Sense

Recognizing an aircraft by sound can be an unreliable practice. Without visual confirmation it might even be a dangerous one. Few positive aids can be formulated, and the subject is largely a matter for individual experience.

Readers will, however, be interested in the following impressions of the Republic F-84 Thunderjet from Leading Observer R. S. Marsh of 1/D.2. He remarks: "I find one does not have to 'see' a Thunderjet to know what it is—that is below about 8,000 ft. It makes about twice as much noise as any British jet aircraft, and has a much harsher sound. Thunderjet is a good name for it. I find the F-80 not so distinctive. Above 8,000 ft. jets seem almost impossible to recognize by sound, but one can still pick out a lot of piston engined types."

### Misquotes

Douglas F3D-1 Skyknight . . . All-weather corner-based fighter.

### Britain's Spotting Possibles

The following additions and minor amendments should now be made to the list published in the August Journal:—

#### ADDITIONS

Aiglet	Drone	Prestwick Pioneer
Ashton	F-86 Sabre	Primer
Autocar	Foster Wickner Wicko	Scion Junior
Avro 504	Hawk Speed Six	Short SB 3
Avro 707	Heath Parasol	Skandinavisk KZ 3
B.H.T. Beauty	Klemm 25	Skandinavisk KZ 7
Blackburn YB 1	Lignel 46	Slingsby Motor Tutor
Cessna C-120	Lincoln	Supermarine 535
Chilton DW 1	Lockheed 14	Tipsy Belfair
Club Cadet	Miles M-28	

#### AMENDMENTS

Delete: Mercator, Ju 290.

Delete	Replace by
Bellatrix	SO 30 Bretagne
Dragonfly	D.H. Dragonfly
Sikorski S 51	Sikorski S 51
Fouga Cyclone	Fouga Cyclone or Sylphe
Fouga Sylphe	

### New Aircraft Recognition Material

#### LARGE SILHOUETTES

A.D. 4649 Vampire FB Mk. 5  
A.D. 4650 Hermes 4

#### 1/72 SCALE MODEL

R.A.F. Stores Ref. 52/914 }  
Naval Pattern No. 6050 } Martin 2-0-2

#### NIGHT SILHOUETTES

A.D. 4946 Dove  
A.D. 4947 F-80 Shooting Star

#### WORKING DRAWING 1/72 SCALE MODEL

A.D. 4657 F-86A Sabre  
A.L. No. 3 to National Markings Chart  
A.D. 4625

If no local arrangements are already in force, applications for supplies should be made through the usual official channels quoting reference numbers as above.

### Engine Enigma

Recent reports indicate that readers have been seeing six-engined aircraft. It is possible that these aircraft are Boeing B-50D's. The B-50D carries large fuel tanks outboard of the outer engines which, from some angles, give the impression of being additional engines. See cover of December, 1949, *Journal* for illustration.

### Seen in Aviation Journal

Bargain: Pair of Flying Boats size 9 brand new—only 7s. 6d.

