Research Notes on the

F-86 / Canadair Sabre

Compiled by John Griffin

Part 1/2

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Canadair Sabre (F86)

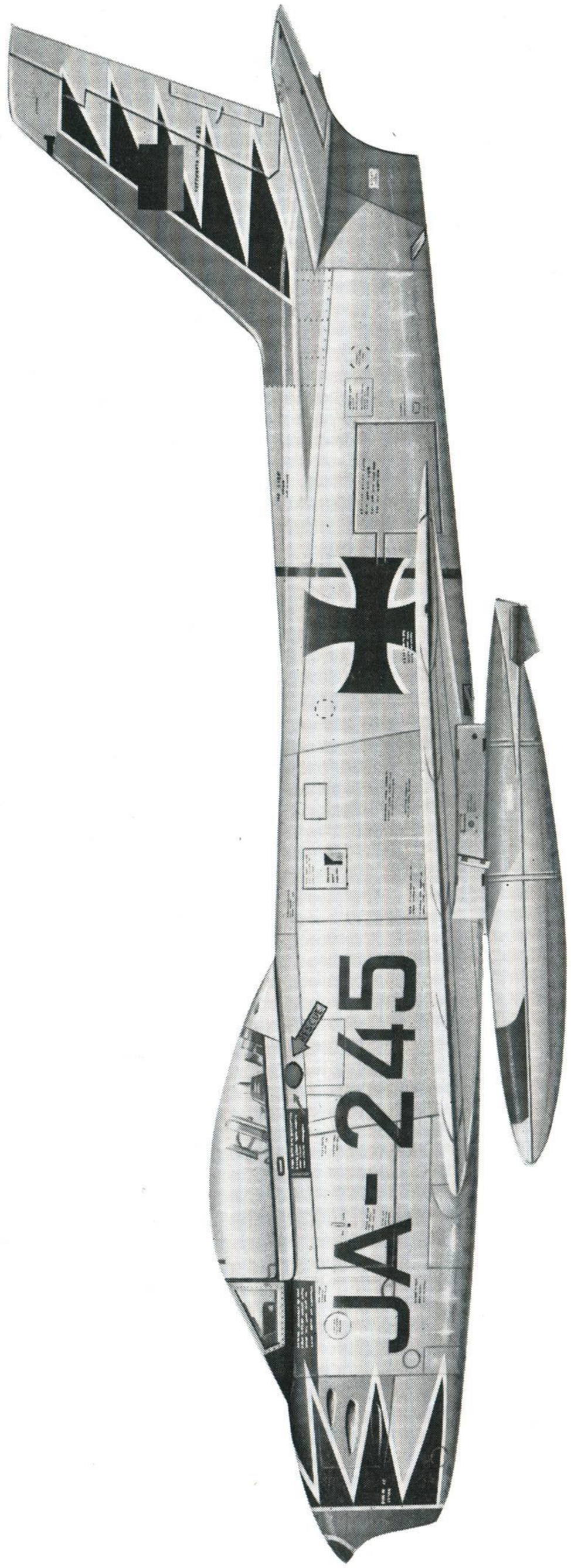
27 Dec 1999

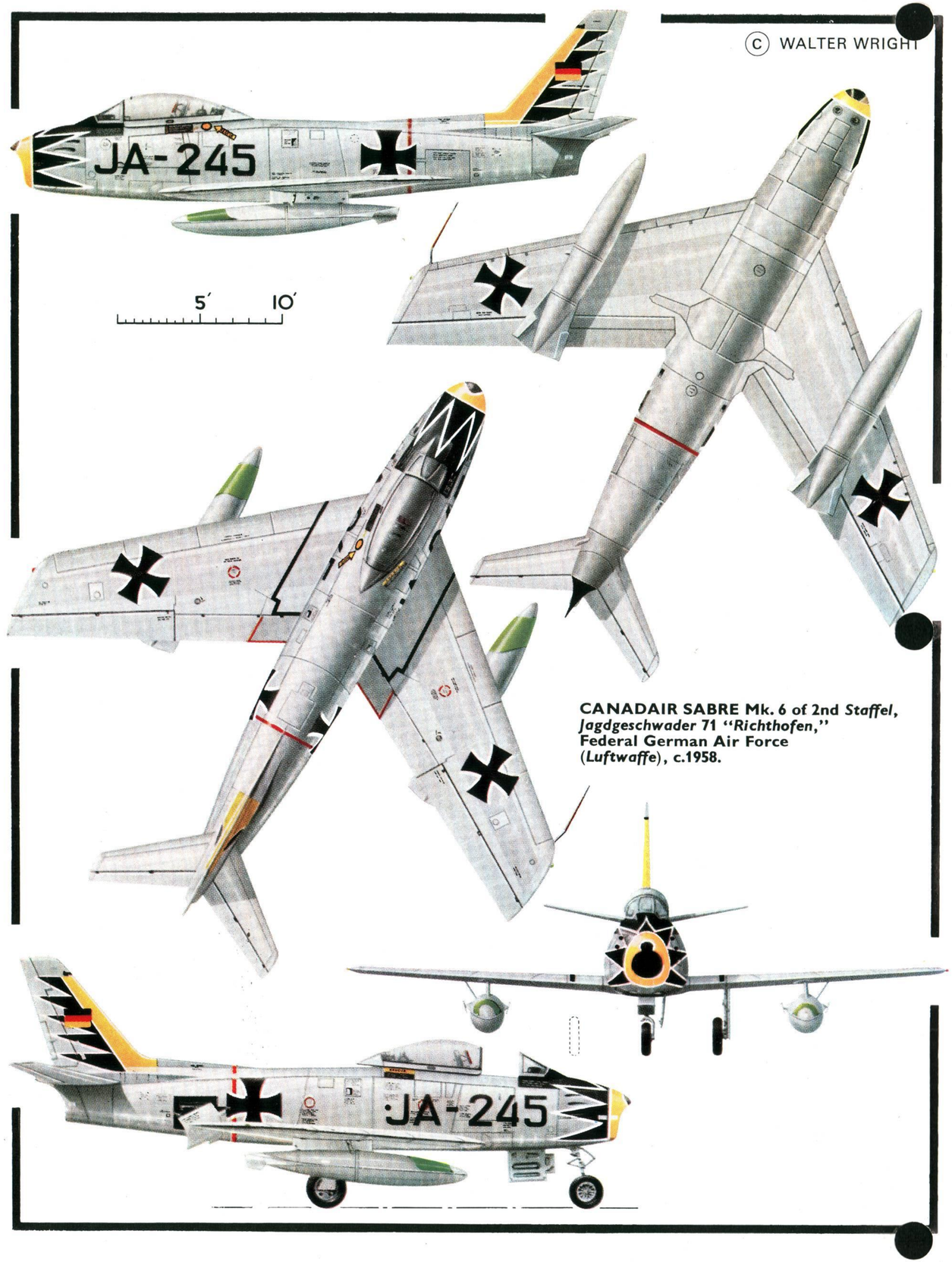
The single Sabre flown by a defector
To the Communists was 23407 and
the pilot was listed as missing

PROFILE PUBLICATIONS

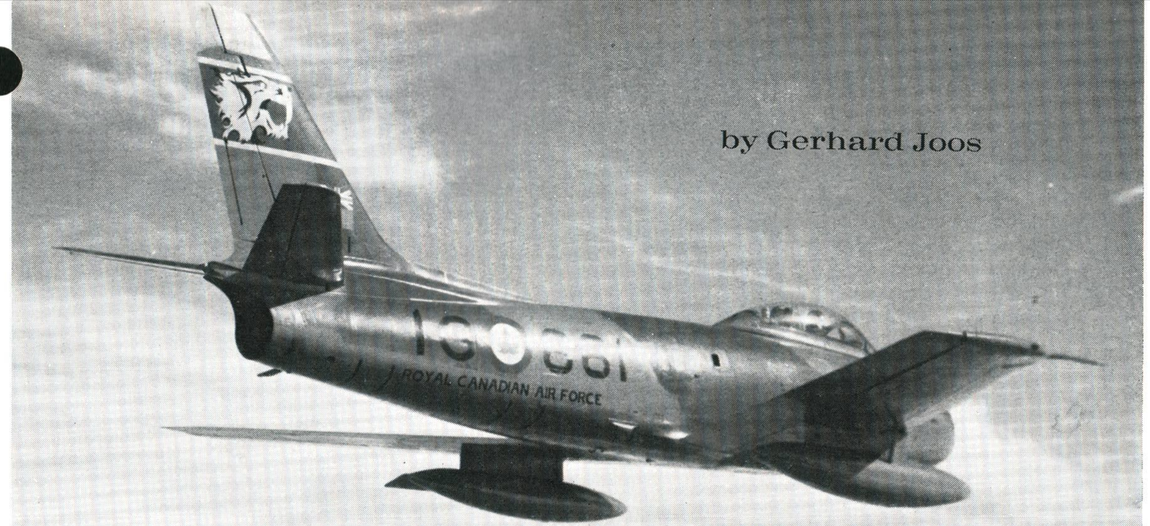
The Canadair Sabre

NUMBER 186





CANADAIR SABRE Mk. 6 of 2nd *Staffel*, *Jagdgeschwader* 71 "*Richthofen*," Federal German Air Force (*Luftwaffe*), c.1958.



The Canadair Sabre

by Gerhard Joos

A Sabre Mk. 6 of No. 439 Sqn., No. 1 Wing, Royal Canadian Air Force from Marville, France displays the Squadron's colourful "Sabre Tooth Tiger" fin insignia. (Photo: R.C.A.F.)

You could be sure of seeing them every clear day over Southern Germany, the Rhine Valley or Southern France; tiny darts, flashing silver in the sunlight at the tips of beautiful swelling contrails. Soon they were criss-crossing the flawless blue of the sky, forming bizarre patterns, soaring straight upwards without warning, hesitating momentarily at the peak of their climb and then falling back towards the earth at ever-increasing speed; then, as they raced down the sky, they would suddenly seem to hang motionless, or to disappear entirely, snatched out of sight by an invisible hand. In stable weather conditions this would continue until the clear sky was completely overcast by their drifting, merging contrails, which took on the shape of high cirrus clouds. They were silently demonstrating the outstanding manoeuvrability of one of the finest fighter aircraft in the history of military aviation; the Canadair Sabre.

But this was not their only significance. They were bearing witness to the approaching close of the most fascinating chapter in military flying; the conventional day combat, challenging to both men and machines, and offering victory to the most successful combination of able pilot and sound aircraft. The fighter had to climb fast, accelerate quickly, turn tightly even at high altitude, and provide a stable platform for weapons delivery after the pilot had placed it in the best possible attacking position. These requirements were laid down in the First World War and remained valid in principle until the closing chapter of the career of the pure day fighter, when the Sabres finally rolled to their last rest.

GENESIS OF THE CANADAIR SABRE

When Canada entered the North Atlantic Treaty Organisation its Air Force had equipment which was rapidly becoming obsolete. A modern first line fighter aircraft was needed to enable the R.C.A.F. to fulfil its new requirement in Europe, and the choice fell logically on the best aircraft which existed at that time, the North American Sabre (U.S.A.F. designation F-86). (See *Profile* No. 20.)

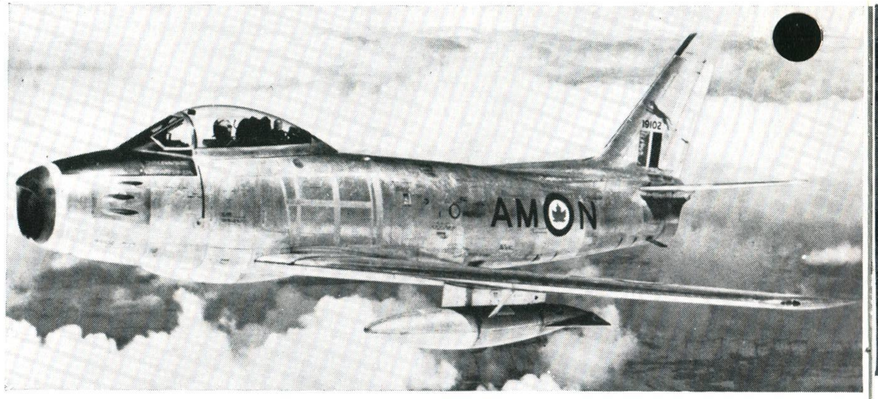
Since a large number was needed, licence production in Canada was intended. In 1949 an agreement was signed by North American Aviation and Canadair Ltd., of Montreal, to build an initial batch of 100 F-86A's. N.A.A. was to supply the drawings, and about 90% of the components were also delivered by the United States to Cartierville airport, near Montreal, where the final assembly was taking place. (When the Canadian Sabre production finally ended 85% of all components and the engines were produced in Canada.) There was an exchange of engineers and some 46,000 drawings were sent to Canadair.

The Canadian version of the F-86A received the designation CL-13 Sabre Mk. 1. It was identical with the F-86A-5 and was powered by a General Electric J47-GE-13 turbojet engine, producing 5,200 lb. static thrust. It carried the serial number *19101* and flew for the first time on 9th August 1950 from nearby Dorval airport, where it had been towed whilst the Cartierville runway was being extended. This was just a year after the contract had been signed, and a few days later it went supersonic for the first time. Meanwhile N.A.A. had developed the F-86E which offered better performance, thus the sole Mk. 1 was the only aircraft built in Canada to F-86A standards.

The second aircraft built by Canadair was a CL-13 Mk. 2, equivalent to the F-86E. It also used the J47-GE-13 engine, and 350 examples of this type were built, starting with serial number *19102*. The first F-86E flew on 23rd September 1950, and the first Sabre Mk. 2 followed just one month later in October 1950!

It was essentially similar to the Mk. 1 but had an "all-flying tailplane", which was introduced with the F-86E after careful flight testing of this new control system. Instead of the mechanically adjustable stabilizer for trim control of the F-86A, the F-86E's elevator and horizontal stabilizer were controlled

The first Sabre 2, 19102, in the early markings of No. 410 Sqn., No. 1 Wing, R.C.A.F. (Photo: R.C.A.F.)



and operated as one unit. The horizontal stabilizer was pivoted at its rear spar so that the leading edge was moved eight degrees up and down by normal stick movement. The elevator was mechanically linked to the stabilizer and moved proportionately to stabilizer movement. Elevator travel was slightly greater than stabilizer travel which became effective during the last portion of stick movement at the lowspeed range. The new system eliminated many undesirable compressibility effects, such as loss of control sensitivity at high Mach numbers, and more positive action and greater control effectiveness with less control surface movement were afforded by the controllable horizontal tail. It had no trim tabs as trimming was performed by changing the control stick's neutral position and thereby the angle of incidence of the horizontal tail plane. The irreversible hydraulic system eliminated the customary stick 'feel', rendering necessary the installation of an artificial 'feel' bungee system to provide the pilot with the necessary control force feelings. A new flat windshield was introduced with the F-86E-10 which was also adopted for the Canadian Sabres during the production process.

Meanwhile Orenda Engines Ltd. were working on a Canadian designed engine to match the Sabres airframe, and the first example, the Orenda 3, which delivered 6,000 lb. static thrust, was installed in the 100th production aircraft, *19200*, which became the sole Mk. 3 version. This engine was the prototype for the Orenda 10 production engine.

The Sabre Mk. 3 was used by Jacqueline Cochran to raise the women's speed record. She achieved 652·552 m.p.h. over a 100-kilometre course on 18th May 1953, and 675·471 m.p.h. over a 15-kilometre closed course on 3rd June 1953.

In 1952 the first example of the new production version, the Mk. 4, was completed. It introduced changes in the compass, cabin air conditioning system, pressurization controls and canopy release mechanism. The canopy could now be jettisoned separately in case of emergency landing, instead of only upon ejection. Beginning with the 555th production aircraft, the elevator trim actuator was moved from near amidships to the rear of the fuselage. Apart from these changes the Mk. 4 was similar to the N.A.A.-built F-86E.

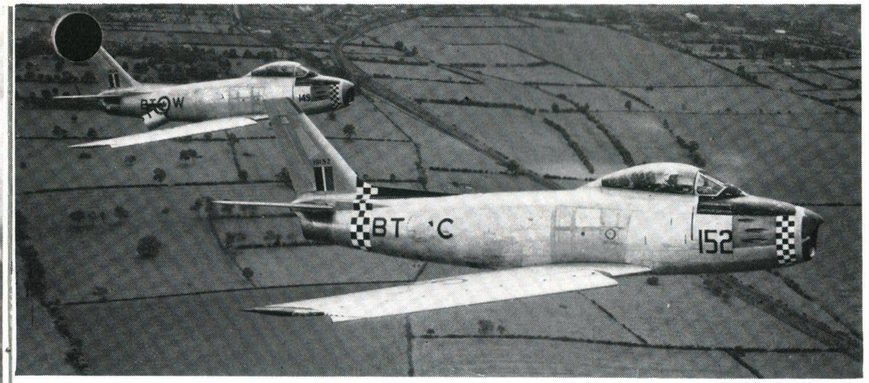
Following experience gained with early Sabres which had automatically extending wing slats, N.A.A. engineers were searching for means to improve the Sabre's high-altitude performance. At the suggestion of test pilots a fixed leading edge was tried which eliminated the drag-producing effects of the extended slats. Three test aircraft so modified showed immediate improvement. These fixed leading edge wings were extended six inches at the root and three inches at the tip and were often referred to as the '6-3' extension. Changes of airflow across the wing required the addition of five-inch high wing fences at 70% of the span, and wing area was increased from 287·9 to 302·3 square-feet. The most important advantage was the delay of buffeting at tight turns thus enabling the pilot to fly tighter turns at higher *g*-loads. It also gave slight improvement in speed and range. However it also brought along a disadvantage, losing the excellent low speed characteristics of the slatted wing, which were of special importance during the landing. The stalling speed increased from 111 knots to 125 knots, thus increasing approach speed and landing run. An undesirable yaw-and-roll effect prior to the stall also accompanied the modification.

Originally it was intended to equip the Mk. 4 with the Orenda engine, but this was changed in favour of similarity with the F-86E. The first version to use the new Orenda 10 engine, which delivered 6,355 lb. static thrust, was the CL-13A Sabre Mk. 5. This model, also called 'The Hard-edge Five', used the new '6-3' extended leading edge with wing fences. The

Sabre Mk. 5, manufacturers' number 1111, at the top of a loop during a production test flight. (Photo: via the author)

A section of Mk. 6 Sabres near St. Hubert, P.Q., in the summer of 1955, flown by pilots of No. 1 Overseas Ferry Unit. (Photo: R.C.A.F.)

Aircraft of No. 441 Sqn., No. 1 Wing, R.C.A.F. in the intermediate markings of 1952. (Photo: R.C.A.F.)



first Mk. 5, *23001*, was completed on 21st of July, 1953 and took the air for the first time a few days later on 30th of July. It had a clear advantage over the Mk. 2 by reaching 40,000 ft. in nine minutes, only half the time of its predecessor.

The Orenda engine was slightly larger in diameter than the J-47, necessitating enlargement of the frame openings over the engine bay, provision of different pick-up points, and some minor local structural changes. Empty weight was increased from 11,000 lbs. to 11,365 lbs., and loaded weight (clean) from 14,640 lbs. to 14,936 lbs. Sabre Mk. 5A was the designation applied to those aircraft in which certain radar and gun sight units had been removed and replaced by ballast.

On 20th April 1954 the 1,000th Canadair Sabre was completed, and the Mk. 5 version production run had reached a total of 370. It was followed by the last and best Canadian Sabre version, the CL-13B Sabre Mk. 6. This aircraft was equipped with the two-stage Orenda 14 engine, which delivered 7,275 lb. static thrust. The first example, *23371*, was completed on 2nd November, 1954, and climb rate and altitude performance were again considerably improved. Empty and loaded weights were less than those of the Mk. 5. With the exception of some early aircraft the Mk. 6 reverted to the slatted wing to combine its excellent low-speed characteristics with the advantage of the '6-3' leading edge. This, in combination with the weight saving and increased thrust of the Orenda 14, made the Mk. 6 the best of all Canadair-built Sabres. In fact it was the best version in overall performance of all Sabre versions built, including the FJ-4 Fury. For comparison, performance data for the Mk. 5 and Mk. 6 can be taken from a table appearing at the end of this *Profile*.

A total of 655 Mk. 6s were built, and the complete number of Sabres built by Canadair totalled 1,815, the last one being completed on 9th of October, 1958. 36 Mk. 6s ordered by Argentina were cancelled due to lack of foreign exchange, and 24 Mk. 6s intended for Israel were cancelled for political reasons.

SERVICE RECORD

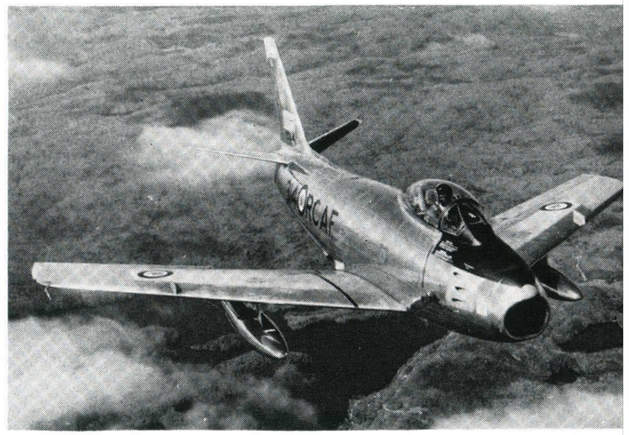
The Royal Canadian Air Force received the lion's share of the Canadair Sabres to form Canada's N.A.T.O. contingent in Europe, the No. 1 Air Division. It consisted of four day fighter wings, Nos. 1, 2, 3 and 4, each comprising three squadrons. The first Sabres coming off the assembly lines were delivered to No. 1 Wing with Nos. 410, 439 and 441 Squadrons as the initial part of the N.A.T.O. commitment.

New air bases for the R.C.A.F. had to be built: Marville and Gros Tenquin in France, and Zweibruecken and Soellingen in Germany. No. 1 Fighter Wing was the first wing to be sent overseas. It moved initially to North Luffenham in England as a temporary home base until its final station, Marville, was ready to receive the unit.

With the European commitment, the R.C.A.F. started a new scheme of sending its aircraft to the old world. After official formation of No. 1 Wing, on 1st of November 1951 at North Luffenham, and the preparation of the airfield to accommodate the whole wing, the time was ripe on 30th May, 1952 for a complete squadron of Sabres Mk. 2, No. 439, to take off from Uplands, outside Ottawa, to make the first leg of their Atlantic crossing to their new base. The operation was called 'Leap Frog One', and the first part of the route was *via* Bagotville, and Goose Bay, Labrador, where the actual ocean crossing began. Next stop was at Bluie West One, Greenland, then Keflavik, Iceland, and across to R.A.F. Kinloss in Scotland. The final leg was from there to North Luffenham. Despite some bad weather, which kept the squadron grounded during their trip for some days, the crossing was safely and successfully completed, and on 15th of June, 21 Sabres shut down their engines at North Luffenham for the first time. Only the Squadron's C.O. was forced to give up early during the crossing due to an attack of appendicitis.

This first Atlantic crossing acted as the pattern for many more crossings in both directions. The majority of the squadron's ground crew were flown over before the Sabres' departure, and other ground crews accompanied the Sabres to provide maintenance *en route*. Two days before their departure from Uplands the squadron was inspected by Defence Minister Claxton, who referred to their coming flight as " . . . one of the greatest demonstrations of teamwork yet to be found in any operation, civil or military."

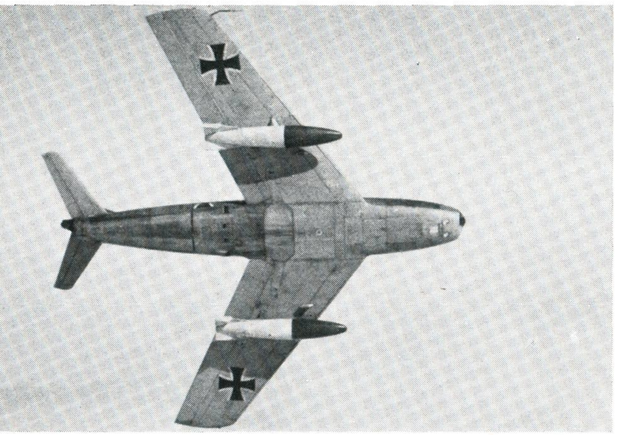
Sabre Mk. 5, 23314, over Ontario. (Photo: R.C.A.F.)



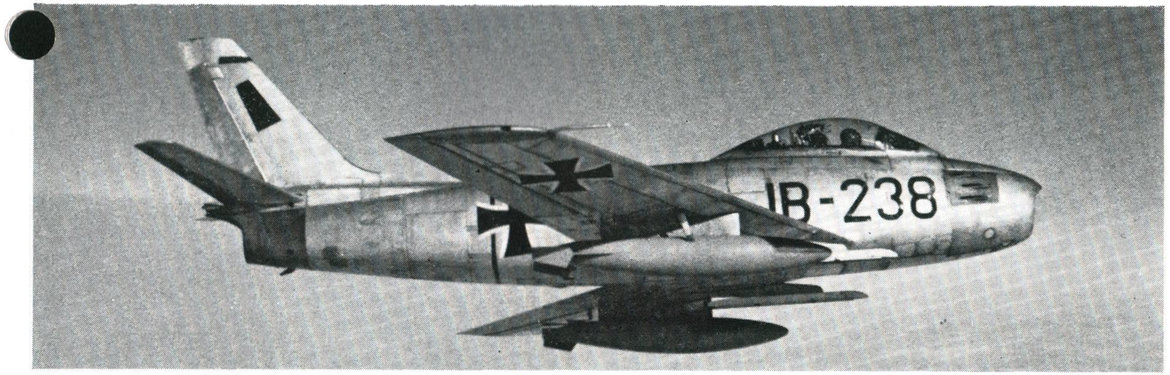
(Right, top) *a Sabre 6 in the red nose and tail flashes of 1* Staffel, *JG 71* "Richthofen"; (right, below) *yellow decoration at nose end tail identifies JB-238 of JG 72 as a 2* Staffel *machine.* (Photos: Stephen Peltz). (Below, left) *a Sabre Mk. 6 of JG 73 in flight.* (Photo: the author).

Arrival of 439 Sqn. brought the R.C.A.F.'s No. 1 Fighter Wing to its full complement of three Sabre squadrons. Aircraft for the first two squadrons (Nos. 410 and 441) made the ocean crossing aboard *H.M.C.S. Magnificent*. The example set by No. 439 Sqn. was soon to be followed as R.C.A.F. fighter strength in Europe was building up. No. 2 Wing, comprising Nos. 416, 421 and 430 Squadrons, flew its Sabres over the Atlantic to Gros Tenquin in October 1952; No. 3 Wing, Nos. 413, 427 and 434 Squadrons, flew to Zweibruecken early in 1953; and No. 4 Wing, Nos. 422, 414 and 444 Squadrons, made it to Soellingen in September 1953, bringing the Air Division up to its operational strength of about 300 Sabres. No. 1 Wing moved to Marville, their final home base, early in 1955.

When they first arrived in Europe the Canadian Sabres had a superior performance to any other N.A.T.O. aircraft and provided a powerful reinforcement for the alliance. Their main task was patrolling the Air Defence Identification Zone along the 'Iron Curtain' and standing 'Zulu alert' to intercept unidentified aircraft. In all exercises, especially gunnery competitions, the Canadian Sabres and their pilots proved again and again their superior qualities and remained to this standard to their last days, when the Sabres gave way to the CF-104. To maintain their performance margin, the original Sabre 2s and 4s were replaced early in 1954 by the Sabre 5, and these in turn gave way to the Mk. 6 at the end of 1956. None of the R.C.A.F. Sabre squadrons had remained in Canada after their formation, leaving air defence there solely to the CF-100, which eventually also replaced one of each European Fighter Wing's Sabre squadrons. In mid-1956 two non-regular units in Montreal, Nos. 401 and 438 Squadrons, received some of the discarded Sabre 5s, and later on six of the Auxiliary squadrons flew eight each of these fighters, together with Vampires, T-33s and Harvard Mk. 4s. Pilot training was given by the No. 1 (Fighter) O.T.U., the Sabre Transition Unit at Chatham, New Brunswick, which operates the last Sabres within the R.C.A.F. in order to provide pilots with experience in high subsonic performance and in low level tactics before they start flying the Mach-2 CF-104.



The direct ferrying of the Sabres for the Air Division to Europe led to the formation of a special unit for the purpose of bringing new aircraft from the manufacturer to the customer. This was No. 1 O.F.U. (Overseas Ferry Unit), R.C.A.F., which was formed in October 1953. This unit worked most successfully during its existence, using the route which was first tried by No. 439 Squadron until it was disbanded in June 1957 after the last Sabre 6 had been delivered to Europe and the last Sabre 5 had been flown back to Canada. More than 1,000 Sabres and T-33s were flown across the Atlantic without a single accident, the pilots of the O.F.U. setting a safety record for thousands of jet hours, a trans-Atlantic ferry record and also a cross-Canada speed record. The latter was set by two pilots of the O.F.U., F/L. Ralph Annis and F/O. R. J. 'Chick' Childerhose, on 29th August 1956, when they flew their Sabres from



This natural-metal-finish Sabre 6 of JG 72 is fitted with Sidewinder launch rails inboard of the drop-tanks. (Photo: via the author)

Vancouver to Halifax, Nova Scotia, in five hours and 30 seconds with one intermediate landing at Gimli for refuelling which was completed in nine minutes.

THE CL-13 FOR EXPORT

Sixty Sabres of the Mk. 2 version were delivered to the U.S.A.F. in 1952 to accelerate the build-up of fighter strength in Korea. They were built by Canadair on contract AF-9386 and served with 4th and 51st Wings, and later with Air National Guard units.

The next nation to use the Canadair Sabre was Great Britain, where it was decided in 1952, despite some criticism, to adopt it until the first British swept wing jet fighter became available. The R.A.F. received 430 Sabres, both Mk. 2 and Mk. 4 aircraft, under M.D.A.P. funds. The first three Mk. 2s with R.C.A.F. serials *19378*, *19384* and *19404*) arrived at Prestwick, Scotland, in October 1952. They, and the others to follow, were flown to England by No. 1 Long Range Ferry Unit (later No. 147 Sqn.) of Transport Command in an operation known as 'Bechers Brook', which lasted from 8th December 1952 to 19th December 1953. The first batch was handed over to the R.A F. in a ceremony at Abingdon in January 1953, and in May shortly before the end of the Korean war, Nos. 3, 67 and 71 Sqns. were the first units to receive the type, thus becoming the first swept wing R.A.F. fighter squadrons. Most of the Sabres went to ten R.A.F. squadrons in Germany (Nos. 3, 4, 20, 26, 67, 71, 93, 112, 130 and 234) as part of N.A.T.O. Second A.T.A.F., but two U.K.-based fighter command squadrons, Nos. 66 and 92, were also flying Sabres. They gave the R.A.F. a fighter in the 700 m.p.h. class at a critical period when East-West relations were tense. In the spring of 1955 the first Hunters arrived in Germany, gradually replacing the Sabres, and by the end of June 1956 all the Sabres had been replaced by Hunters, the last to leave being *XB670* of No. 3 Squadron.

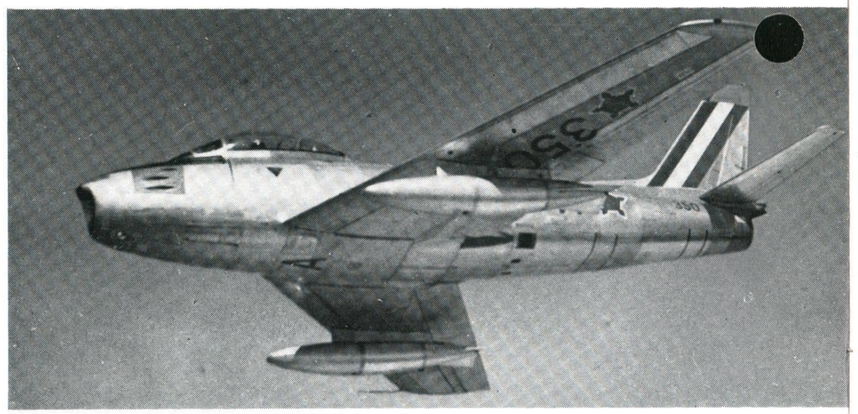
As the newer Mk. 5 and Mk. 6 Sabres became available for the R.C.A.F., most Mk. 2s and 4s were fitted with '6-3' extended leading edge wings and otherwise modernized. They were then designated F-86E(M)—the 'M' denoting modified—and under the M.D.A.P. programme delivered to other N.A.T.O. nations. Beginning in July 1954, Greece received 104, and Turkey 105, of these fighters. Most of the ex-R.A.F. Sabres were also transferred to other European nations, with 180 going to Italy and 121 to Yugoslavia. Italian units using the Sabre included the *4ª Aerobrigata*, comprising the *9°*, *10°* and *12° Gruppi*, and the *2° Stormo*. These Sabres reached international fame with thrilling displays executed by the various aerobatic teams of the I.A.F., the R.H.A.F. and T.A.F., and in Canada Sabres were used by the R.C.A.F.'s 'Golden Hawks' aerobatic team which was disbanded after having finally used the Mk. 6.

The Mk. 6 version was also exported. Six aircraft were built for Colombia, and delivered in June 1956. Thirty-four Mk. 6s were completed for South Africa, where they equipped Nos. 1 and 2 Squadrons until their replacement in 1964 by the Mirage IIICZ.

Largest foreign customer, apart from the R.A.F., was West Germany. This country received the final Mk. 6 production batch of 225 aircraft which equipped three day fighter wings, JG 71 'Richthofen', JG 72 and JG 73. Pilot training was provided by *Waffenschule* 10 in Oldenburg. When the F-104G (see *Profile* No. 131) became available JG 71 exchanged all its Sabres for the new type, but JG 72

Scramble take-off by four Mk. 6's of No. 434 Sqn., No. 3 Wing, R.C.A.F., at Zweibrucken, Germany. (Photo: via the author)

The first of 34 Sabre Mk. 6's purchased by South Africa; and (below) *a line-up of S.A.A.F. Sabres of No. 2 Squadron at Watercloof Air Station in Pretoria.*
(Photos: via the author, and S.A.A.F. Official)



and 73 continued to use Sabres in the fighter-bomber rôle with one squadron each, the other squadrons using the Fiat G-91R3 (see *Profile* No. 119). Both units' designations were changed to JABO G (for *Jagdbombergeschwader*) 43 and 42 respectively, and a number of Sabre 6s are still flying at the time of writing. Germany also received 75 Mk. 5s, which were primarily used by WS 10 for conversion training*. During 1966 ninety surplus Sabres Mk. 6 were sold by Germany to the Imperial Iranian Air Force.

MODIFICATIONS AND DEVELOPMENTS

Canadair had also worked on further developments of the Sabre to increase its production and extend its usefulness. One of these projects was the CL-13C. This was a Sabre 6 using an afterburner. One aircraft was test-flown with such an afterburner at the National Aeronautical Establishment, and the last ten Sabre 6s for the Luftwaffe were in fact held back by Canadair for possible use in the test programme before being delivered to Germany about a year after the others.

The CL-13D was another suggested variant, which was to have an Armstrong-Siddeley Snarler rocket motor, while the CL-13E was the 21st Mk. 5 with the fuselage faired to the so-called 'Coke Bottle Shape' to test an application of the area rule. This last variant was said to show no discernible improvement in performance.

Other projects were the CL-13G, a two-seat training version similar to the American TF-86F; the CL-13H, with all-weather radar equipment, and the CL-13J, which was to utilize a simplified Bristol Siddeley afterburner for better climb and acceleration. None of these variants however passed the design stage, and the Mk. 6 remained the final production version.

A number of aircraft were modified for various purposes. One of the R.A.F. Sabres, *XB982*, had a Bristol Siddeley Orpheus engine installed and was test-flown in 1958. A number of German Mk. 6s were equipped with Sidewinder rocket-launching rails, mounted between drop tank and fuselage. The Sabres Mk. 6 of JG 71, JG 72 and WS 10 of the Luftwaffe were equipped with Mk. 5 Martin Baker ejection seats. (This modification was first introduced in the F-86F's of the Norwegian Air Force). The installation required some minor changes in the cockpit and a new canopy opening and lock mechanism. Ejection is through the plexiglass of the canopy. Another modification applied to a few of Germany's Mk. 6s was the installation of Del Mar RADOP weapons training systems. This consists of a wing-mounted launcher, a radar reflective, lightweight tow

When the F-104G Super Starfighter became available, the day fighter wings JG 72 and JG73 were redesignated as Jagdbombergeschwader (*fighter bomber wings*) *and continued to operate the Sabre Mk. 6 in this rôle under the designations* Jabo *43 and* Jabo *42 respectively. JC-121 displays the early markings of* Jabo *42, and JC-362 the unit's latest style with black identification codes outlined in white. A colour illustration of the fin insignia may be found on page 11 of this* Profile.
(Photos: Stephen Peltz, and the author)

* *For a relatively short period.*

target and a tow reel for high speed target towing. The tow target can be extended to a maximum length of about 25,000 feet at speeds up to 400 Kts. or Mach 0·9. Aircraft thus equipped have been handed over to a civil contractor and are flying with civil registrations. They are probably the only jet fighters so far to be entirely used by a civilian operator and for some years to come will be the last Sabres flying in Germany.

THE SABRE DESCRIBED

The following description applies to the Mk. 6, principal differences between earlier Marks having been discussed in the preceding text. The Canadair Sabre was primarily designed as a single-seat, high speed, high-altitude day fighter, characterized by a swept back wing and empennage, but has also been used to attack ground or naval objectives with gunfire, bombs, chemicals or rockets.

The wing is a cantilever monoplane featuring a modified NACA 0012-64 wing section. Its depth is 10·8 ft. at the root (fuselage centre line) and 5·4 ft. at the tip, with maximum thickness at 50 per cent. chord. Sweep back is 35° 41′ along 25 per cent. chord line. Dihedral is 3 degrees and wing area is 287·9 square feet. Automatically extending leading edge slats are fitted, extension depending on airspeed and angle of attack.

The fuselage is an all-metal, flush-riveted, stressed-skin structure of oval section with hydraulically-operated lateral dive brakes, which open within two seconds. The tail is a cantilever monoplane, all-metal structure with 35 degrees sweep back on all three surfaces. The horizontal stabilizers have 10 degrees dihedral.

The pilot is protected fore and aft by armour-plate bulkheads. Powerplant is the Orenda 14 axial-flow,

Mk. 5's of the R.C.A.F. aerobatic team "The Golden Hawks" in their earlier colour scheme and (below) *the team's latest marking style, with "GH" fin monogram.*
(Photos: R.C.A.F. and Stephen Peltz)

An F-86E(M), ex-Mk. 4, of the Italian Aeronautica Militare *in the markings of the* Lanceri Neri *aerobatic team.*
(Photo: via the author)

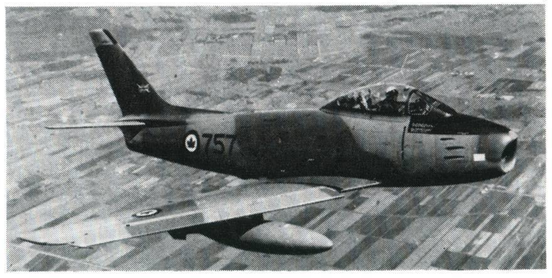
turbo-jet engine, providing approximately 7,275 lb. static thrust at sea level. An electric starter-generator unit is provided for starting on an external power source. The engine fuel system consists of two engine-driven variable-delivery pumps, a proportional flow control unit, acceleration control unit, jet pipe temperature limiter and other components. Engine requirements are sensed through a servo-mechanism which controls pump delivery according to throttle opening. Ram pressure and altitude are also controlling factors. An emergency fuel system is also installed, providing manual control of the fuel flow upon being set in operation by a switch in the cockpit.

The aircraft fuel system consists of five self-sealing fuel cells; two in the fuselage, one in the centre wing section and one in each outer wing panel. Fuel is supplied by gravity feed from internal cells to the centre wing cell and to the engine. Two fuel booster pumps in the centre tank normally supply fuel under pressure to the engine fuel system.

The main fuel supply can be augmented by installing a 120-U.S. Gall. or 200-U.S. Gall. drop tank under each wing, from where it is forced to the forward fuel

Mk. 5 Sabres of the R.C.A.F.'s No. 2 Wing at Gros Tenquin, France; 'AS' code indicates No. 416 Sqn., 'BH' No. 430 Sqn.
(Photo: R.C.A.F.)

A low-speed study of a Sabre 6; note partially extended wing slats. (Photo: R.C.A.F.)



SERIAL NUMBERS FOR CANADAIR SABRES

Type	Manufacturing No.	R.C.A.F. serial No.	Other Serial No.
Sabre Mk. 1	1	*19101*	
Sabre Mk. 2	2-199, 201-352	*19102-19199 19201-19452*	60 of these were delivered to U.S.A.F. receiving U.S.A.F. Serial Nos. *52-2833 to 52-2892*
Sabre Mk. 3	100	*19200*	
Sabre Mk. 4	353-790	*19453-19890*	
Sabre Mk. 5	791-1160	*23001-23370*	
Sabre Mk. 6 for R.C.A.F.	1161-1590	*23371-23760*	
Sabre Mk. 6 for Luftwaffe	1591-1815		
Sabre Mk. 6 for Colombia			*2021-2026*
Sabre Mk. 6 for S. Africa			*350-383*

R.A.F. serial numbers for Mk. 2 and 4 aircraft delivered to the R.A.F.:— *XB530-XB550, XB575-XB603, XB608-XB646, XB664-XB713, XB726-XB769, XB790-XB839, XB856-XB905, XB941-XB990, XD102-XD138, XD706-XD736, XD753-XD781.*

cell by compressed air drawn from the engine compressor section.

Three separate hydraulic systems are provided: utility, normal flight control and alternate flight control. The utility system is powered by an engine-driven pump and supplies the landing gear, speed brakes, nose wheel steering and wheel brakes.

The landing gear and wheel fairing doors are hydraulically actuated and electrically controlled and sequenced. Upon raising the gear handle to UP-position the main gear doors and the nose gear door open and close automatically when the gears are retracted. For lowering the gear sequence is similar.