### Aerogram

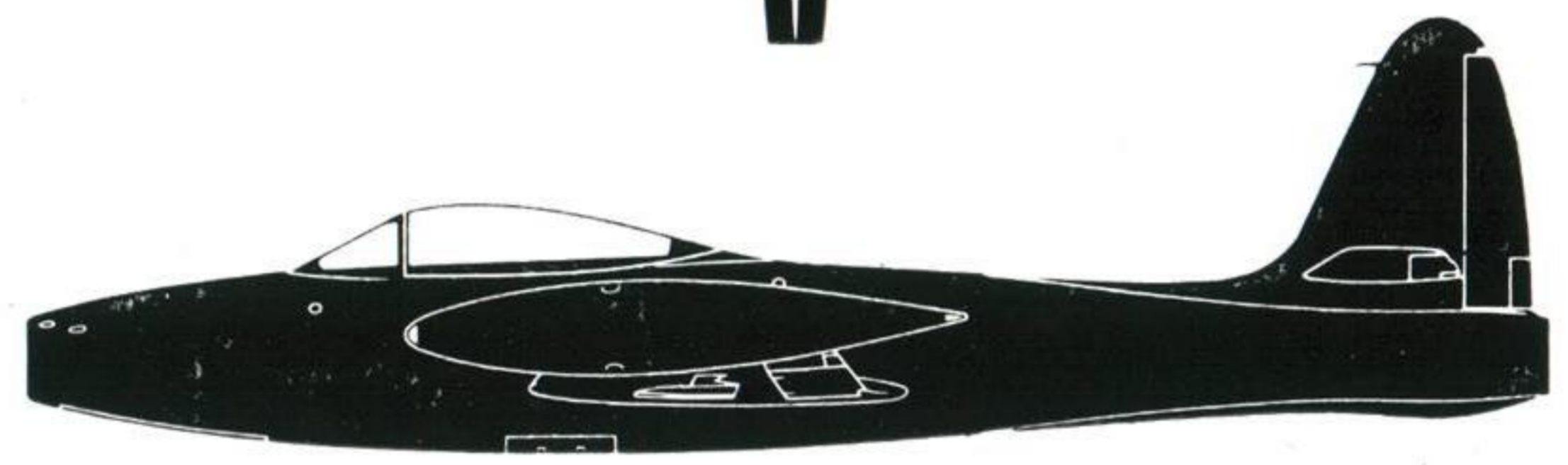