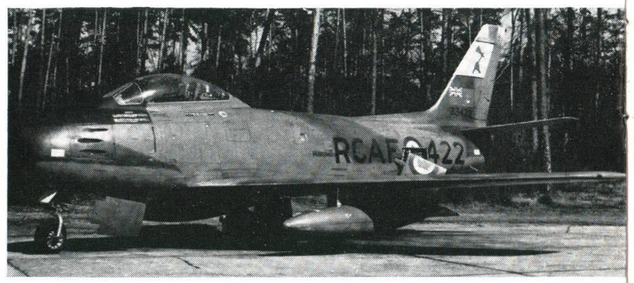
The normal flight control system is also powered by the engine-driven pump and operates the ailerons and horizontal tail surfaces. The alternate flight control system is powered by an electrically-driven pump and operates the ailerons and horizontal tail surfaces in the event of normal system failure. The rudder is cable-operated and is provided with an electrically actuated trim tab. In emergency the main landing gear is lowered by gravity and the nose gear by an emergency accumulator. The nose wheel steering system is electrically engaged by depressing a switch on the control stick grip and hydraulically powered and controlled by the rudder pedals.

Electric power is provided by a 28-volt, 400 ampere engine-driven d.c. generator. A 24-volt, 36 ampere-hour battery serves as a stand-by source. A main and an alternate three-phase inverter supplies alternate current to the flight instruments.

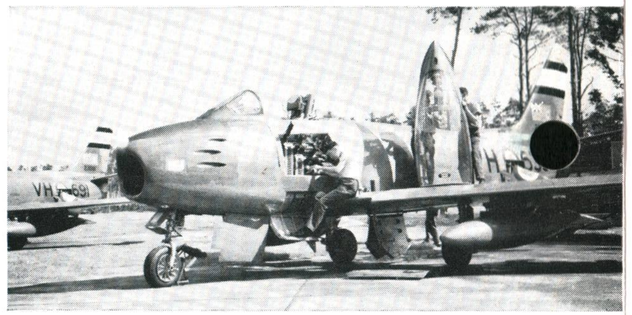
Electrically-operated slotted-type wing flaps are fitted. Each flap is actuated by its own electric motors and circuits. They are mechanically interconnected to prevent uneven operation and to provide protective operation should one motor fail.

The Sabre is equipped with conventional navigation lights. For night operation two retractable lights are located in the fuselage nose. They are controlled by a switch on the left forward console. When the

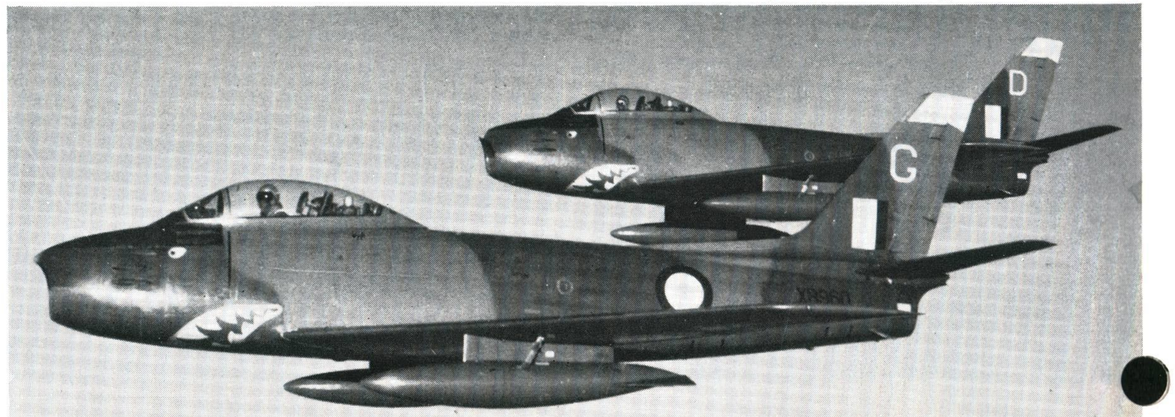
In the foreground, a Sabre Mk. 6 of No. 410 Sqn., No. 1 Wing, R.C.A.F.; in the background can be seen the tails of two No. 439 Sqn. aircraft. The wing was originally based at North Luffenham in England while its facility at Marville, France, was being prepared. (Photo: Stephen Peltz)



The R.C.A.F.'s No. 4 Wing arrived at its Soellingen base in September 1953; shown here are machines of (above) *No. 422 Sqn., and* (below) *No. 414 Sqn.; the latter was photographed in 1958.* (Photos: Stephen Peltz and R.C.A.F.)



(Below) *Sabre Mk. 4's of the R.A.F.'s famous "Shark Squadron", No. 112, were based at Bruggen, Germany with the 2nd Tactical Air Force.* (Photo: Air Ministry/Ministry of Defence)



Two of the squadrons based at Gros Tenquin, France, with No. 2 Wing R.C.A.F. were (above) *No. 421 and* (below) *No. 430.*
(Photos: R.C.A.F. and Stephen Peltz)

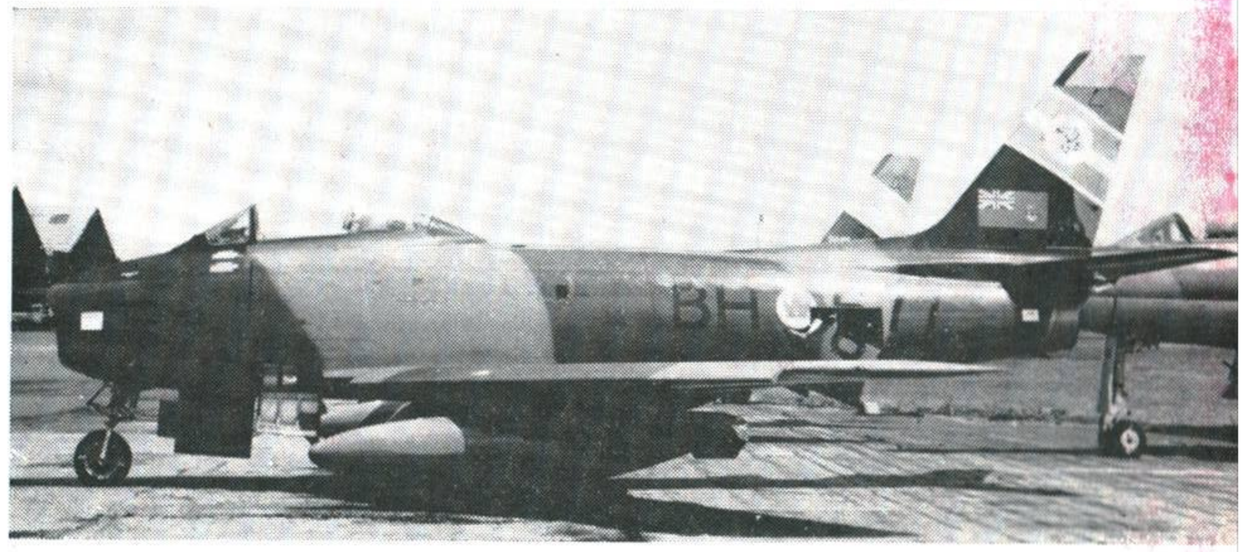
switch is at EXTEND, both lights illuminate and extend to landing position. When the aircraft touches the ground, the landing light goes out and the taxi light extends further to taxiing position. Both lights are automatically extinguished when in the retracted position.

The canopy is electrically operated, controllable from inside and outside and can be jettisoned in case of emergency. In-flight opening is possible up to 215 Kts.

Eighth-stage air from the engine compressor is delivered to the cockpit at selected temperatures for heating, ventilation and pressurization. Above 12,500 ft. a 2·75 p.s.i. or a 5 p.s.i. pressure differential schedule is available. For breathing, a low pressure oxygen system with normal minimum pressure of 400 p.s.i. is provided.

The communication equipment consisted initially of the following: an AN/ARC-502 V.H.F. transmitter-receiver, an AN/ARN-6 radio compass and an APX-6 I.F.F.-radar. This was later changed, and German Sabres were modernized by installing UHF radio and ultimately TACAN navigation equipment.

For its operational use the aircraft is equipped with an A-4 gun-bomb-rocket sight. Range data for gunnery operation is supplied to the sight by AN/APG-501 radar ranging equipment or by pilot-operated manual range control. Three ·50-calibre machine guns are mounted on each side of the engine air intake. (This armament set has been standard on all marks of Canadair Sabres). Three hundred rounds of ammunition may be carried for each gun, although the normal load is 267 rounds. A pneu-



matically-operated gun charging system is installed. A removable bomb rack can be installed on the lower surface of each outer wing panel. Each rack will carry single bombs from 100 to 1,000 lb., bomb clusters up to 500 lb. size, a chemical tank, or one fragmentation bomb rack assembly. The A-4 sight is used for bomb sighting and automatic bomb release. Controls are provided for normal and emergency release of either demolition or fragmentation bombs. Alternatively eight rockets may be carried under each wing on four removable rocket launchers, each holding two rockets one above the other.

Canadair Sabres have formed the backbone of R.C.A.F. fighter strength for several years. Sabres have seen, and still do see, service in many parts of the world, under many flags, and have earned an unrivalled reputation for excellence in performance and dependability; their flying characteristics are superb, and no pilot who ever took a Sabre up into the air has judged it other than enthusiastically.

© *Gerhard Joos, 1967.*

LEADING PARTICULARS

	Mk. 5	Mk. 6
Over-all demensions:		
Wing span	37·1 ft.	37·1 ft.
Length	37·5 ft.	37·5 ft.
Height	14·7 ft.	14·7 ft.
Weights—approximate:		
Empty—clean a/c	11,365 lb.	10,850 lb.
Loaded—clean a/c (full fuel, oil, ammunition and pilot)	14,936 lb.	14,370 lb.
with two 120 U.S.-gall. drop tanks	16,704 lb.	16,135 lb.
with two 200 U.S.-gall. drop tanks	17,881 lb.	17,315 lb.
Total internal fuel	429 U.S.-galls.	429 U.S.-galls.
Power plant	One Orenda 10 providing 5,870 lb.s.t. at sea level	One Orenda 14 providing 7,275 lb.s.t. at sea level
Performance:		
Take off run (clean a/c, + 15°C., sea level, no wind)	1,850 ft.	1,150 ft.
Normal rate of climb, conditions as above at 93% r.p.m. engine power	5,900 ft./min.	6,900 ft./min.
Climbing time to 40,000 feet	12·5 min.	10 min.
Military-power rate of climb at 97·5% r.p.m. engine power	8,100 ft./min.	9,800 ft./min.
Climbing time to 40,000 feet	7·5 min.	7 min.
Maximum power rate of climb at 100% r.p.m. engine power	9,700 ft./min.	11,800 ft./min.
Climbing time to 40,000 feet	6·5 min.	6 min.
Landing distance	2,150 ft.	1,850 ft.
Maximum range with two 200 U.S.-gall. drop tanks at 40,000 feet	1,220 air ml.	1,550 air ml.
Stalling speed with 1,500 lbs. of fuel, power off	105 kts.	99 kts.
Final speed with 1,500 lbs. of fuel, power off	145 kts.	135 kts.

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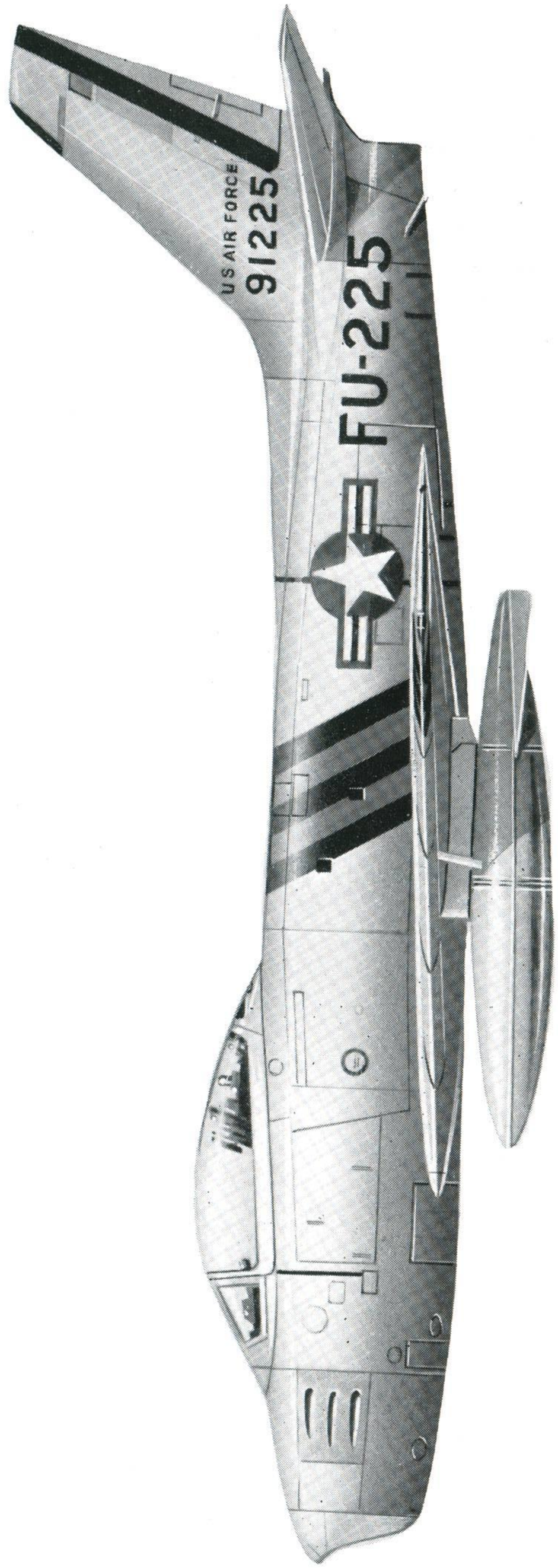
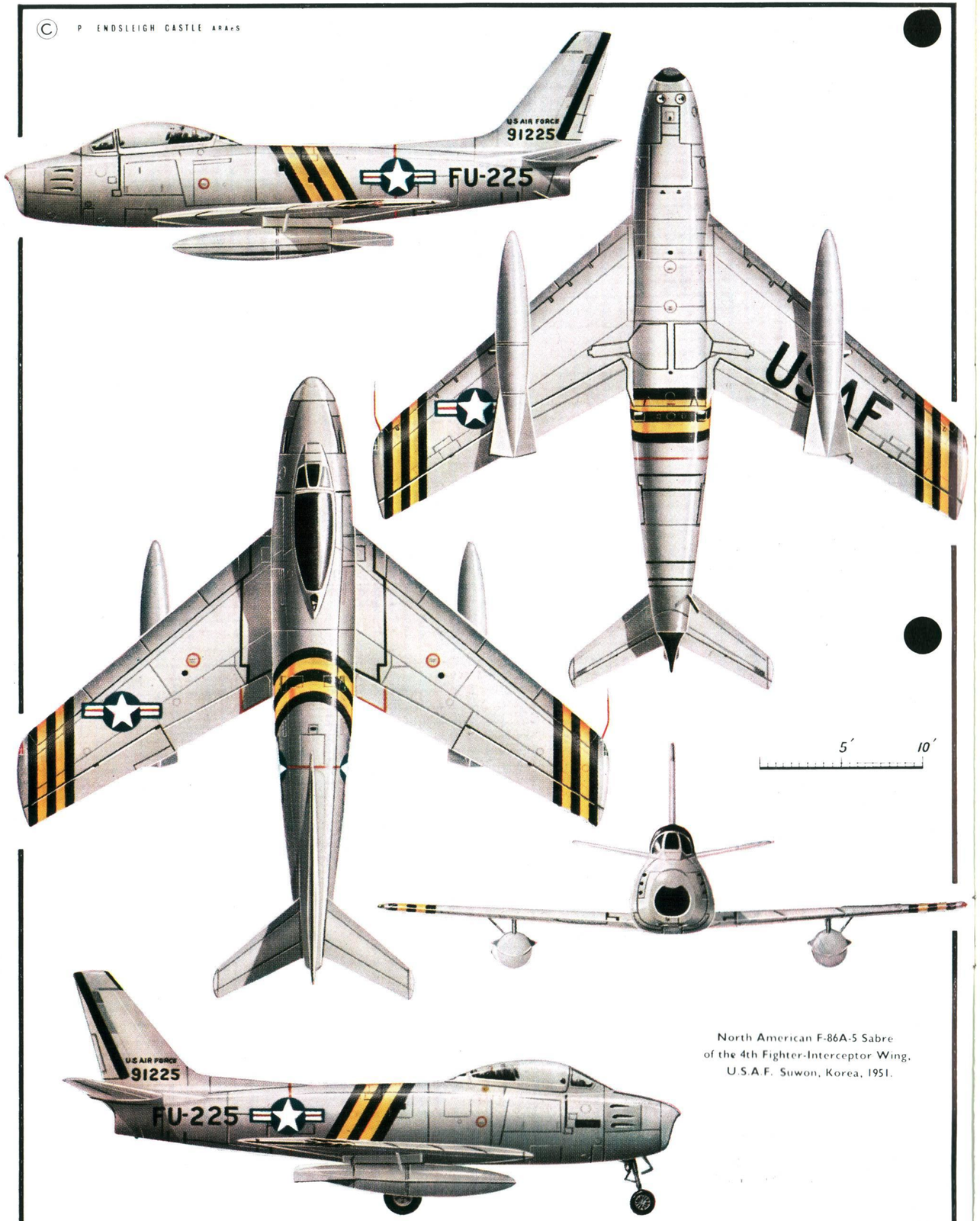
PROFILE PUBLICATIONS

The North American F-86A Sabre



NUMBER 20

TWO SHILLINGS



North American F-86A-5 Sabre of the 4th Fighter-Interceptor Wing, U.S.A.F. Suwon, Korea, 1951.

The North American F-86A Sabre

by Edward Shacklady

Main armament of the F-86A Sabre was six ·50 machine guns grouped in the nose section, but various underwing loads could be carried as may be seen by the selection in this photograph.

Few warplanes make history, but those that do are remembered long after their deeds are forgotten. Prime examples are Great Britain's Supermarine Spitfire and Hawker Hurricane; Germany's Messerschmitt Me 109 and Focke-Wulf Fw 190, and Japan's A6M1-3, better known by its wartime appellation of Zero. All these famous fighters had one thing in common—they were designed and built for a war that had been anticipated by the world's major powers for at least three years. And, when World War II finally exploded upon a waiting world in September 1939, this fighting quintet was in full production and awaiting testing in a bitter struggle that took nearly six years to decide.

One of the greatest warplanes of the years of uneasy peace that followed the end of World War II in 1945, was not specifically built for the conflict in which it played such a decisive part, but was, in fact, a development of a jet fighter ordered for the U.S. Navy.

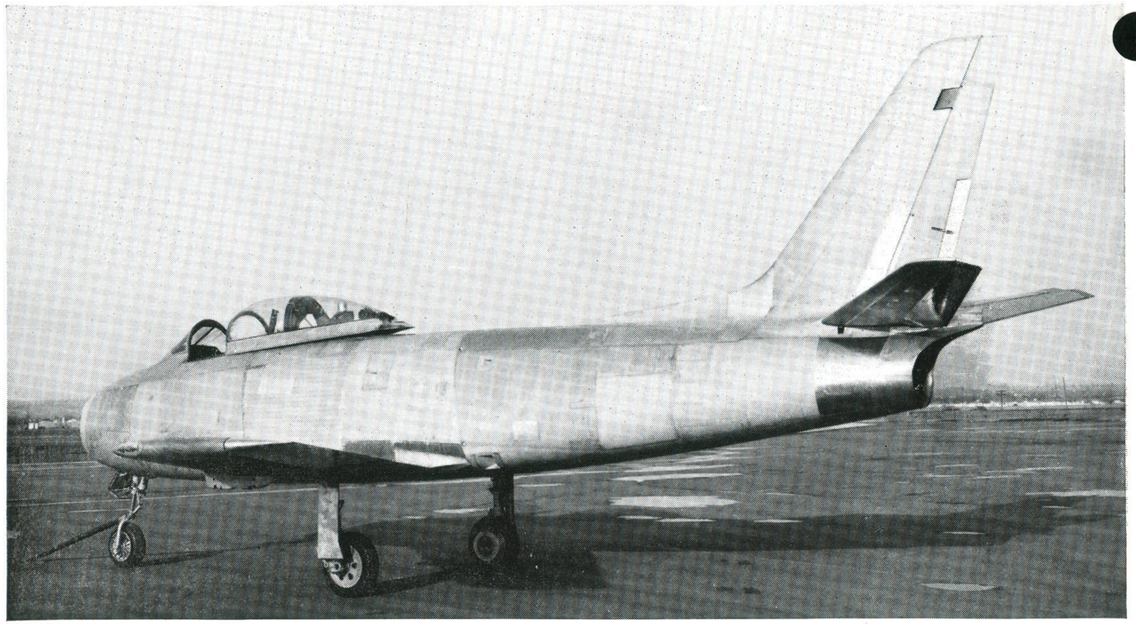
In late autumn, 1944, the North American Aviation Company was engaged in the design of their first jet-propelled fighter, the NA-134, or XFJ-1, for the U.S. Navy. At about the same period the U.S. Air Force had issued a requirement for a medium-range day fighter, which could also be utilised as an escort fighter and, of all things, a dive bomber. A proposed variant of the XFJ-1 minus its naval equipment was offered to the Air Force, which on 18th May 1945, authorised construction of three aircraft under the designation XP-86. The XP-86, like its stablemate, had a straight, thin section wing set low on the fuselage, which was tubby and featured a straight through flow of air from nose intake to jet exhaust under a straight tailplane.

A mock-up of the aircraft was constructed and Air Force approval received in June. Salient details included a wing span of 38·2 feet, a length of 35·5 feet, and a height of 13·2 feet. At a gross weight of 11,500 lb. a maximum speed at sea level of 574 m.p.h. was estimated. But the specification had called for a speed of at least 600 m.p.h. for the Air Force already had nearing completion the Republic XP-84 Thunderjet possessing a speed of 587 m.p.h. It appeared that the XP-86 would remain just a drawing board design.

DESIGN CHANGES

At about this period, however, the North American P-86 design team, headed by L. P. Greene, became interested in captured German wind tunnel reports on the advantages of wing sweep-back. These reports were discovered amongst a mass of scientific data collected by the Allied armies swarming over a defeated Germany. The reports showed that whereas a straight-winged aeroplane was severely affected by compressibility as sonic speed was approached, a swept-wing delayed the effects of shock waves thus permitting control at higher speeds. One major defect, however, was the problem of low-speed stability.

Armed with this knowledge North American constructed a scale wind-tunnel model, subsequent tests revealing that the swept-wing raised the limiting Mach number to ·875. A new design study for a swept-wing XP-86 was submitted to the Air Force, which swiftly approved the proposal. This



The prototype XP-86 on roll-out.

important decision was to have a decided effect on the outcome of the Korean War that began five years later in June 1950.

The sweeping changes to the design called for by the new wing resulted in a radically different aeroplane from that originally planned, and more than one thousand trials with the wing were undertaken by North American in their subsonic wind tunnel. A Messerschmitt Me 262A wing was studied in order to adopt the leading-edge slots for the XP-86 wing in an effort to overcome low-speed stability problems, but they proved unsuitable, and eventually a completely new automatic slat had to be developed.

The first of three prototypes serialled 45-59597 was completed on 8th August 1947, and it was powered by a Chevrolet-built General Electric J-35-C-3 engine developing 4,000 lb. static thrust. Taxiing trials took several weeks and on 1st October the XP-86 took to the air for its maiden flight with North American test pilot George Welch at the controls, just thirteen weeks before its would-be adversary, the Russian MiG-15, left the ground for its first flight. On 26th April 1948 the prototype exceeded Mach One for the first time in a shallow dive. Later production aircraft were limited for safety reasons to Mach ·95, 669 m.p.h. The prototype was officially delivered to the Air Force on 30th November 1948, and was followed shortly afterwards by 598 and 599.

PRODUCTION BEGINS

Like the majority of modern fighters production of the P-86A (or F-86A as it became later when the U.S.A.F. changed the P for Pursuit to F for Fighter) had been planned long before the prototype's first flight, a production contract for 33 aircraft having been approved during December 1946. Engineering drawings were released to the North American Los Angeles Division shops in June 1947, and the first production F-86A-1-NA, serial 47-605, made its first flight on 20th May 1948. Production aircraft had the new General Electric J-47 engine and three ·50 calibre machine guns installed on either side of the pilot's cockpit. The first and second production aircraft 605 and 606 were officially accepted by the U.S.A.F. on 28th May, and by March the following year the final machine 47-637 had been delivered.

While the first production F-86s were under construction North American's design team was working on a U.S.A.F. requirement for larger tyres and had drawn up a scheme for a fuselage seven inches wider in order to accommodate them. The second production order of F-86s was for 188 of the modified aircraft and they were given the designation F-86B. Fortunately, higher pressure tyre design did away with the need for larger tyres, and the F-86B with the wider fuselage never went into production. The contract for 188 86Bs was transferred to the F-86A-5-NA at the suggestion of North American to the Air Force.

Deliveries of the A-5 with the new General Electric J-47 engine of 5,200 lb. thrust began in late March 1949 when 48-129 was accepted by the Air Force. The A-5 differed externally from the A-1 in having a V-shaped instead of rounded windscreen, and in place of the flush-fitted, automatic gun-muzzle doors of the earlier machines which opened and closed when the machine guns were fired, plastic plugs were installed. These were blasted clear with the first shots.

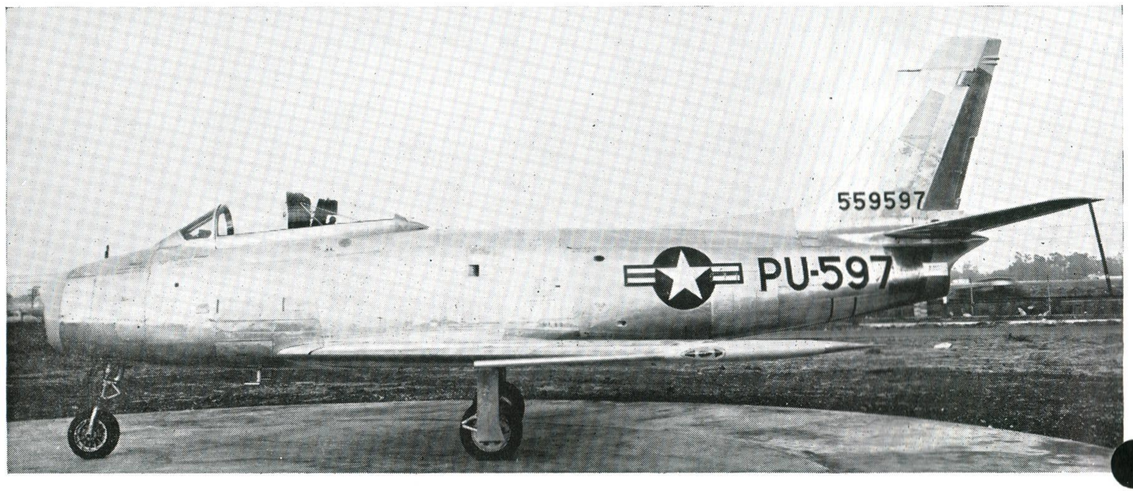
Performance-wise the F-86A-5 was far in advance of other jet fighters of the period, possessing a maximum sea-level speed of 679 m.p.h., a service ceiling of 48,000 feet, and an initial climb rate of 7,470 feet per minute. In common with contemporary American fighters it was armed with six ·50 M-3 machine guns with a rate of fire of approximately 1,100 rounds per minute. Ammunition supply was 267 rounds per gun.

The guns were aimed with the aid of a Mark 18 sight, a lead computing device that included both a gyro and fixed sighting system. When a target was identified the span selector lever was set to correspond with the aircraft's span, and when the target appeared within a circle of six diamond images on the reflector the range control was rotated until the circle diameter was identical in size to the target. With the target thus framed for one second the gun sight automatically completed the required lead and the guns were fired. A more advanced sight, the A-1CM, was coupled with an AN/APG-30 radar installed in the upper air intake lip of later production Sabres.

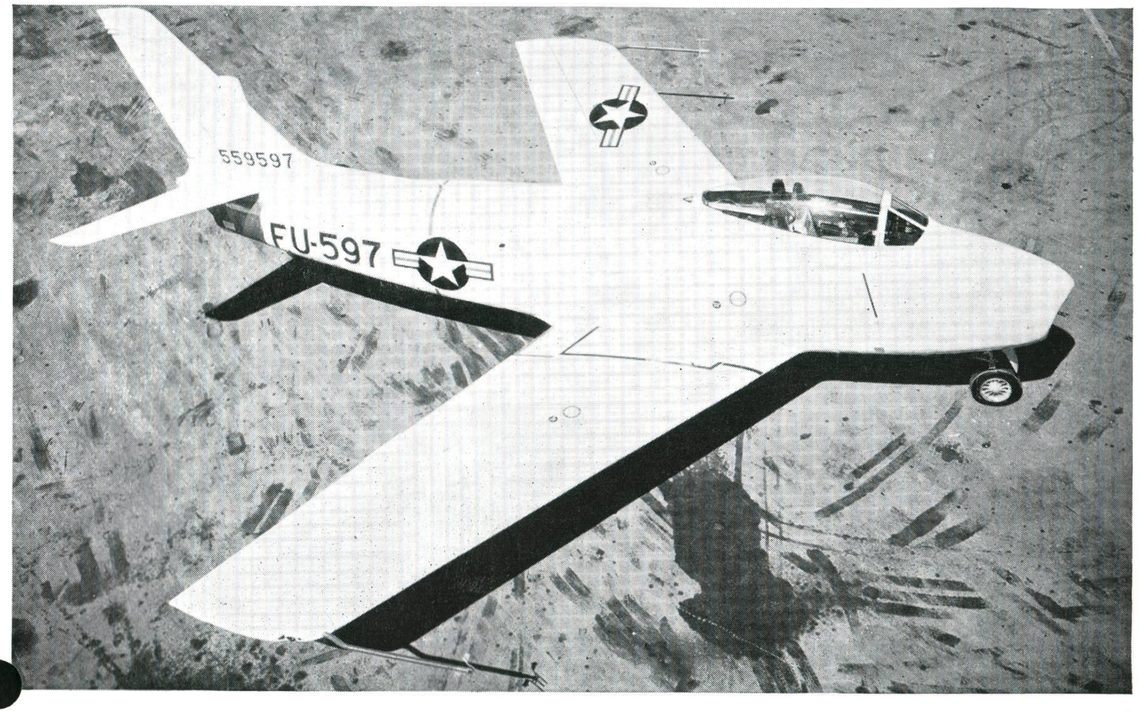
THE SABRE DESCRIBED

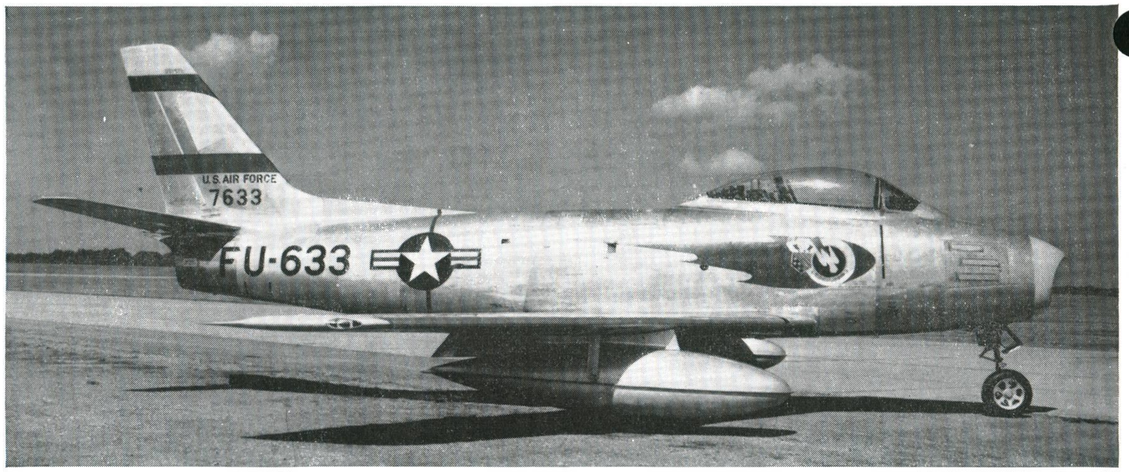
The F-86A Sabre was a low-wing cantilever monoplane featuring a modified N.A.C.A. 0012-64 (root), 0011-64 (tip) wing section. Maximum thickness at 50 per cent chord and 35° sweep-back along 25 per cent chord line. Structurally the wing con-

The prototype, now bearing national insignia and serial numbers.



The prototype F-86A (XP-86) in the white overall finish applied for early trials.





F-86A Sabre of the 71st Squadron, First Group. Note Group emblem aft of squadron emblem.

sisted of two spars with upper and lower skins, each of which was a sandwich of two sheets milled to tapering thickness separated by hat section extrusions. The whole formed a torsion-box structure. Split flaps were carried inboard of the ailerons. Wing area 287·9 sq. ft.

Fuselage was an oval section, all metal, flush riveted, stressed skin structure with lateral airbrakes on each side of the fuselage. Tail unit was a cantilever monoplane, all-metal structure with 35° sweep-back on all three surfaces. The "flying-tail" elevator and tailplane were geared together and moved differentially with movements of the control column to provide in-flight trim.

First U.S.A.F. combat organisation to receive the F-86 was the First Fighter Group at March Air Force Base, California. The 9th Squadron, the famed "Hat in the Ring" outfit of World War I fame, becoming the first F-86A tactical squadron, taking delivery of its aircraft in February and March 1949. The 27th and 71st Squadrons were equipped next and by the end of May the Group had accepted delivery of 83 aircraft.

As yet the F-86 was unnamed and the First Fighter Group sponsored a contest in February for this purpose. Seventy-eight names were submitted, the best of these was deemed to be "Sabre", the name becoming official on 4th March 1949.

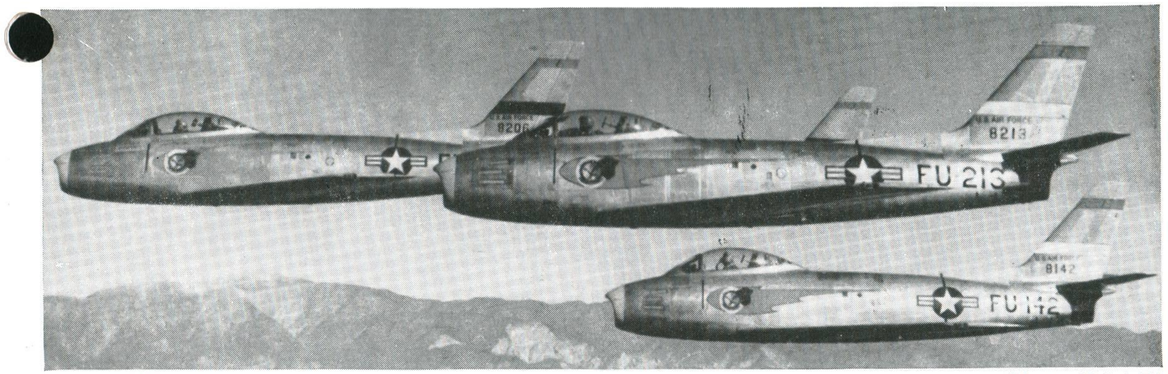
CANADA'S F-86A

Development of the Sabre had been watched with great interest by the Royal Canadian Air Force, and in early 1949 the Canadian Government decided to obtain a licence to manufacture the American fighter. In August of that year an order for 100 aircraft was placed with the Canadair Company under the designation of CL-13, Sabre Mk. 1.

It had been intended that the F-86A would be built by Canadair, and the first Sabre off the production was in fact an 'A' bearing the serial number 191-010. It flew for the first time on 9th August 1950, piloted by A. J. Lilly, just one year after the contract with North American Aviation had been signed, and one month before the fighter was to meet the MiG-15 in combat over Korea.

By August 1949, however, North American was building the improved F-86E which had the "all-

First squadron to receive F-86A-1s was the First Group's "Hat in the Ring" 94th Squadron of World War I fame.



Sabres of 27 Squadron, First Group. (Photo: U.S.A.F.)

flying" tailplane, and Canadair introduced this major modification on the aircraft on their production line and built only one 86A. Almost 90 per cent of the 15,000 components were obtained from the United States for the Canadian aircraft industry lacked the facilities and technicians to produce them, but by 1956 almost 85 per cent of the Canadian Sabre was produced in the Dominion.

THE SABRE IN KOREA

As previously mentioned the Sabre was not designed from the outset for the Korean War, but it was, fortunately, in production when its appearance over the battlefield prevented the MiG-15 from sweeping the United Nations aircraft from the sky.

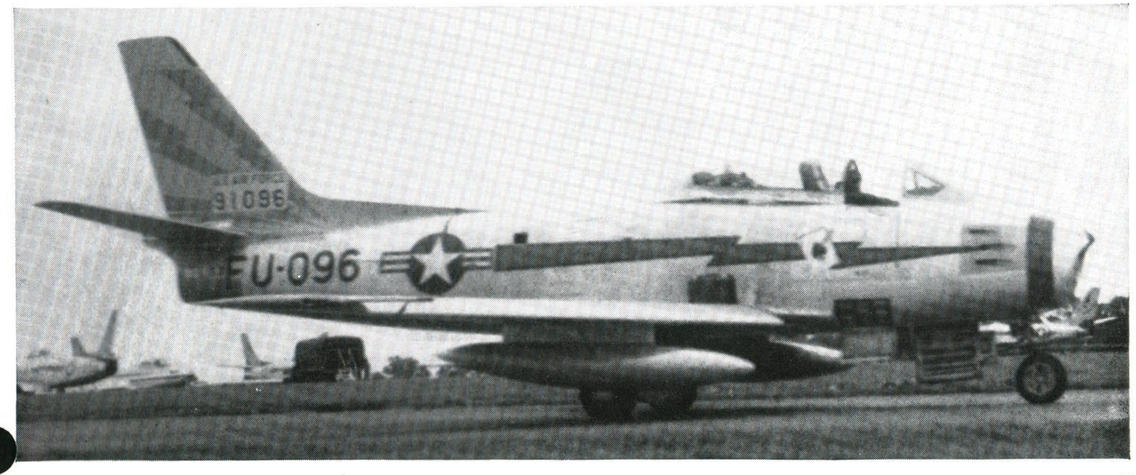
The division of Korea after the Japanese surrender in 1945 led to continuous friction between the Northern and Southern halves of the country, for one was dominated by the Communists in the shape of Russia and Red China, whilst the other half was strongly influenced by America. In 1948, as the result of elections, the Republic of Korea was established. America aided the new Republic by organising and constructing an internal security force, and by July 1949 had withdrawn all its own forces with the exception of a small military group.

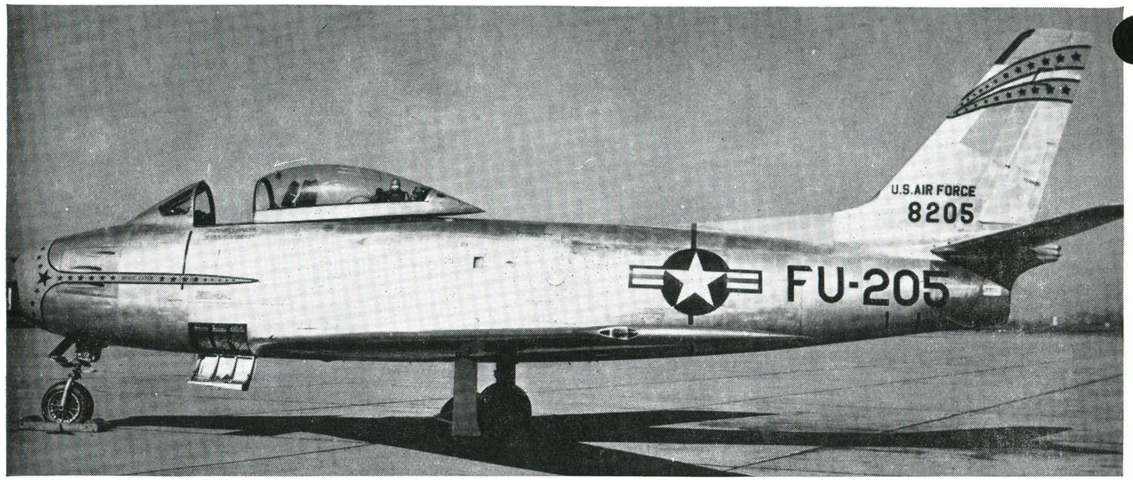
Just before dawn on the morning of 25th June 1950, the North Korean Army crossed the 38th Parallel, and just over 24 hours later they entered Seoul, capital city of South Korea. The United Nations Security Council adopted a resolution calling upon the North Koreans to cease their aggression and withdraw their forces to the 38th Parallel. But without avail for the North Koreans intensified their efforts.

On 27th June, on the instructions of President Truman, General MacArthur ordered the Far East Air Force into action against the invaders, the Americans flying Lockheed F-80 Shooting Star; F-51 Mustang and F-82 Twin-Mustang fighters, and Boeing B-29 bombers. Command of the air was soon established and as a fighting entity the North Korean Air Force was rendered completely ineffective.

With enemy air power neutralised the United Nations ground forces, now fighting alongside the South Koreans, fought to stem the North Korean army's advance down the peninsular. United Nations aircraft bombed and strafed the invading armies, and there is little doubt that without

F-86A-5 Sabre of the 116th Squadron. (Photo: C. R. Elliot)





F-86A-5-NA, serial 48-205, of the 56th Fighter Group, O'Hare Air Force Base. It was named "Space Eater". (Photo: U.S.A.F.)

complete mastery of the air the whole of Korea would have come under the influence of Communism.

While the U.N. armies were being pushed back into a small area south of Naktong River, General MacArthur was planning an amphibious encirclement of the enemy. On the morning of September 15th, units of the U.S. X Corps went ashore at Inchon and the strengthened and reinforced Eighth Army broke out of the Pusan perimeter in an all-out drive to crush the enemy forces.

In just over fourteen days the whole of South Korea was clear of the invading armies and the counter invasion of North Korea began. Within a month the capital city Pyongyang fell and by the end of October the whole of the Korean peninsular was in United Nations hands. It seemed that victory was complete until, quite suddenly, the armies of Red China were hurled into battle and once again United Nations forces began the retreat southwards.