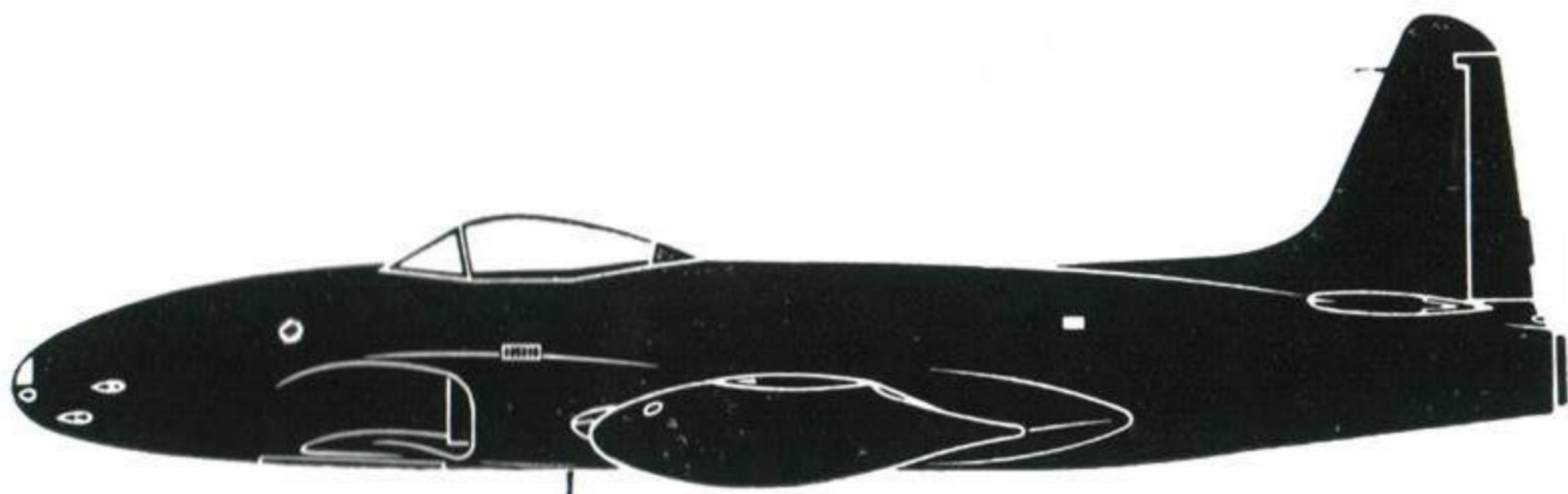
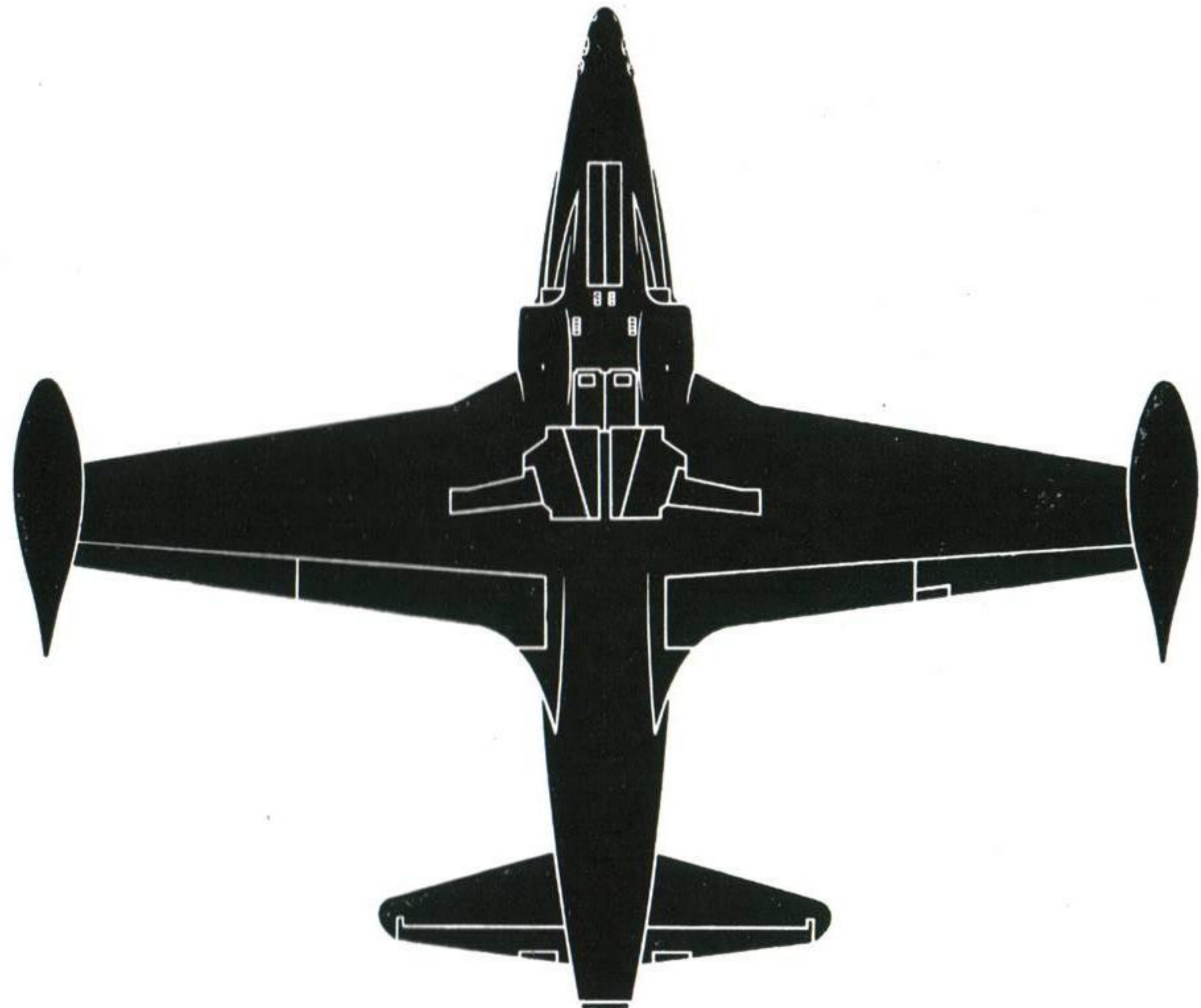