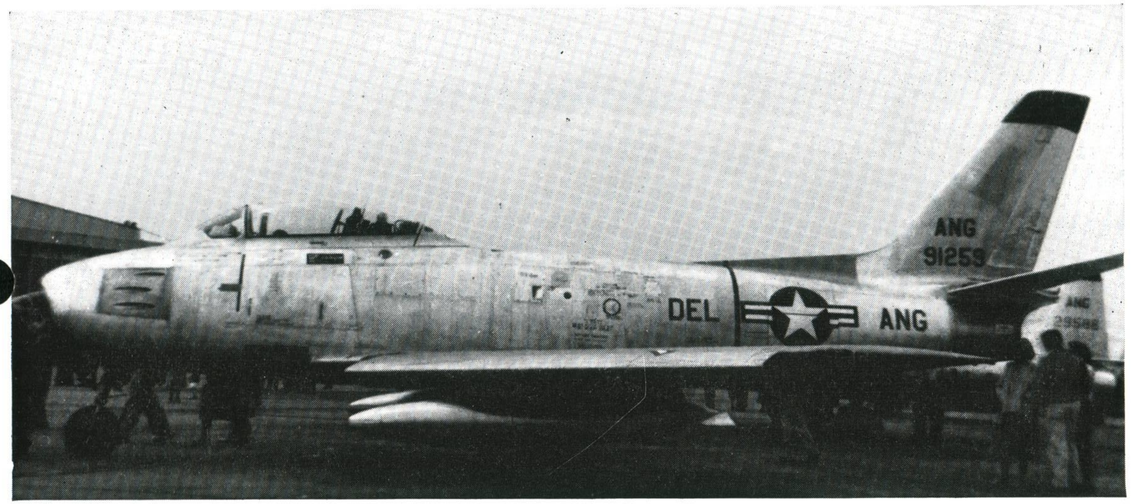
SABRE v. MiG-15

It was during this period, November 1950, that the Russian-built MiG-15 swept-wing jet fighter appeared, flying from airfields situated in Manchuria, across the border in China. The F-80 and F-51 were no match for the MiG and the Americans decided to commit their new fighter the F-86A against the new menace.

On November 8th the 4th Fighter-Interceptor Wing was ordered to Korea and the unit's Sabres were flown from their home base at Wilmington, Delaware, to San Diego, California. There they

F-86A-5-NA, serial 49-1216, of the Utah Air National Guard. Green trim on fin. (Photo: Roger Besecker)

F-86A-1-NA, 47-614, which took part in the Korean campaign. Named "Go for Broke" it is now on display at Chanute AFB. (Photo: Roger Besecker)



F-86A-5-NA of the Delaware Air National Guard. Red-tipped fin. (Photo: G. J. Letzer)

were embarked aboard an aircraft carrier and shipped to Yokosaka, Japan.

FIRST SABRE SORTIES

The first Sabre missions against the Red Air Force were flown on December 17th, when an advance detachment of F-86A-5s based on Kimpo airfield in Korea took off for an armed reconnaissance of the Yalu River. Flying at 32,000 feet and at a speed of 472 m.p.h., they patrolled the area until four MiG-15s were sighted flying at 7,000 feet below the Sabres. The two 120-gallon drop tanks were jettisoned as the Americans made ready to take on the enemy fighters. The aircraft of 336 Squadron led by Lt.-Col. B. H. Hinton closed rapidly on the MiGs, and in the matter of seconds one of them was diving earthwards, its entire rear section enveloped in flames. The other three MiGs got clear of the scrap by diving for the Manchurian border. It was first blood for the Americans and for the Sabre which, in its first air battle had emerged victorious.

Colonel Hinton led another four-plane flight from Kimpo on December 19th, and on approaching the Yalu they met six MiGs. The red jets made head-on passes through the American formation without firing a shot, and by the time the F-86s turned to give chase the enemy were diving for their home base. A further six MiGs appeared, but they did not enter the fight.

However, this situation was not to last for long as the American pilots were aware, and on December 22nd the MiGs stayed to fight. The day began with eight Sabres meeting MiGs at 40,000 feet, the enemy fighters attacking with cannons blazing. One of the Sabres fell in flames as the MiGs once again raced back across the border unscathed. Four hours later the Sabres returned to the scene to be met by 15 MiGs. Minutes later the exuberant Americans saw the enemy fleeing

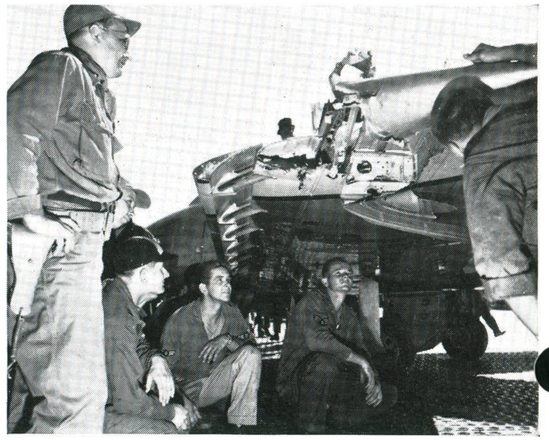
Cocooned F-86As on a lighter at the beginning of the journey to Korea.

across the Yalu leaving six of their comrades diving in flames to their destruction. This high rate of loss deterred the enemy pilots and for the rest of December they studiously avoided the Americans as they patrolled the Yalu. By the end of the month the 4th Wing had flown 234 sorties, during which time the opposing sides had clashed 76 times, with eight victories to the Sabres for the loss of one.

But the situation on the ground had worsened. The Chinese armies had swept the U.N. forces from North Korea and on New Year's day 1951 had begun an invasion of South Korea. To escape the advancing Chinese the Sabres had to leave Kimpo and return to Johnson Air Force Base in Japan, this move putting them effectively out of range for the Korean fighting.

Before the end of the month, however, the Sabre was once again in the thick of it, operating from Taegu in the interceptor and ground attack rôle. Armament consisted of two 5-inch rockets in addition to the standard machine guns, and since drop fuel tanks were needed to give the aircraft effective range, time over target was limited. Because of this lack of time over target the Sabres were not very successful in their new rôle.

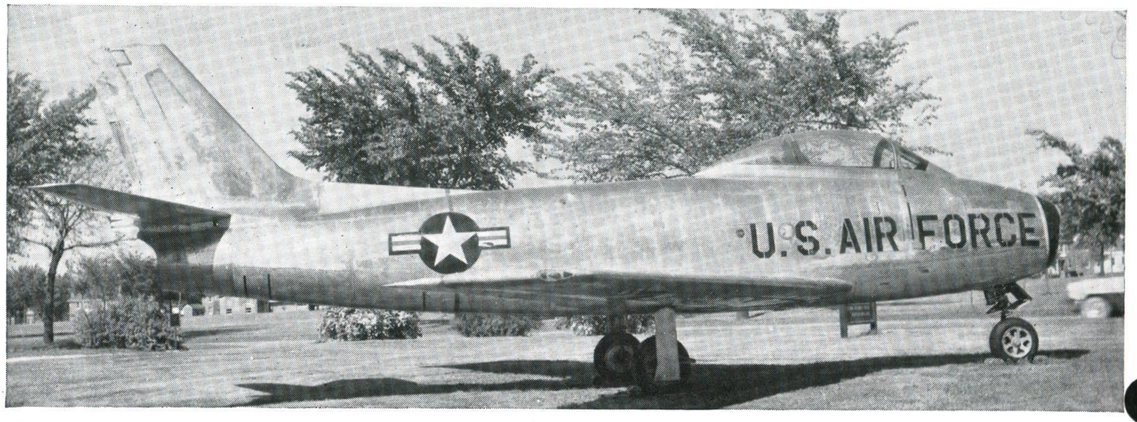
The Chinese attack finally ground to a halt due



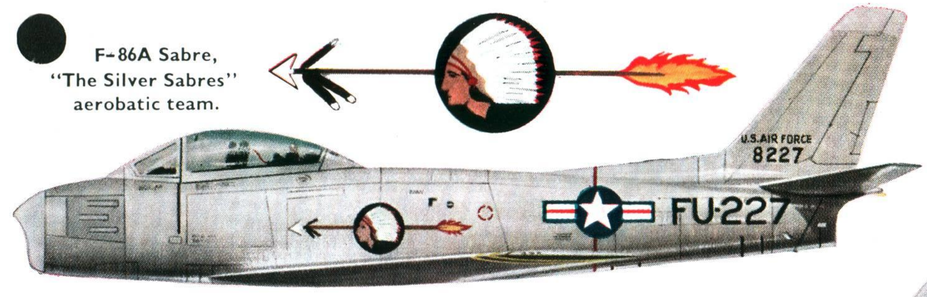
Heavy battle damage sustained during the Korean air battles.

to the problem of supplying front-line troops over long supply lines that were constantly under attack by U.N. aircraft. After a lull in the fighting a new Chinese offensive started and it was heralded with an increase in aggressiveness by the MiG fighters. They were met determinedly by the Sabres of the

One of the original batch of 33 NA-151s, F-86A Sabres, now on display in America. Serial number is 47-614.
(Photo: Roger Besecker)

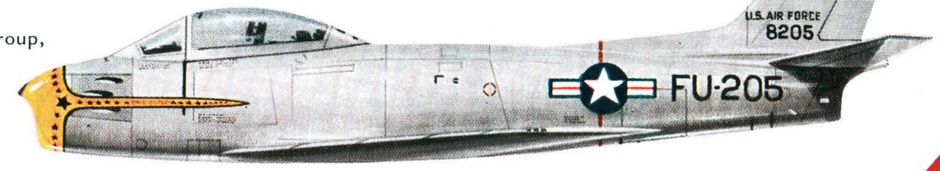


F-86A Sabre,
"The Silver Sabres"
aerobatic team.

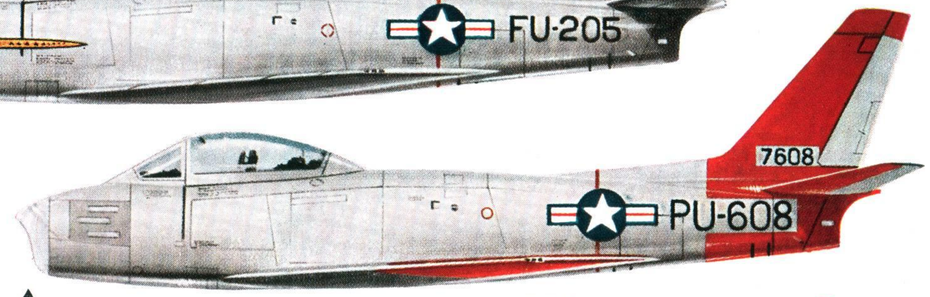


56th F.G.
nose detail.

F-86A Sabre,
56th Fighter Group,
O'Hare A.F.B.
"Space Eater".



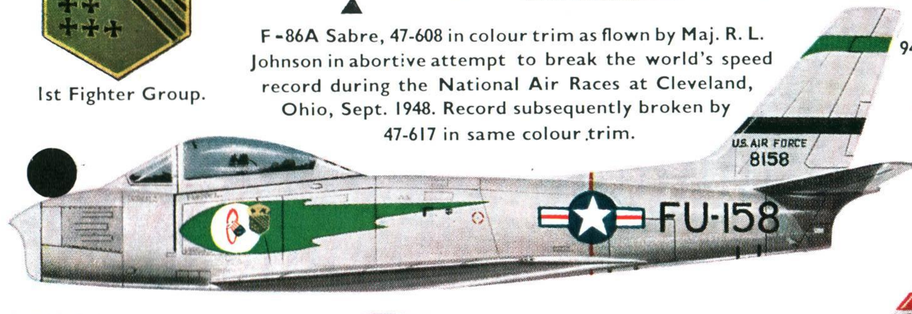
1st Fighter Group.



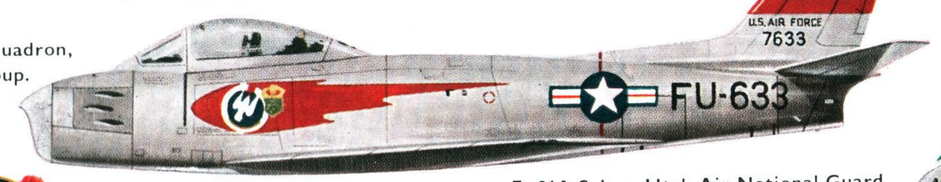
F-86A Sabre, 47-608 in colour trim as flown by Maj. R. L. Johnson in abortive attempt to break the world's speed record during the National Air Races at Cleveland, Ohio, Sept. 1948. Record subsequently broken by 47-617 in same colour trim.

F-86A Sabre,
94th Fighter Squadron,
1st Fighter Group.

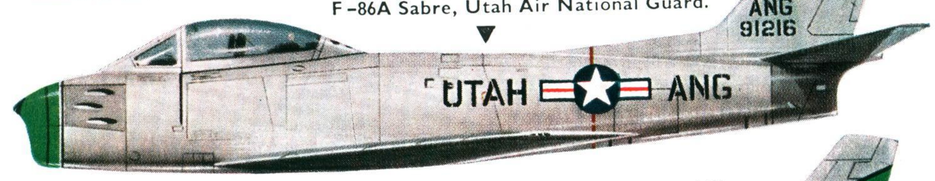
94th Fighter Sqdn.



F-86A Sabre,
71st Fighter Squadron,
1st Fighter Group.

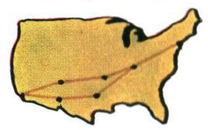


F-86A Sabre, Utah Air National Guard.



71st Fighter Sqdn.

F-86A Sabre, 115th Fighter Interceptor Squadron, 146th Fighter Interceptor Wing, California Air National Guard. "California Boomerang". Flown by Lt. John M. Conroy on "Operation Boomerang" from Los Angeles to New York to Los Angeles, 5,085 miles in 11 hrs. 18 mins. 27 secs. on 21st May 1955.



"Operation
Boomerang"
insignia.
Stbd. side.

© WARD

334th and 336th Squadrons of the 4th Wing. The pace quickened during April and more MiG-Sabre clashes took place, with the tactical advantage always to the former as they still fled across the border into China after making fast passes at the American 'planes from a superior height. The Americans, despite this handicap, still managed a loss/victory ratio of about 4 to 1 in their favour.

As the first year of the war drew to its close it was apparent that the Sabre had frustrated the MiG-15's bid for air superiority, and without this superiority the efforts to rebuild the North Korean air bases came to nothing as the B-29s blasted them at regular intervals. With the start of the second year of war a programme was under way to increase Sabre strength in Korea. Continued development of the basic Sabre airframe had resulted in a new version designated the F-86E and in due course this improved fighter gradually replaced the tired 86As. The first 86E reached Korea during October 1951 and it was not until July the following year that the last 'A' was returned home.

Wartime development of the Sabre produced a Mark that was basically an improvisation. For tactical reconnaissance the Lockheed RF-80A was used in Korea, but it proved too slow for the MiG-15 and had to be escorted. To provide a recce-fighter capable of operating without an escort six F-86A-5s were converted into RF-86As by installing two 2-inch K-24 and one 24-inch K-24 cameras in a compartment below the cockpit. Five were delivered to the 67th Wing, 15th Reconnaissance Squadron. At least another five F-86As were converted to the reconnaissance rôle, and after the war a number were turned over to the R.O.K. Air Force. One was also used by the California National Air Guard.

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Nose radar detail. Note Indian head emblem under cockpit.

Night gun firing tests. Note landing lamps under air intake.

PRODUCTION DETAILS

North American F–86A Sabre.
First production batch of 33 aircraft (NA–151), serialled 47–605 to 47–637 to Specification NA46–841A; Contract AC–16013. First flight of 47–605 took place on 20th May 1948. Deliveries commenced 28th May 1949 and ended in March 1949.

North American F–86A Sabre.
Second production batch of 188 aircraft (NA–151) serialled 48–129 to 48–316. Deliveries commenced March 1949 and ended in September the same year.

North American F–86A–5 Sabre.
Third batch of 333 (NA–161) serialled 49–1007 to 49–1339 to Specification 48–506A; Contract AC–21671. Deliveries commenced October 1949 and ended in December 1950.

WING AND SQUADRON ALLOCATION

1st Wing—Squadrons *27,71,94.*
4th Wing—Squadrons *334,335,336.*
33rd Wing—Squadrons *58,59,60.*
56th Wing—Squadrons *61,62,63.*
81st Wing—Squadrons *78,91,92.*
Air National Guard Squadrons—*115,146,195,197,198.*
Sabre F–86As lost due to enemy action in Korea, June 1951 to July 1952.
48–301, 49–1083, –1088, –1098, –1109, –113, –1123, –1139, –1140, –1147, –1159, –1179, –1199, –1210, –1223, –1236, –1255, –1258, –1276, –1281, –1298, –1307, –1318, –1319, –1334, –1338.
Sabre F–86As converted to the RF–86A configuration.
48–183, –1841, –185, –186, –187, –196, –217, –246, –257.

SPECIFICATION AND LEADING PARTICULARS

Dimensions: Span, 37·12 feet. Length, 37·54 feet. Height, 14·74 feet. Wheel track 8·3 feet.
Weights: Empty, 10,093 lb. Take-off weight, 14,108 lb. With 2-120 gallon tanks, 15,876 lb. With 2-1,000 lb. bombs, 16,223 lb.
Performance: Stalling speed, 121 m.p.h. Combat radius, 330 miles. Maximum speed, 679 m.p.h. at sea level, 601 m.p.h. at 35,000 feet. Cruising speed, 533 m.p.h. Maximum rate of climb, 7,470 feet per minute at sea level. Climb to 40,000 feet, 10·4 min. Service ceiling, 48,000 feet.
Powerplant: One General Electric J-47-GE-13 (GE-7 on F-86A-1) of 5,200 lb. thrust.

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Sabre 54.

What is definition

see EO's

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TABLE 1: SABRE FEATURES

	FEATURES					
Sabre variant	**Wingspan**	**Wing chord**	**Leading edge**	**Windscreen**	**Canopy**	**Armament**
F-86A-1 (Not all-flying tail planes)	37′1″	Standard	Slats	Curved	Sliding	6-.50-caliber (muzzle doors)
F-86A-5 (Not all-flying tail planes)	37′1″	Standard	Slats	V-shaped	Sliding	6-.50-caliber
F-86D Sabre Dog	37′1″	Standard	Slats	Flat	Clamshell	24-2.75″ rockets
F-86E-1, -5, -6 Canadair Mk. 2	37′1″	Standard	Slats	V-shaped	Sliding	6-.50-caliber
F-86E-10, -15 Canadair Mk. 4	37′1″	Standard	Slats	Flat	Sliding	6-.50-caliber
F-86F-1, -5, -10, -20	37′1″	Standard retrofit with 6-3	Slats retrofit with fixed	Flat	Sliding	6-.50-caliber
F-86F-25, -30	37′1″	Built or retrofit with 6-3	Slats retrofit with fixed	Flat	Sliding	6-.50-caliber
F-86F-35	37′1″	6-3	Fixed	Flat	Sliding	6-.50-caliber
F-86F-40	39′1″	6-3	Slats	Flat	Sliding	6-.50-caliber
Canadair Mk. 6	37′1″	6-3 (except early)	Slats	Flat	Sliding	6-.50-caliber
Australian Mk. 30	37′1″	Standard retrofit with 6-3	Slats retrofit with fixed	Flat	Sliding	2-30 mm cannon
Australian Mk. 31, 32	37′1″	6-3	Fixed	Flat	Sliding	2-30 mm cannon
F-86H-1	First 14 37′1″ rest, 39′1″	6-3	Fixed	Flat	Clamshell	6-.50-caliber
F-86H-5, -10	39′1″	6-3	Fixed, last 10 built and others retrofit with slats	Flat	Clamshell	4-20 mm cannon
F-86K	37′1″	Standard	Slats	Flat	Clamshell	2-20 mm cannon
F-86L	39′1″	6-3	Slats	Flat	Clamshell	24-2.75″ rockets
FJ-2 Fury	37′1″	Standard	Slats	Flat	Sliding (new canopy)	4-20 mm cannon
FJ-3/FJ-3M Fury	37′1″	Standard retrofit with 6-3	Slats retrofit with fixed	Flat	Sliding (new canopy)	4-20 mm cannon
FJ-4/FJ-4B Fury	Completely new wing		Fixed	Flat	Sliding (another new canopy)	4-20 mm cannon

Sabre
Milberry

Summary of Canadair Sabre Marks

Mark	*Span*	*Length*	*Height*	*Wing Area* sq.ft.*	*Empty Wt. lb*	*Max. Wt. lb*	*Max. Speed (Sea Level) mph*	*Cruise Speed mph*	*Initial Climb fpm*	*Service Ceiling ft*	*Combat Radius mi.*	*Max. Range mi.*
1	37.12'	37.54'	14.74'	287.4	10093	15876	679	533	7250	48000	320	1052
2	,,	,,	,,	,,	10434	17750	,,	537	,,	47100	,,	1022
3	,,	,,	,,	,,								
4	,,	,,	,,	,,	11000	17750	,,	,,	,,	47200	,,	,,
5	,,	,,	,,	302.3	10662	17581[z]	696	552	9700	50700	,,	1220
6	,,	,,	,,	,,	10638	17560[z]	698	,,	12000	54100	360	1486

Mark	*First Flight*	*No. Built*	*Engine*	*Thrust lb*
1	8-8-50	1	GE J47	5200
2	31-1-51	350	,,	,,
3	29-9-52	1	Orenda 3	6000
4	28-8-52	438	GE J47	5200
5	30-7-53	370	Orenda 10	6500
6	19-10-54	655	Orenda 14	7440

Mark	*Constructor's No.*	*RCAF No.*	*No. Built*	*Cumulative*
1	1	19101	1	1
2	2-99	19102-19199	98	99
3	100	19200	1	100
2	101-352	19201-19452	252	352
4	353-790	19453-19890	438	790
5	791-1160	23001-23370	370	1160
6	1161-1815	23371-23760[1]	655	1815

[1]plus SAAF, Colombia, Luftwaffe

Standard Armament
All marks: 6 x .50 mg with 267 rounds per gun; up to 2000 lb bombs and rockets.