I hit a fur enjoyer. (Answer on rear cover).

# SILHOUETTES — AMERICAN JETS

LOCKHEED F-80A SHOOTING STAR

REPUBLIC F-84B THUNDERJET



American Fighter

Engine : 1 General Electric turbojet  
Span : 38 ft. 10 in. Length : 34 ft. 6 in.

American Fighter

Engine : 1 General Electric turbojet  
Span : 37 ft. 6 in. Length : 36 ft. 6 in.

*Recognition Features :*

**Wings :** low-set nearly half way along fuselage, slight dihedral, near diamond shape, faired to fuselage at roots with jet intake bulges at leading edge, duo-curve tips or wing tip tanks.

**Fuselage :** long nose—cigar-shaped in side view—pointed in plan view, jet pipe aft of tail.

**Tailplane :** diamond-shaped, pointed duo-curve tips, set across top of jet-pipe.

**Fin and Rudder :** tall, triangular, faired to fuselage, pointed duo-curve tip.

**Detail :** bubble cockpit set back from nose.

*Recognition Features :*

**Wings :** low-mid-set, moderate dihedral, slight straight taper with blunt tips or tip tanks.

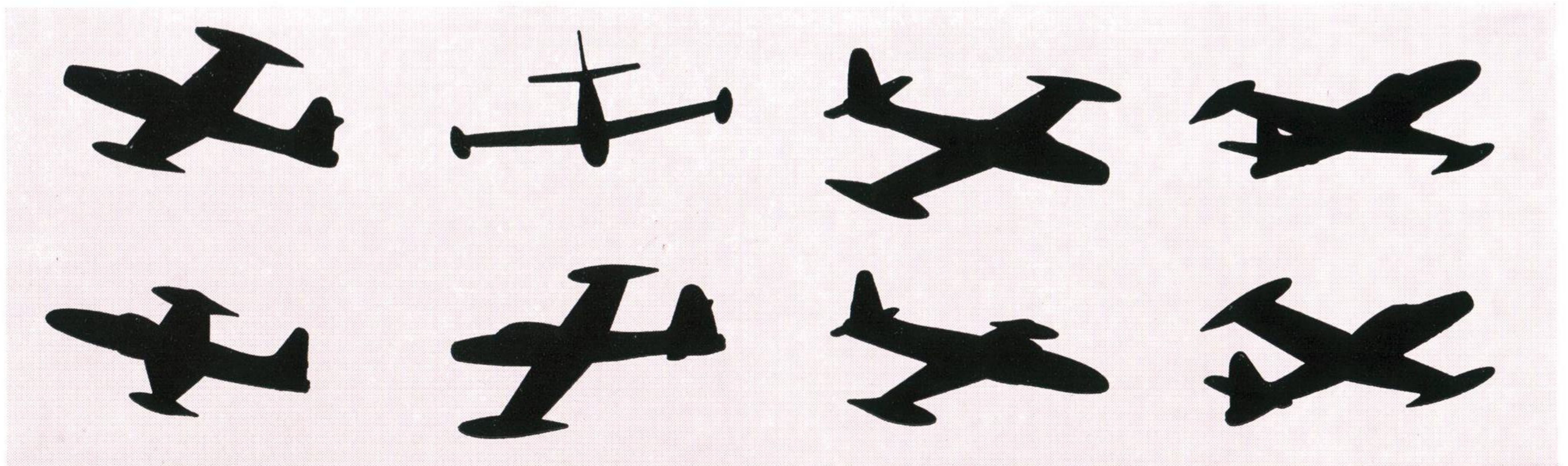
**Fuselage :** slender, bottle shaped, jet pipe aft of tailplane.

**Tailplane :** slight equi-taper, blunt tips, set through base of fin and rudder, slight dihedral.

**Fin and Rudder :** pear-shaped, faired to fuselage.

**Detail :** long streamlined cockpit canopy set forward on fuselage.

Now solve these **SILLOGRAPHS** (Answers on rear cover)





COVER: Republic Thunderjets characterized by near rectangular wings and tailplane, pear-shaped fin and rudder and a fuselage which suggests to us the nickname "Thunderbottle."



#### ACKNOWLEDGEMENT

We are indebted to Mr. Harold G. Martin for the use of his photographs of the F-84 on this page and page 32.

#### IN THE RED

The solution to Red Shadows No. 791 on page 235 of the August edition should read YAK-18 and not YAK-11.

## SOLUTIONS TO RECOGNITION TESTS IN THIS EDITION:

### ELEMENTARY

- 865. Sea Prince Mk.1
- 866. P4M-1 Mercator
- 867. Hornet F Mk.3
- 868. Hythe
- 869. Balliol T Mk.2
- 870. Chipmunk T Mk.10
- 871. MD 450 Ouragan
- 872. Canberra B Mk.1
- 873. Seagull ASR Mk.1
- 874. Athena T Mk.2
- 875. Buckmaster T Mk.1
- 876. Marauder
- 877. Sea Hornet PR Mk.22
- 878. Firefly F Mk.1
- 879. Seafury T Mk.20
- 880. F-82 Twin-Mustang
- 881. Athena T Mk.2
- 882. B-26B Invader
- 883. Proctor T Mk.4
- 884. B-29 Superfortress
- 885. Gemini

### SILLOGRAPHS

- 875. Constellation
- 876. F-41 Mustang
- 877. F-89 Scorpion
- 878. AF-1 Guardian
- 879. Bristol 170
- 880. P4M Mercator
- 881. F8F Bearcat
- 882. TBM Avenger
- 883. B-26 Marauder
- 884. F-84 Thunderjet
- 885. Meteor F Mk.8
- 886. Hornet F Mk.3
- 887. F9F Panther
- 888. Comet
- 889. B-25 Mitchell
- 890. CF-100 Canuck
- 891. Canberra B Mk.1
- 892. Scottish Aviation A.4/45
- 893. Argus
- 894. Firefly
- 895. F4U Corsair

### LIGHT TYPES

- 1. Avro 504K
- 2. Fairey Junior
- 3. Zaunkönig
- 4. Beech Bonanza
- 5. Hawker Tomtit
- 6. Comper Swift
- 7. B.A. Swallow
- 8. Chrislea Skyjeep
- 9. Miles Aerovan
- 10. Wicko CM-1
- 11. Heath Parasol
- 12. Chrislea Super Ace
- 13. Hornet Moth
- 14. Fairey Primer
- 15. Aeronca 100
- 16. Topsy Belfair
- 17. Slingsby Motor Tutor
- 18. Moth Minor
- 19. Hawk 3
- 20. Argus
- 21. Leopard Moth
- 22. Chipmunk T Mk.10
- 23. Beech D-17
- 24. Chilton DW 1A
- 25. Percival P 56
- 26. G.A. Cygnet
- 27. Sopwith Pup
- 28. Topsy 6
- 29. Miles Messenger
- 30. Miles Sparrowhawk
- 31. Miles Whitney Straight
- 32. Ercoupe 415
- 33. Tiger Moth
- 34. Gemini
- 35. Auster 5
- 36. Fox Moth
- 37. Blackburn B 2
- 38. Benes-Mraz Bibi
- 39. Piper Super Cruiser
- 40. Auster Autocrat
- 41. Heston Phoenix
- 42. Miles Falcon
- 43. Piper Cub
- 44. Proctor
- 45. Auster Autocar

#### F-80 and F-84 SILLOGRAPHS

Top line Left to Right : F-84, F-84, F-84, F-84, F-80.

Bottom line Left to Right : F-80, F-84, F-80, F-84.

#### AEROGRAM

I hit a fur enjoyer = The Fairey Junior.

#### TRICKY TRIO

Left to right : F-86 Sabre ; P. 1081 ; MIG-jet.



Tip Tank Tactics by a Grumman F9F-3 Panther. Fuel is being exhausted by air pressure.

## TRICKY TRIO