Mark	*Operators*
1	RCAF (1)
2	RCAF (350), Greece (106+), Turkey (107+)
3	RCAF (1)
4	RCAF (71**), RAF (438), Italy**(180), Yugoslavia**(121), Honduras(8)***
5	RCAF (370), Luftwaffe++ (75)
6	RCAF (390), Luftwaffe (225), SAAF (34), Colombia (6), Pakistan+++ (90)

* Mark 1,2,3,4, up to and including c/n 700 built with original wing (287.4 sq.ft.); c/n 701 and on built with "6-3 wing" (302.3 sq.ft.). Mark 1,3 and surviving 2s and 4s retrofitted with "6-3 wing".
+ From original RCAF batch
** From original RAF batch
*** From original RAF batch via Yugoslavia
++ From original RCAF batch
+++ From original Luftwaffe batch
z Max.wt. from Canadair specs, with 2 x 167 Imp.gal.

Summary of Canadair Sabre Variations

1-150	Fibreglass nose ring for radar transmission.
151 and subsequent	Ring replaced by fibreglass nose cap.
1-70	Inboard sway brace on underwing tanks.
71 and subsequent	Sway brace deleted, fuel level indicators changed from gallons to pounds.
1-352	Taxi light on left, landing light on left.
353 and subsequent	Left light, land and taxi. Landing light on right.
2-352	Sabre 2s could carry 166 Imp.gal. drop tanks, but only with strict adherence to flight limitation.
353 and subsequent	166 Imp.gal tanks for ferry use only. Oxygen filler valve relocated from lower left nose to upper right forward fuselage. Dual rear latches on radar compartment. Normal and alternate flight controls hydraulic power systems filler relocated from left dive brake well to underside rear fuselage. IFF antennae relocated from fin tip to under fuselage (Stn.152).
365 and subsequent	Changed from A-1C to A-4 gunsight.
401-1221	Provision for target towing.
701-1400	Slats deleted, "6-3" leading edge substituted.
791 and subsequent	166 Imp.gal. standard fitting, 100 gal. tanks optional.
791-1000	One lower position light.
791-1280	Ice detector in intake duct.
1001 and subsequent	Upper ident. light may be deleted. Two wing lights and one tail light (right side) standard.
1401 to 1815	Slats re-installed on "6-3" wing.

RAF Sabres Diverted to RCAF (71 A/C)

19453-19463, 19491, 19575, 19579, 19582, 19584, 19585, 19590, 19597-19599, 19601, 19606, 19615-19617, 19619, 19624, 19627-19629, 19631, 19632, 19635-19637, 19639, 19642, 19643, 19647, 19649, 19650, 19652, 19653, 19655, 19657, 19659-19661, 19663-19665, 19667-19671, 19673-19675, 19677, 19679, 19680, 19682, 19684-19686, 19689, 19691, 19695, 19702. (Crashed in RCAF Service)
19456, 19462, 19463, 19619, 19637, 19643, 19660, 19670, 19679, 19689
(10 A/C)

Mark 6 Breakdown

Constructor's No.	*No.*	*No. Built*	*Cumulative*	*Operator*
1161-1452	23371-23662	292	292	RCAF
1453-1458	2021-2026	6	298	Colombia
1459-1492	350-383	34	332	SAAF
1493-1519	23363-23689	27	359	RCAF
1520	23753*	1	360	RCAF
1521-1522	23690-23691	2	362	RCAF
1523-1526	23754-23757*	4	366	RCAF
1527-1530	23692-23695	4	370	RCAF
1531-1532	23758-23759*	2	372	RCAF
1533	23696	1	373	RCAF
1534	23760*	1	374	RCAF
1535-1590	23697-23752	56	430	RCAF
1591-1815		225	655	Luftwaffe

*Originally Israeli AF Nos.6030-6037

Summary of RAF Sabres

RAF Serial	*RCAF Serial (441 A/C)*
XB530-XB551	*19378, *19384, *19404, 19464-19481, 19663.
XB575-XB603	19482-19510.
XB608-XB650	19511-19549, 19854-19857.
XB664-XB713	19550-19574, 19457, 19576-19599.
XB726-XB776	19600-19618, 19635, 19620-19628, 19458 19630-19634, 19459, 19636, 19629, 19638-19642, 19460, 19858-19863, 19644.
XB791-XB839	19645-19659, 19461, 19661/19662, 19453, 19664-19669, 19454, 19671-19678, 19575 19680-19688, 19455, 19690-19693.
XB851-XB900	19864-19868, 19694-19706, 19732-19748, 19774-19788.
XB912-XB961	19789-19792, 19803-19848.
XB973-XB999	19849-19853, 19869-19890.
XD706-XD736	19707-19731, 19749-19754.
XD753-XD781	19755-19773, 19793-19802.

*Mk.2's loaned to RAF.

Summary of Canadair Sabre Marks

Mark	*Span*	*Length*	*Height*	*Wing Area* sq.ft.*	*Empty Wt. lb*	*Max. Wt. lb*	*Max. Speed (Sea Level) mph*	*Cruise Speed mph*	*Initial Climb fpm*	*Service Ceiling ft*	*Combat Radius mi.*	*Max. Range mi.*
1	37.12'	37.54'	14.74'	287.4	10093	15876	679	533	7250	48000	320	1052
2	,,	,,	,,	,,	10434	17750	,,	537	,,	47100	,,	1022
3	,,	,,	,,	,,								
4	,,	,,	,,	,,	11000	17750	,,	,,	,,	47200	,,	,,
5	,,	,,	,,	302.3	10662	17581[z]	696	552	9700	50700	,,	1220
6	,,	,,	,,	,,	10638	17560[z]	698	,,	12000	54100	360	1486

Mark	*First Flight*	*No. Built*	*Engine*	*Thrust lb*
1	8-8-50	1	GE J47	5200
2	31-1-51	350	,,	,,
3	29-9-52	1	Orenda 3	6000
4	28-8-52	438	GE J47	5200
5	30-7-53	370	Orenda 10	6500
6	19-10-54	655	Orenda 14	7440

Mark	*Constructor's No.*	*RCAF No.*	*No. Built*	*Cumulative*
1	1	19101	1	1
2	2-99	19102-19199	98	99
3	100	19200	1	100
2	101-352	19201-19452	252	352
4	353-790	19453-19890	438	790
5	791-1160	23001-23370	370	1160
6	1161-1815	23371-23760[1]	655	1815

[1]plus SAAF, Colombia, Luftwaffe

Standard Armament
All marks: 6 x .50 mg with 267 rounds per gun; up to 2000 lb bombs and rockets.

Mark	*Operators*
1	RCAF (1)
2	RCAF (350), Greece (106 +), Turkey (107 +)
3	RCAF (1)
4	RCAF (71**), RAF (438), Italy**(180), Yugoslavia**(121), Honduras(8)***
5	RCAF (370), Luftwaffe ++ (75)
6	RCAF (390), Luftwaffe (225), SAAF (34), Colombia (6), Pakistan +++ (90)

* Mark 1,2,3,4, up to and including c/n 700 built with original wing (287.4 sq.ft.); c/n 701 and on built with "6-3 wing" (302.3 sq.ft.). Mark 1,3 and surviving 2s and 4s retrofitted with "6-3 wing".
+ From original RCAF batch
** From original RAF batch
*** From original RAF batch via Yugoslavia
++ From original RCAF batch
+++ From original Luftwaffe batch
[z] Max.wt. from Canadair specs, with 2 x 167 Imp.gal.

Summary of Canadair Sabre Variations

1-150	Fibreglass nose ring for radar transmission.
151 and subsequent	Ring replaced by fibreglass nose cap.
1-70	Inboard sway brace on underwing tanks.
71 and subsequent	Sway brace deleted, fuel level indicators changed from gallons to pounds.
1-352	Taxi light on left, landing light on left.
353 and subsequent	Left light, land and taxi. Landing light on right.
2-352	Sabre 2s could carry 166 Imp.gal. drop tanks, but only with strict adherence to flight limitation.
353 and subsequent	166 Imp.gal tanks for ferry use only. Oxygen filler valve relocated from lower left nose to upper right forward fuselage. Dual rear latches on radar compartment. Normal and alternate flight controls hydraulic power systems filler relocated from left dive brake well to underside rear fuselage. IFF antennae relocated from fin tip to under fuselage (Stn.152).
365 and subsequent	Changed from A-1C to A-4 gunsight.
401-1221	Provision for target towing.
701-1400	Slats deleted, "6-3" leading edge substituted.
791 and subsequent	166 Imp.gal. standard fitting, 100 gal. tanks optional.
791-1000	One lower position light.
791-1280	Ice detector in intake duct.
1001 and subsequent	Upper ident. light may be deleted. Two wing lights and one tail light (right side) standard.
1401 to 1815	Slats re-installed on "6-3" wing.

RAF Sabres Diverted to RCAF (71 A/C)

19453-19463, 19491, 19575, 19579, 19582, 19584, 19585, 19590, 19597-19599, 19601, 19606, 19615-19617, 19619, 19624, 19627-19629, 19631, 19632, 19635-19637, 19639, 19642, 19643, 19647, 19649, 19650, 19652, 19653, 19655, 19657, 19659-19661, 19663-19665, 19667-19671, 19673-19675, 19677, 19679, 19680, 19682, 19684-19686, 19689, 19691, 19695, 19702. (Crashed in RCAF Service)
19456, 19462, 19463, 19619, 19637, 19643, 19660, 19670, 19679, 19689
(10 A/C)

Mark 6 Breakdown

Constructor's No.	*No.*	*No. Built*	*Cumulative*	*Operator*
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1523-1526	23754-23757*	4	366	RCAF
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XB726-XB776	19600-19618, 19635, 19620-19628, 19458 19630-19634, 19459, 19636, 19629, 19638-19642, 19460, 19858-19863, 19644.
XB791-XB839	19645-19659, 19461, 19661/19662, 19453, 19664-19669, 19454, 19671-19678, 19575 19680-19688, 19455, 19690-19693.
XB851-XB900	19864-19868, 19694-19706, 19732-19748, 19774-19788.
XB912-XB961	19789-19792, 19803-19848.
XB973-XB999	19849-19853, 19869-19890.
XD706-XD736	19707-19731, 19749-19754.
XD753-XD781	19755-19773, 19793-19802.

*Mk.2's loaned to RAF.

Sabre Squadrons of the RCAF, 1951-1963

Squadron	*Name*	*Wing*	*Code*	*Station(s)*	*F-86 in Service*	*Current*
400	City of Toronto	(2 Group)	GW	Downsview	Mk.5 Oct.1956-Oct.1958	CH-136
401	City of Westmount	(1 Group)		St. Hubert	Mk.5 Oct.1956-Oct.1.1958	CH-136
410	Cougar	1	AM	St. Hubert May 1951	Mk.2 May 1951-Nov.1954	CF-18
				North Luffenham Nov. 1951		
				Baden-Söllingen Nov.1954 (TD)		
				Marville Apr.1955-Oct.1956		
411	County of York	(2 Group)	KH	Downsview	Mk.5 Oct.1956-Sep.1958	CH-136
413	Tusker	3	AP	Bagotville Aug.1951	Mk.2 Nov.1951-Jun.1954	Buffalo, CH-113
				Zweibrücken Apr.1953-Apr.1957	Mk.5 Jun.1954-Sep.1955	
					Mk.6 Sep.1955-Apr.1957	
414	Black Knight	4	AQ	Bagotville Nov.1952	Mk.4 Nov.1952-Nov.1953	Challenger,Falcon
					Mk.5 Feb.1954-Aug.1955	T-33,Voodoo
				Baden-Söllingen Sep.1953-Jul.1957	Mk.6 Jul.1955-Jul.1957	
416	Black Lynx	2	AS	Uplands Jan.1951	Mk.2 Mar.1952-Mar.1954	
					Mk.5 Mar.1954-May 1955	
				Grostenquin Oct.1952-Jan.1957	Mk.6 Apr.1955-Jan.1957	
421	Red Indian	2	AX	St. Hubert Dec.1951	Mk.2 Dec.1951-Mar.1954	
					Mk.5 Mar.1954-Jun.1956	
				Grostenquin Oct.1952-Aug.1963	Mk.6 Jun.1956-Jul.1963	
422	Tomahawk	4	TF	Uplands Jan.1953	Mk.2 Jan.-May 1953	
					Mk.4 Apr.1953-Dec.1954	
					Mk.5 Jan.1955-Sep.1955	
				Baden-Söllingen Sep.1953-Apr.1963	Mk.6 Sep.1955-Apr.1963	
427	Lion	3	BB	St. Hubert Aug.1952	Mk.2 Sep.1952-Jun.1953	CH-135, CH-136
					Mk.5 May 1953-Sep.1955	
				Zweibrücken Apr.1953	Mk.6 Sep.1955-Dec.1962	
				Grostenquin Jun.1962-Dec.1962		
430	Silver Falcon	2	BH	North Bay Nov.1951	Mk.2 Nov.1951-Jun.1953	CH-135, CH-136
					Mk.5 Jun.1953-Jun.1957	
				Grostenquin Oct.1962-May 1963	Mk.6 May 1957-May 1963	
431				Bagotville	Mk.2 Jan.-Oct.1954	Tutor
434	Bluenose	3	BR	Uplands Jul.1952	Mk.2 Jul.1952-Nov.1953	CF-5
					Mk.5 Oct.1953-Jan.1957	
				Zweibrücken Apr.1953-Jun.1962	Mk.6 Jan.1957-Jan.1963	
				Marville Jun.1962-Jan.1963		
438	City of Montreal	(1 Group)	BQ	St. Hubert	Mk.5 Oct.1956-Nov.1958	CH-136
439	Sabre Tooth Tiger	1	IG	Uplands Sep.1951	Mk.2 Nov.1951-Feb.1955	
					Mk.5 Mar.1955-Jul.1956	
				North Luffenham Jun.1952	Mk.6 Jul.1956-Oct.1963	
				Marville Apr.1955-Nov.1963		
441	Silver Fox	1	BT	St. Hubert Mar.1951	Mk.2 Jun.1951-Jun.1955	
					Mk.5 Jan.1955-Aug.1956	
				North Luffenham Mar.1952	Mk.6 Aug.1956-Sep.1963	
				Zweibrücken Dec.1954 (TD)		
				Marville Apr.1955-Sep.1963		
442	City of Vancouver	19(Aux)	SL	Sea Island	Mk.5 Oct.1956-Aug.1958	
443	City of New Westminster	19(Aux)	PF	Sea Island	Mk.5 Oct.1956-Aug.1958	
444	Cobra	4	VH	St. Hubert Mar.1953	Mk.4 Mar.1953-Mar.1954	CH-139
					Mk.5 Feb.1954-May 1955	
				Baden-Söllingen Sep.1953-Mar.1963	Mk.6 May 1955-Mar.1963	
Other Units						
No.1(F)OTU				Chatham	Mk.2 Feb.1952-mid 1955	
					Mk.5 mid 1955-Oct.1961	
No.1 OFU				St. Hubert	Oct. 1953-Jul.1957	
Sabre Transition Unit				Chatham	Mk.5 Nov.1961-Nov.1968	
Golden Hawks				Chatham	Mk.5/6 Mar.1959-Feb.1964	

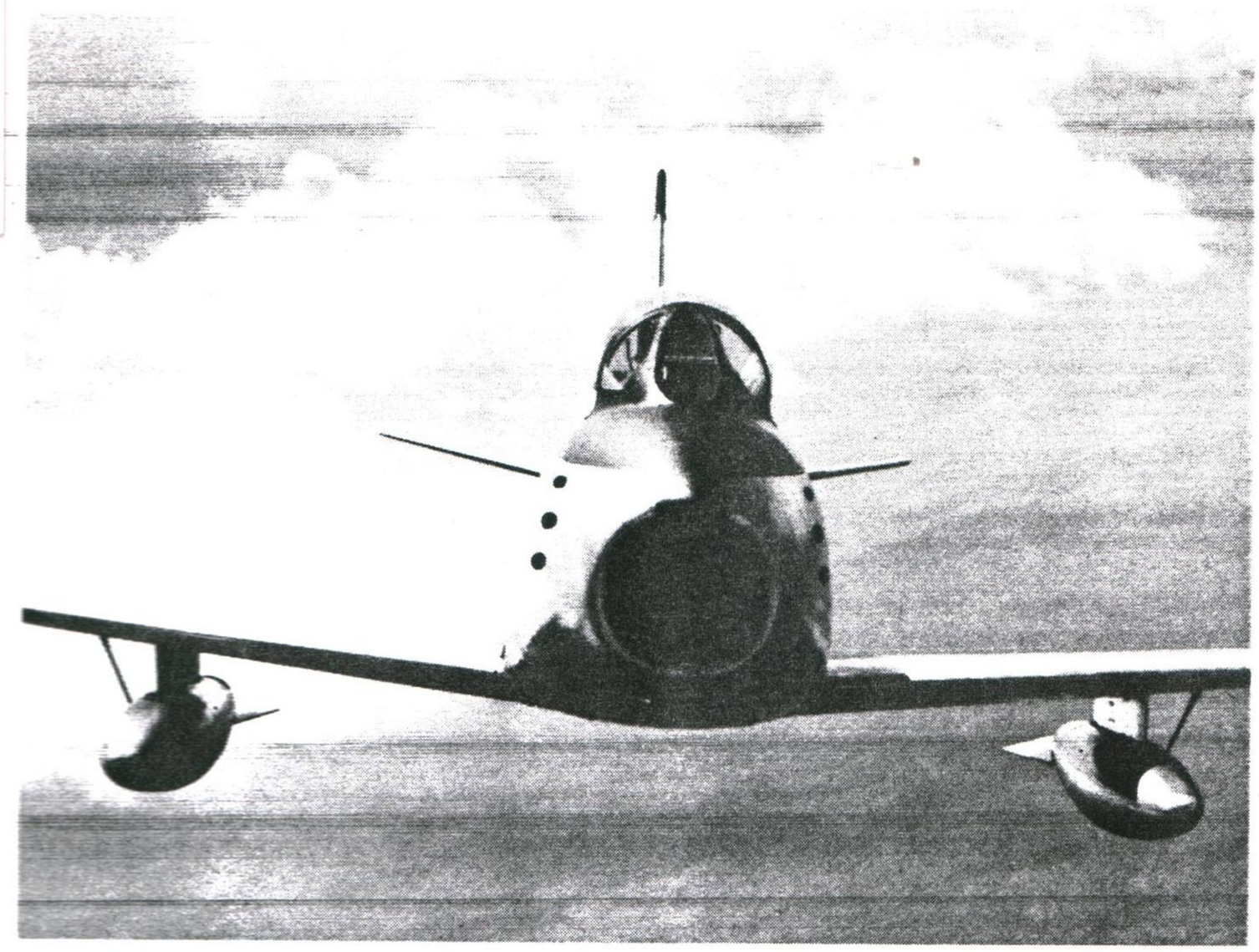
Air Armament Evaluation Detachment (Cold Lake), AFHQ Practice Flight (Uplands), Central Experimental and Proving Establishment (Uplands), Central Flying School (Saskatoon, Trenton), National Aeronautical Establishment No.129 Test and Ferry Flight (Trenton), Station Flight (Macdonald, Gimli)

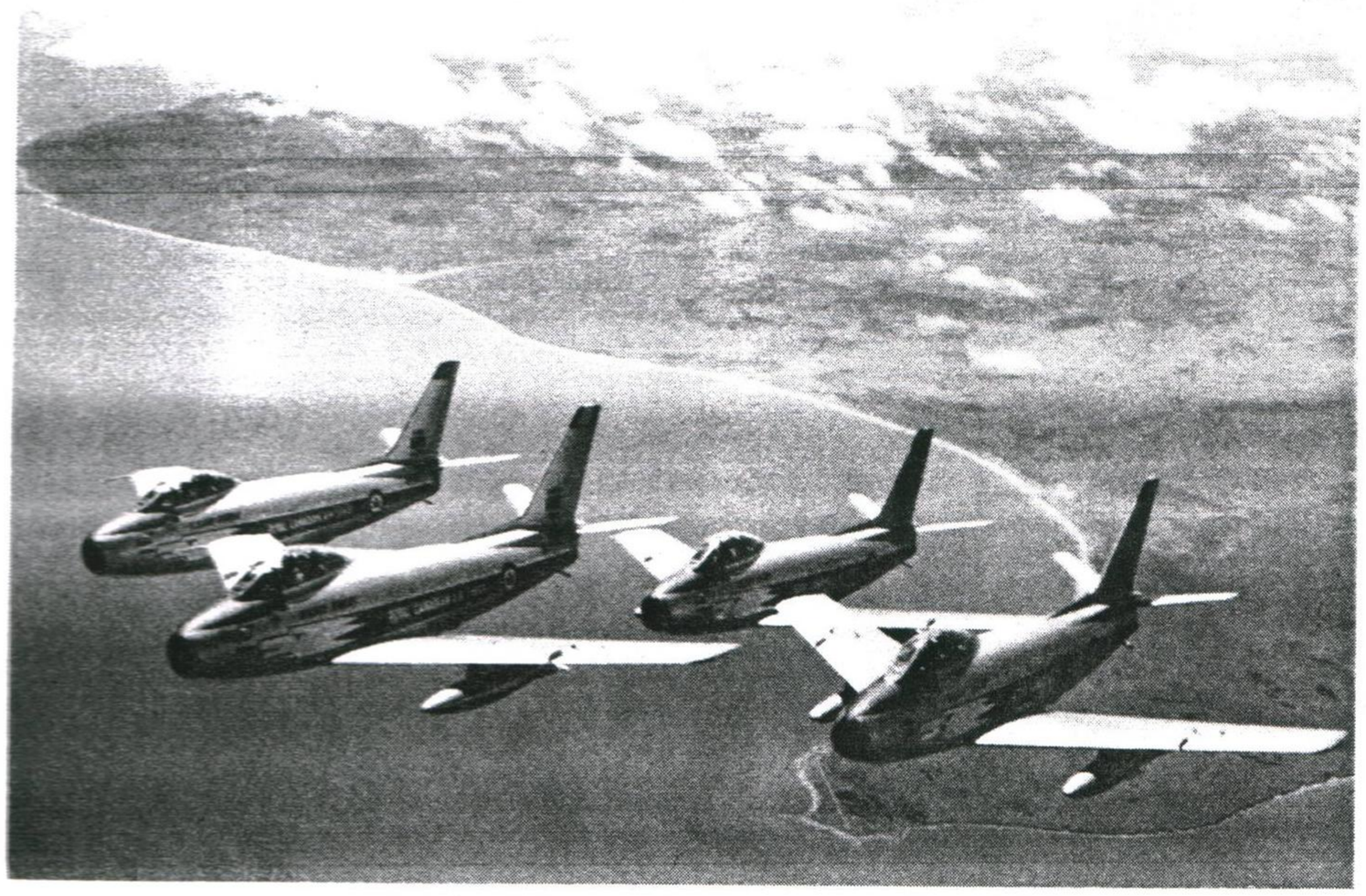
RCAF/CF Sabre Hours Flown and Accidents

	Hours flown		*Accidents (Category A-E)*		*Write-offs*	
Year	*By yr.*	*Accum.*	*By yr.*	*Accum.*	*By yr.*	*Accum.*
1950/51	26	26	1	1	0	0
51/52	6002	6,028	50	51	4	4
52/52	36497	42,525	139	190	37	41
53/54	62269	104,794	190	380	30	71
54/55	80550	185,344	144	524	44	115
55/56	96479	281,823	99	623	39	154
56/57	108450	390,273	101	724	32	186
57/58	91027	481,300	103	827	25	211
58/59	85766	567,066	70	897	13	224
59	77440	644,506	83	980	11	235
60	74162	718,668	88	1068	16	251
61	72829	791,497	57	1125	13	264
62	67457	859,044	37	1162	5	269
63	32046	891,090	23	1185	5	274
64*	10503	901,593	2	1187	1	275
65	7937	909,530	3	1190	2	277
66	5884	915,414	0	1190	0	277
67	5569	920,983	2	1192	2	279
68	4647	925,630	1	1193	0	279
69	37	925,667	0	1193	0	279

*"D" Category accidents not included 1964-1969

Relight





(Top left) The Hawks, led by Fern Villeneuve, prepare to taxi out from Nellis AFB. Then, they are seen alighting in typical formation style. Finally, six Hawks overfly Bill Stewart's Mark 5 at Calgary on July 13, 1960. (DND)

(Top) Head-on view of one of the Hawks. Next, a Hawk four-plane, seen near Chatham on June 21, 1960. Then (arrgghhh!) Sabres 23455, 410 and 066 in a dreadful state at Mountain View on November 6, 1965. (first two DND, Harry Tate via Jack McNulty)

The Golden Hawks over the years

1959
W/C Jake Easton, OC
S/L Fern Villeneuve, lead
F/L Jim McCombe, right wing
F/L Ed Rozdeba, left wing
F/L Jeb Kerr, slot
F/L Ralph Annis, lead solo
F/L "JT" Price, second solo
F/O Bill Stewart, spare
F/O Jim Holt, spare
F/L L. "Sammy" Eisler*
S/L Russ Bowdery, PRO
F/L Ray Grandy, EO
F/O George MacDonald, commentator
F/O Lorne Johnson, Adj.

1960
W/C Jack Allan, OC
S/L Fern Villeneuve, lead
F/L Jim McCombe, right wing
F/L Ed Rozdeba, left wing
F/L Bill Stewart, slot
F/L Ralph Annis, lead solo
F/L "JT" Price, solo
F/L Dave Tinson, second solo
F/L Rocky Van Vliet, PRO
F/L Dan McKinnon, EO
F/O George MacDonald, commentator

1961
W/C Jack Allan, OC
S/L Jim McCombe, lead
F/L "BR" Campbell, right wing
F/L Lloyd Hubbard, left wing
F/L Ed Rozdeba, slot
F/L Bill Stewart, lead solo
F/L Alf McDonald, solo
F/L Jack Frazer, second solo
F/L Jim McCann, second solo
F/L Rocky Van Vliet, PRO
F/L Phil Perry, EO
F/O Bob Dobson, commentator

1962
W/C Jack Allan, OC
S/L Lloyd Hubbard, lead
F/L "BR" Campbell, right wing
F/L Norm Garriock, left wing
F/L Jack Frazer, slot
F/L Alf McDonald, lead solo
F/L George Miller, solo
F/L Ed McKeogh, second solo
F/L Jim Giles, PRO
F/O Phil Perry, EO
F/L Bruce Lebans, commentator

1963
W/C Frank Hatton, OC
S/L Lloyd Hubbard, lead
F/L Al Young, right wing
F/L Norm Garriock, left wing
F/L C.B. Lang, slot
F/L Ed McKeogh, lead solo
F/L Dave Barker, solo
F/L Bill Grip, second solo
F/L Jim Giles, PRO
F/L Carl Peterson, EO
F/L Bruce Lebans, commentator

*Killed in flying accident.

USAF #591069

REMARKS:

Returned to USAF from Loan.

Returned to USAF from Korea.

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029) LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT DATE 17 OCT 51 TRANSFER ORDER No. 1437

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
17 OCT 51	12 TSU(A V ROE) Ldon	TO 1437			
8 June 53	USAF Dayton Ohio Ground Tool Unit	QTO 469 & 764 dt 27 Oct 53.			
29/12/53	USAF Brookley AFB Alabama	QTO 1800			

REMARKS: see back of card.

TYPE OF EQUIPMENT IN WHICH USED					

BATCH No. QUAN. IN BATCH LEDGER FOLIO SPECIFICATION No.

REGISTRATION No.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S No.
591069	SABRE F 86A			

591069 Sabre F 86A

REGISTRATION No.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S No.
591060	SABRE F86A			

OVERHAUL DATA

DATE	REASON	DONE BY	REQ'N No.	COST		HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

ACCIDENT RECORD

DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SERV.
1									
2									
3									
4									
5									
6									
7									
8									

MAJOR EQUIPMENT RECORD CARD

REMARKS

Received from USAF on loan authority
AFHQ letter 360-5-20-1 (DSS) 7 June 51

Sabre "A" on loan

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029)

LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT

DATE 17 OCT 51

TRANSFER ORDER No. 1437

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
17 OCT 51	12 TSU(A V RCE) loan	TO 1437			
8 June 53	USAF ~~Degaussing Proving~~ Ground Tool Unit	GTO 1469 & 7641 dt 27 oct 53.			

REMARKS: see back of card.

TYPE OF EQUIPMENT IN WHICH USED					
BATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S No.
391068	SABRE F 86A				

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S No.
1069	SAABE F86A			

OVERHAUL DATA

DATE	REASON	DONE BY	REQ'N No.	COST	HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

ACCIDENT RECORD

DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SERV.
1									
2									
3									
4									
5									
6									
7									
8									

MAJOR EQUIPMENT RECORD CARD

REMARKS

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REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233 15M-5-49 (5896) H.Q. 605 E. 233 LOWE-MARTIN MFG

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT CANADAIR DATE 25 Aug 50 TRANSFER ORDER No. 1197

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
11 Aug 50	ATC (NRC ARNPRIOR)	T O 1197			
2[illegible] June 51	MoT TSU Canadair)	TO/194			
17 July 51	A2C (NRC Arnprior)	TO1229			
16 May 52	TTSU (Canadair)	QTO1124			
16 May 52	ATC (CF&PE Det Arnprior) Del. TTSU Q 845, 21 May.	QTO1125			
10 June 52	CF&PE Dt Arnprior	QTO1197			
25 June 52	TTSU (Canadair)	Del. Rock OS1, 28 Jun QTO1220			
23 June 52	CF&PE Rockcliffe	QTO1230			
Jan 53	C&P & Det replaced	QTO-1517			
19 Oct 55	SR Stn Lincoln Park for storage at Chatham for future use as Museum A/C	QTO 421			

REMARKS: RECEIVED AT CANADAIR OFF CD 601

OCT-30?

TYPE OF EQUIPMENT IN WHICH USED					069-478

BATCH No.	QUAN. IN BATCH	LEDGER FOLIO	SPECIFICATION No.

REGISTRATION No.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S No.
19101	Sabre F86A-1			

19101	SABRE 1	J47 - 13	2.
RCAF REGISTRATION NUMBER	MAKE AND MODEL	ENGINE TYPE	MANUFACTURERS No.

INITIAL ENTRY AT | DATE | QTO No. | CD No.

TRANSFERS			TRANSFERS		
DATE	QTO No.	TO	DATE	QTO No.	TO
19 Oct 55	421	SR Lincoln Park (Museum of C)	Lethbridge		
13 March 62	1007	SR Lincoln Park (Museum of C)	Lethbridge		
16 Mar 64	QTO 968	CR 75 R Leth. Ire		LC IP QC 280 re fwd by a Tmt to Hospital and Authority.	
24 Nov 64	QTO 794	Aprd 1007 TO Leth. re			
25 Aug 65	W 1461	Base sell to			
(re-issued	7 Sept 65)	no Tool (City of Edmonton) ME 272			
		Wing			
		RCAF Association		Sale date 21 Sept 67	
		Inc - 17 St Edmonton Alta			

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S NO.
[illegible]101	SABRE F86A /			

OVERHAUL DATA

	DATE	REASON	DONE BY	REQ'N NO.	COST	HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
1	26 June 51	repair of fuel tank in forward	Lindsay tank Canadair	CDS11962			17.7.51	ATC
2	16.5.52	fully unrepaired	Canadair	W51196 2				
3	23.6.52	fully in repairs	Canadair	W 51196 2				
4								
5								
6								
7								
8								
9								
10								
11								
12								

ACCIDENT RECORD

	DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SERV.
1										
2										
3										
4										
5										
6										
7										
8										

MAJOR EQUIPMENT RECORD CARD

REMARKS

23-9.52 - AFRO 497 d 18 July - Amc 9T01 487 d 23-9-52

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE NO.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029)

LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 111TSU DATE 13 NOV 52 TRANSFER ORDER No. 1621

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
~~13~~					
3 NOV 52	ADC (STN BAGOTVILLE) Sel. 111TSU Q980, 18 Dec	QTO 1621			
26 Aug 53	1 air Div (4FW)	QTO-1384			
1 Dec 53	NDOP (RAF) on return off loan	QTO-1690			

REMARKS: RECEIVED AT 111TSU OFF CD 601

(* Nothing on reverse side)

TYPE OF EQUIPMENT IN WHICH USED	J47-13				067-5[illegible]
BATCH NO.	QUAN. IN BATCH	LEDGER FOLIO			SPECIFICATION No.
REGISTRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S No.
19453	CANADAIR 4				

19453 Sabre 4

23001	SABRE 5	ORENDA 10	791 2. 1.391
RCAF REGISTRATION NUMBER	MAKE AND MODEL	ENGINE TYPE	MANUFACTURERS No.

INITIAL ENTRY AT | DATE | QTO No. | CD No.

TRANSFERS			TRANSFERS		
DATE	QTO No.	TO	DATE	QTO No.	TO
29 Oct 53	1583	11TSU Canadair C.L.			
15 Jan 58	216	1 FOTU Chatham			
16 Nov 60	733	Strike off			

R.C.A.F. E. 233 5M-11-47 (5416) A.O. 635 E. 233 — LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11TSU | DATE 27 Oct 53 / 29 Oct 53 | TRANSFER ORDER No. 1583 / 1583

TRANSFERS			TRANSFERS		
DATE	TO	AUTHORITY	DATE	TO	AUTHORITY
27 OCT 53	11TSU (CANADAIR) LOAN	QTO 1583			
29 Oct 53	11TSU (Canadair)	QTO-1583			

REMARKS:

RECEIVED AT 11TSU (CANADAIR) OFF CD 601

TYPE OF EQUIPMENT IN WHICH USED	ORENDA 10			
REGISTRATION	QUAN. IN RATOR	LEDGER	SPECIFICATION	
	MAKE & MODEL	YEAR		
	SABRE 5 A			

23001 Sabre 5 A 791

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	BY (INSPECTOR'S) NO.
	SEC C			

OVERHAUL DATA

DATE		REASON	DONE BY	REQ'N NO.	COST		HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
31 Mar 55	1	work installation							
	2	engine 14 hrs							
	3	installation check	Lonsdale	906841					
	4	reorganization							
	5	for base 5+6							
	6	[illegible]							
	7	[illegible]							
	8								
	9								
	10								
	11								
	12								

ACCIDENT RECORD

DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SERV.
1									
2									
3									
4									
5									
6									
7									
8									

MAJOR EQUIPMENT RECORD CARD

REMARKS

This aircraft is a bastardized mk 6 and differs from other mk 6 aircraft in modifications only. At aircraft 23216 a series of weight saving mods have been incorporated. This is basically what it lacks.

23371	SABRE 6	ORENDA 14	2
RCAF REGISTRATION NUMBER	MAKE AND MODEL	ENGINE TYPE	MANUFACTURERS No.

INITIAL ENTRY AT | DATE | QTO No. | CD No.

TRANSFERS			TRANSFERS		
DATE	QTO No.	TO	DATE	QTO No.	TO
13 Sept 53	QTO-844	1 Air Division			
3 Sep 63	1 air Div QTO 5H	WR 6 J's Prestwick			
~~5 Nov 63~~ Cancelled Logs	~~QTO 610~~	~~Spec Spt Det Prestwick~~ 55 12 12 may 64			
12 may 64	QTO 233	Struck off (A/F)			

R.C.A.F. E. 233 15M-5-49 (5636) H.Q. 885 E. 233 LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11 TSU (CANADAIR) DATE 30 DEC 54 TRANSFER ORDER No. QTO 317

TRANSFERS			TRANSFERS		
DATE	TO	AUTHORITY	DATE	TO	AUTHORITY
30 DEC. 54	A.T.C. (1 OFU ST HUBERT)	QTO 317			
20 Jan 55	11 TSU (Canadair) LC	QTO-655			
13 Sept 56	1 air Div	QTO - 844			

REMARKS:

RECEIVED AT 11 TSU (CANADAIR) OFF CD 601

TYPE OF EQUIPMENT IN WHICH USED	ORENDA 14				2274
H No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S NO.
23371	SABRE 6	Air Div			

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S NO.
2337	[illegible]			

OVERHAUL DATA

	DATE	REASON	DONE BY	REQ'N NO.	COST	HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
1	30 Jun 55	Camouflaging & incorporation of latest mods.	Canadair	476541			13 Sept 55	Main Div.
2								
3	30.6.55						13.9.55	1 Air Div.
4	30.6.55							
5								
6								
7								
8								
9								
10								
11								
12								

ACCIDENT RECORD

	DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SERV.
1										
2										
3										
4										
5										
6										
7										
8										

MAJOR EQUIPMENT RECORD CARD

REMARKS

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE NO.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. NO.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029)

LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11 TSU DATE 31 MAY 52 TRANSFER ORDER NO. 1166

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
31 MAY 52	ADC (Bolthen) 11 TSU 16 July	OTO 1166			
12 may 54	11 TSU (Canadair)	OTO-1110			
20 July 54	Air Division	OTO-1335			
~~28 July 54~~	~~MOAP (Kindley)~~	~~OTO-1333~~			
20 Jul 54	MOAP Greenham	OTO-1334			

REMARKS:

RECEIVED AT 11 TSU OFF CD 601

TYPE OF EQUIPMENT IN WHICH USED	J47-13				067-571
BATCH NO.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION NO.	
REGISTRATION NO.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S NO.
19374	SABRE F86E-2 Canadair				

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—3M-6-50 (6332) H.Q./885 E. 223 LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11TSU DATE 19 OCT 51 TRANSFER ORDER No. 1440

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
11$ OCT 51	ADC	TO 0440			
27 May 52	1 Fighter Wing	QTO 1152			
18 Jun 53	1 Air Division	QTO-1185			
29 Sep 54	MDAP Group	QTO-562			

REMARKS: RECEIVED AT CANADAIR OFF CD 601

067-701
~~151-067~~

TYPE OF EQUIPMENT IN WHICH USED	J47-13				
BATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S No.
19199	SABRE F-86E-3				

↑ Turkey in pencil

REMARKS:

Sabre 1 - 86A - 1951
2 - E - Model 70 1952 - 1954 - excepting 2 aircraft
3 - F86EO - Model 70 1955
4 - F86E - Model 70 - 1953 - 1980
5 - F86EO - Model 70 - 1980 - pack-ground

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029)

LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT ADC DATE 30 JULY 52 TRANSFER ORDER No. 1323

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
30 JULY 52	ADC (Platham) 11TSU @ 921 d 16 Aug.	QTO 1323			
31 Oct 52	11TSU (Canadair)	&TO 1581			
23 Mar 54	@ DD	@TO-1046			
1 Oct 54	11TSU (Canadair)	@TO-569			
20 Jul 54	1 Air Div	@TO-1335			
20 July 54	MDAP Greece	@TO-1334			
	↑				

REMARKS: RECEIVED AT 11 TSU OFF CD 601

↓

TYPE OF EQUIPMENT IN WHICH USED	J47-13			Captain Barnes	643-797
BATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S No.	
19381	F-86E	Greece			

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E. 233—15M-11-51 (7029)

LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11 TSU DATE 23 FEB 52 TRANSFER ORDER No. 1747

TRANSFERS			TRANSFERS		
DATE	TO	AUTHORITY	DATE	TO	AUTHORITY
FEB 52	ADC (Chatham) 11TSU@532 & 10 apx.	T O 1747			
July 54	11TSU (Canadair)	@TO-132)			
Jul 54	1 Air Div	@ To-1335			
Aug 55	MDAP Greece	@ To-747			

REMARKS: RECEIVED AT 11 TSU OFF CD 601

Serials Tracing

TYPE OF EQUIPMENT ON WHICH USED	J47-13				067495
BATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S No.
19305	SABRE 6				

Highlights of the Canadian service of Sabre 5
Serial Number 23330, Manufacturer's Number 1120

30 Sep. 54	Taken on strength at 11 Technical Servise Unit (Canadair) and assigned to No.1 Air Division Europe.
28 Jan. 57	Returned to Canadair for overhaul (CAIR) Calender,Aircraft Inspection & Repair.
16 Aug. 57	No.1 Fighter Operational Training Unit, Chatham,N.B.
27 Oct. 61	No.11 Technical Service Unit, Enamel & Heating Co. for overhaul (CAIR) Note that on 30 Oct. 61, total time on airframe was 1,027:20 hours
19 Mar. 62	Held at 6 Repair Depot, London, Ont. in Active Reserve
12 Dec. 62	Moved to 6 Repair Depot, Mountain View, Ont. in Serviceable Reserve. (14 days - Mods up to date)
21 Jun. 63	At 6 R.D. Mt. View, Status changed to Workshop Reserve.
21 Jun. 63	At 6 R.D., Status changed to Serviseable Reserve.
11 Oct. 63	To Air Defence Command, Golden Hawks Unit, Trenton, Ont.
4 Mar. 64	To 6 R.D. Mt. View, Stored Inactive reserve.
23 Jun. 70	Apdal (Aircraft pending disposal Action in location) at Aerospace Maintenance Depot Unit, Detachment, Mt. View.
9 Sep. 70	Crown Assets Disposal Corp.,Sold to Maritime Aircraft Overhaul & Repair Ltd. Moncton, N.B., David S. McEwen, President.

J.A.Griffin
15 September 1991

23330	SABRE 5	ORENDA 10	1120
RCAF REGISTRATION NUMBER	MAKE AND MODEL	ENGINE TYPE	MANUFACTURERS No.

INITIAL ENTRY AT | DATE | QTO No. | CD No.

TRANSFERS			TRANSFERS		
DATE	QTO No.	TO	DATE	QTO No.	TO
30 Sept 54	PR-552	1 Air Division	23 June 70	QTO 231	Orenda Ltd Mt View
28 Jan 57	803	11 TS Edmonton		A/F	MF29NO
16 Aug 57	798	1 FOTU Chatham	30	ACI	302380 9 Sep 70
27 Oct 61	662	11 TSW Enamel + Heating			CATX - sales to:
19 Mar 62	1031	AR&RD London			Maritime Air Overhaul + Repair Ltd
~~1 Aug 62~~	~~QTO 474~~	~~30 Sept 62~~			RR 4 Moncton NB
~~Dec 62~~	~~2 Aug 62 5519~~	~~1 H Qtrs~~		Acts	David S McEwen
10 Dec 62	QTO 95-1	AR&RD Mt Uniacke			President
21 Jun 63	QTO 301	AR&RD			
21 Jun 63	QTO 301	AR&RD Mt Uniacke			
11 Oct 63	QTO 537	ADC Sp H Unit Trenton			
4 Mar 64	QTO 940	AR&RD Mt Uniacke			

TIME: 1027:20 hrs 30 Oct 61

OVERHAUL DATA

DATE	QTO No.	CONTRACTOR	REPAIRS
28 Jan 57	803	Canadair CO572861	Spec PR2-23 (Can)
24 Oct 61	662	Enamel & Heating 079416	CAIRED 05-5E-7B
21 Jun 63	30j	WRA HQ	WDRG

R.C.A.F. E. 239—15M-11-51 (7029) LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT 11 TSU (CANADAIR) DATE 30 SEPT. 54 TRANSFER ORDER No. 552

TRANSFERS			TRANSFERS		
DATE	TO	AUTHORITY	DATE	TO	AUTHORITY
30 SEPT.54	1 AIR DIVISION	QTO 552			

REMARKS:

RECEIVED AT 111 TSU (CANADAIR) OFF CD 601

TYPE OF EQUIPMENT IN WHICH USED	ORENDA 10				1531
BATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
REGISTRATION No.	NAME & MODEL		YEAR	TYPE	MANUFACTURER'S No.
23330		Air Div			1120

The North American Sabre
by Ray Wagner

Page 112 – Page 117
" 155 – " 156

First a/c Assembled Cartierville

CL-13 Sabre Mark 1 was actually an F-86A-5
#19101 (CK-R) first flown Aug 9/50

350 MK II (J47-GE-13) like F86E
19102 – 19199 & 19201 to 19452

438 MK IV
19453 – 19890

The 100th Canadair Sabre #19200 was modified to take the Orenda 3
This was the Mk III and was flown by Jacqueline Cochran.

370 MK 5 (CL-13A) with Orenda 10 & extended leading edges & wing fences
23001 – 23370 23001 first flew 30 July 53
~~23~~

292 MK 6 (CL-13B) with Orenda 14
23371 + 23662 & 23663 to 23752 23371 finished 2 Nov 54

655 MK 6 in total were built – many sold

No 1 FW (410 439 441)
2 FW (416 421 430)
3 FW (413 427 434)
4 (414 422 444)

J. Ellis.

Air Britain

Sabres @ Canadair

19101	MK1 Proto	1
19102 - 199	Mk2	2 - 99
19200 -	Mk3 Proto	100 (orenda proto ?)
19201 - 452	Mk2	101 - 352
19453 - 890	Mk 4	353 - 790 438 a/c (to RAF F-47) ?
23001 - 370	Mk 5	791 - 1160.
23371 - 760	Mk 6	1161 - 1550

1

19471 become XB540 in RAF

XD series XD706 = 19707

19993 XB992

~ extracted

Sabres - S.K.

Dear John:

It has been some time since we have seen each other but I am hoping within the next two months to be in Toronto, and I hope we can get together again. Meanwhile, I have dug up some information that maybe of some value to you. For what it is worth this is what I have:

441 sqn

from a picture in the magazine Aeronautics (Dec 52, pps 30-33) is an article on 441 & a picture of the Sabre II flown by S/L A.R. Mackenzie. His a/c was #19150, coded BT-A. From Peter Norsman you can get a copy of the markings as I have sent him a copy of the article.

#1 Air Div historical reports ~~on~~ on Sabres.

4 Wing was operating 61 Mk. 4s on loan from RAF. By Mar 54 they had all been returned to the RAF.

In Feb 54 the first Sabre 5s began to arrive. The order of re-equipping was 4-2-3-1 Wings.

Apr 54, 2 Wing began to rx the 5s.
May 54, 4 & 2 completed re-equipment, 3 Wg had rx'd 12 a/c.
Dec 54, 4, 3 & 2 " " with 5s, only 1 Wg with 2s.

In Jun 62, the sqns of 3 wing began to redeploy to 1, 2 & 4 Wing for disbandment, on the ~~re~~ introduction of CF-104s.

The order of de-activation as F-86, & reactivication as CF-104 was.

phase out Sabres	Sqn		activated with 104s.
15 Dec 62	✓423	(3 Wg)	17 Dec 62
15 Jan 63	✓434	"	8 Apr 63
1 Mar 63	✓444	4 Wg	27 May 63
15 Apr 63	✓422	"	15 Jul 63
1 Jun 63	✓430	2 Wg	30 Sep 63
1 Aug 63	✓421	"	2 Dec 63
1 Sep 63	✓441	1 Wg	20 Jan 64
1 Nov 63	✓439	"	2 Mar 64

Jan 64: reference made to Dak. 979 "Pinnochio" being TOS.

414 (F) Sqn.
5 Oct 53, Sabre ~~6s~~ 4s 19455 & 457 to Zweibrucken Pool.
This was the beginning of shipping spare a/c to a pool & leaving sqn strength @ 16 a/c, sqn send old ones to pool & rec'd ~~approx~~ 7 new MK. 4s from the other sqns. dates.

5 Oct 53 SOS Zweibrucken 19455, 19457.
8-9 " " " " 19491, 19461, 19458, 19453, 19454

In Oct 53, sqn a/c strength was. 16 a/c.
following were original sqn MK. 4s.
19579, 589, 606, 628, 653, 657, 661, 673, 675
following were 7 new 4s rec'd.
19695, 691, 680, 671, 652, 647, 631
following 2 for shipment out
19459, 19460.

Going back, when sqn flew Leapfrog IV, flew following MK 4s.
19579 (w/c allen), 653, 461, 455, 673, 606, 460, 457, 459, 455, 661, 454, 491, 453, 675, 657, 585, 628.

Mar 55 rec'd following Sabre 5s
23 228, 205, 008, 186, 343, 223, 219, 208, 165, 079, 071, 033, 092, 345, 047, 010, 006.

Jul 55 rec'd following Sabre 6s.
23 406, 407, 411, 416, 424, 438, 440, 441, 447, 450, 457, 466, 468, 473, 481, 483, 486, 488, 498, 518.

422(F) Sqn.
Jan 55 ~~operated~~ ~~[illegible]~~ following Sabre 5s
23300 (S/L W.J. Buzza), 036, 071, 056, 052, 183, 209, 043, 202, 038, 193, 018, 029, 206, 023, 068, 179, 049, 220, 233

Sep 55 Sabre 6s.
23383, 387, 392, 431, 451, 453, 462, 469, 493, 497, 500, 507, 508, 523, 524, 528, 533.

425 AW(F)
Oct 61 rx'd following CF-101 Bs.
17442, 449, 452, 453, 482, 391, 393, 397, 399, 428, 407, 466, 433, 437.

427 (F)
following Sabre 11s on Leapfrog.
19427(S/L Gervais), 433, 437, 409, 415, 418, 422, 450, 430, 432, 438, 443, 451, 445, 447, 444.

I hope some of this information is of value.
See you soon.

Regards.

Sam Kostenuk.

Canadian Built Sabres 1,805 built (USAF Fighters 16-61)
Page 116

	Mark	Quantity	Serial Nº
1	F86A	1	19101
2	F86E	98	19102 - 19199
2	F86E	252	19201 - 19452
3	F86J	1	19200
4	F86E	438	19453 - 19890
5		370	23001 - 23370
6		390	23371 - 23760
6		255	———

Either direct or after RCAF service

430	To RAF
60	USAF
34	SAAF
6	Columbia
	Italy
	Greece
	Turkey
	~~Yugoslavia~~
75	German Federal Gov't (MK5) Gift
225	" " " (MK6) Purchase

F-86 SABRE JETS TO BE RETIRED

OTTAWA (CP) — The F-86 Sabre jet, one of the mainstays of the Canadian air force since the plane came out in 1950, will be officially retired later this month.

The Defence Department announced yesterday that a ceremony to mark the retirement will be held Nov. 29 at Canadian Forces Base Chatham in New Brunswick.

The 21 Sabres still in the armed forces inventory will be turned over to Crown Assets Disposal Corp., a spokesman said.

The 21 are the last of 1,815 Sabres built by Canadair Ltd. of Montreal between 1950 and 1958.

During the early 1950s Sabres were flown by Canadians in the Korean War and were the front-line operational fighters for Canada's NATO air division.

In the late 1950s they were replaced overseas by the CF-100—later succeeded by the CF-104—and in 1963 the last air division Sabre squadron was disbanded.

In recent years the Sabres have been used only as training aircraft.

1184 Sabre Cards

19374 – 350 M/R.2

19200 – " M/R.3

Is there a list of Gift Sabres?

Equal Opertunities Program. "

(Experimental Orenda Prototype

July 8/90

Dear John,

I have been doing a little belated checking of photos that appeared in my Can.A/c book and I hope you can shed soon light on queries that have arisen. On p.412 I show the Sabre 3 with RCAF nos.. no markings & with E.O.P. on fin, apparently as originally flown & probably as used by Cochran. Your book shows it, apparently after RCAF aceptance. Can you comment on this please? What does E.O.P. mean? On p.409 is RCAF 19374 in Turkish markings. Your book shows it going to Greece. Your comments please

I enjoyed the excellent CAHS meeting last month. Ottawa sure did themselves proud and I do not think Toronto will ever upstage them! Sorry we did not have time to chat as usual, but maybe next time. I expect to go up again in late Sept. or early Oct. but we'll see. Kind regards to Bud and yourself.

Sincerely,

Ken

PART 1 - SECTION 1

DIMENSIONS AND GROUND HANDLING

DESCRIPTION

GENERAL

1 The Canadair built F-86E Sabre 5 and Sabre 6 (see Figure 1-1), are single-place, low-wing, high-performance fighter aircraft powered by a single Orenda 10 or Orenda 14 jet propulsion engine. A tricycle landing gear and a bubble canopy are incorporated. The aircraft are characterized by a swept-back wing and empennage. Six .50-calibre machine guns are mounted in the front of the fuselage. Bombs, chemical tanks or rockets may be carried under the wings. A radar sight is provided for aiming all armament. The flight control system is hydraulically operated and irreversible, and an artificial feel system is incorporated to provide natural stick forces throughout all flight conditions. Speed brakes are provided for effective and rapid deceleration. Alternate hydraulic and fuel systems are incorporated for emergency operation. Provision is made for two 100 Imperial (120 U.S.) or two 166.5 Imperial (200 U.S.) gallon droppable tanks, which may be jettisoned electrically or manually on aircraft 23001 to 23210 inclusive and electrically only on aircraft 23211 and subsequent.

DIMENSIONS

GENERAL

2 With the aircraft supported on the landing gear at normal gross weight, specified tire inflation and strut extension, the over-all dimensions are as follows: (See Figures 1-2 and 1-3.)

(a)	Span	37.1 ft.
(b)	Length (over-all)	37.5 ft.
(c)	Height	14.7 ft.
(d)	Design Gross Weight	15,100 lb.

WING

3 Wing particulars are as follows:

(a)	Type	Low wing
(b)	Airfoil Section	NACA 0012-64 mod
(c)	Chord at root	10.8 ft.
(d)	Chord at tip	5.4 ft.
(e)	Incidence (at root)	plus 1°
(f)	Incidence (at tip)	minus 1°
(g)	Dihedral	plus 3°
(h)	Sweepback (25% chord line)	35°41'
(j)	Aspect ratio	4.8

HORIZONTAL STABILIZER

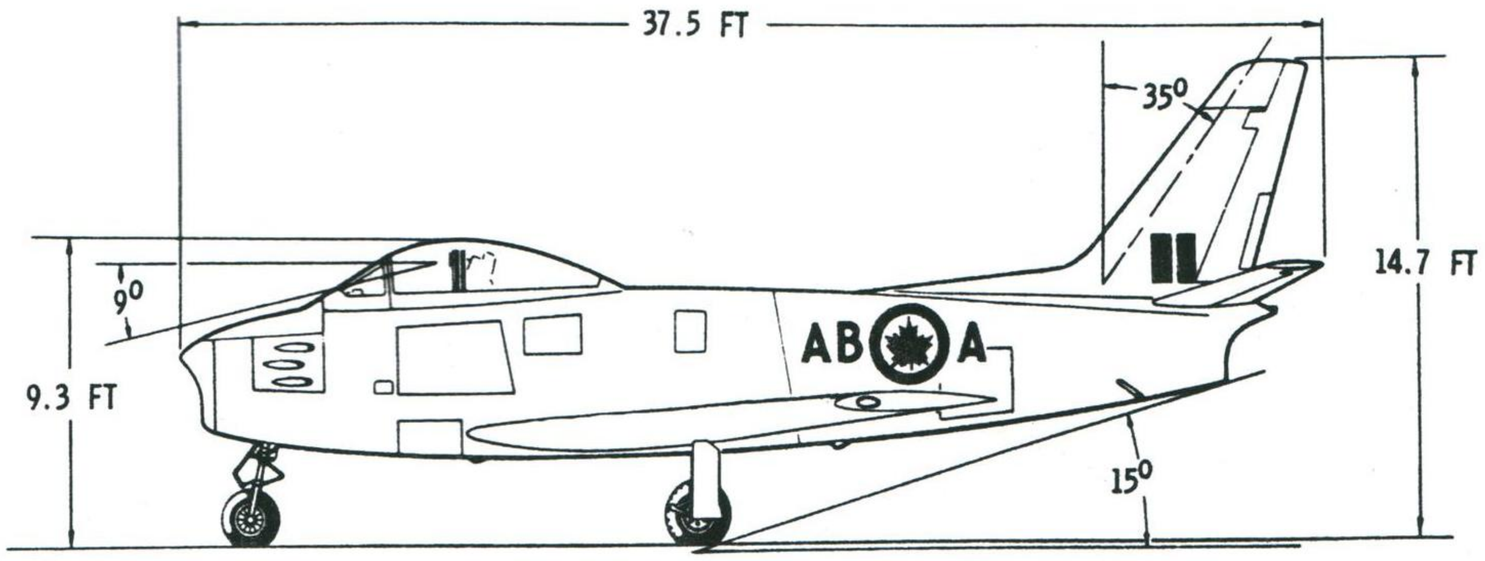
4 Dimensions are as follows:

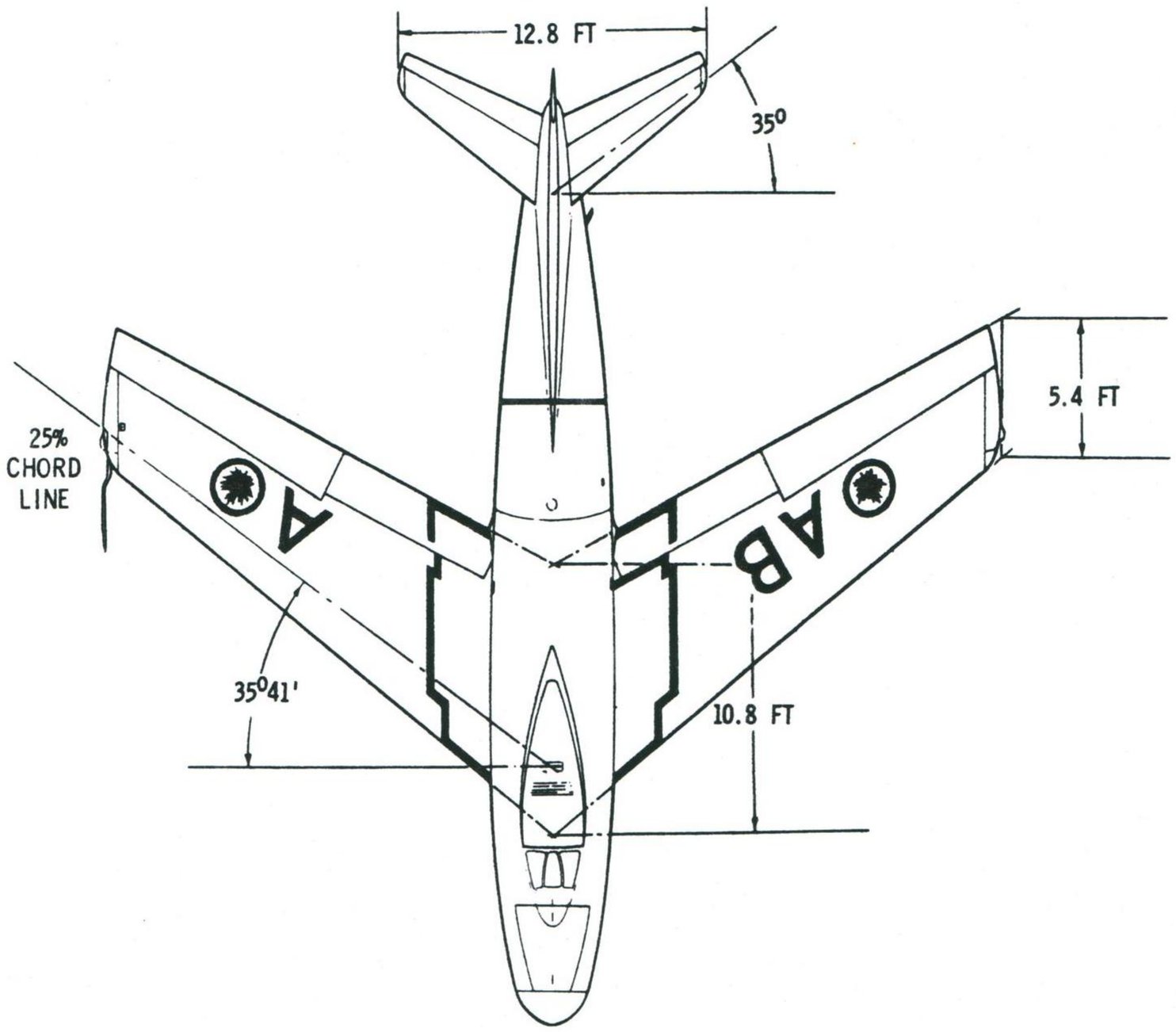
(a)	Span	12.8 ft.
(b)	Chord at root	3.8 ft.
(c)	Chord at tip	1.7 ft.
(d)	Incidence	6° up, 10° down
(e)	Dihedral	10°

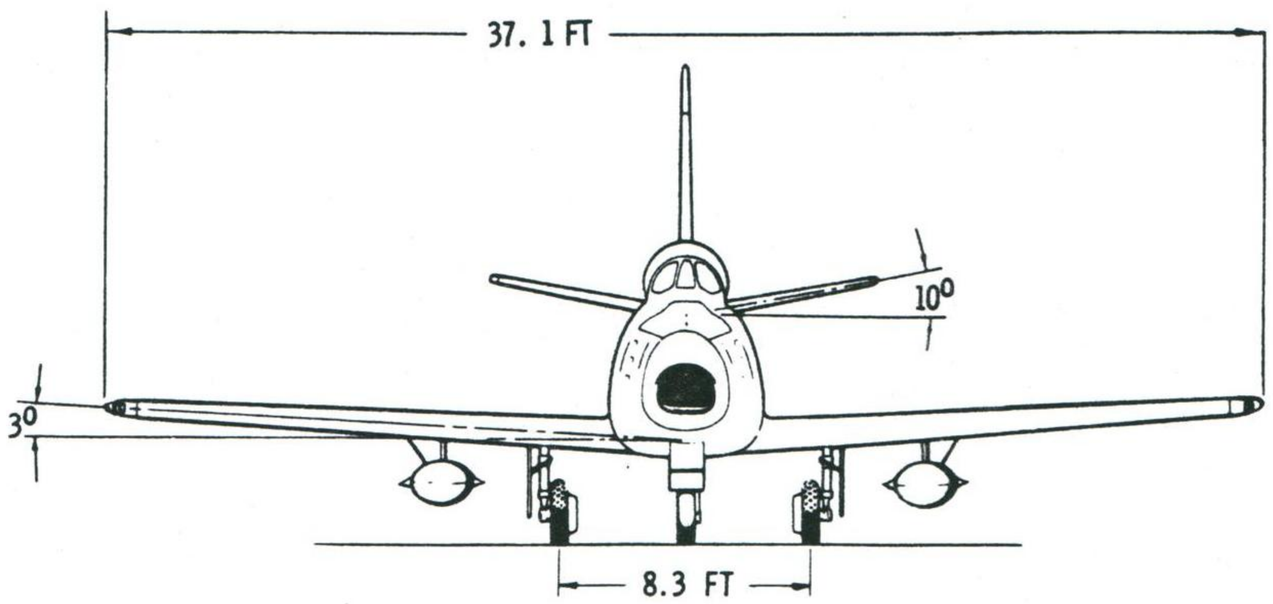
VERTICAL STABILIZER

5 Dimensions are as follows:

(a)	Height	7.5 ft.
(b)	Chord at root	6.4 ft.
(c)	Chord at tip	2.3 ft.

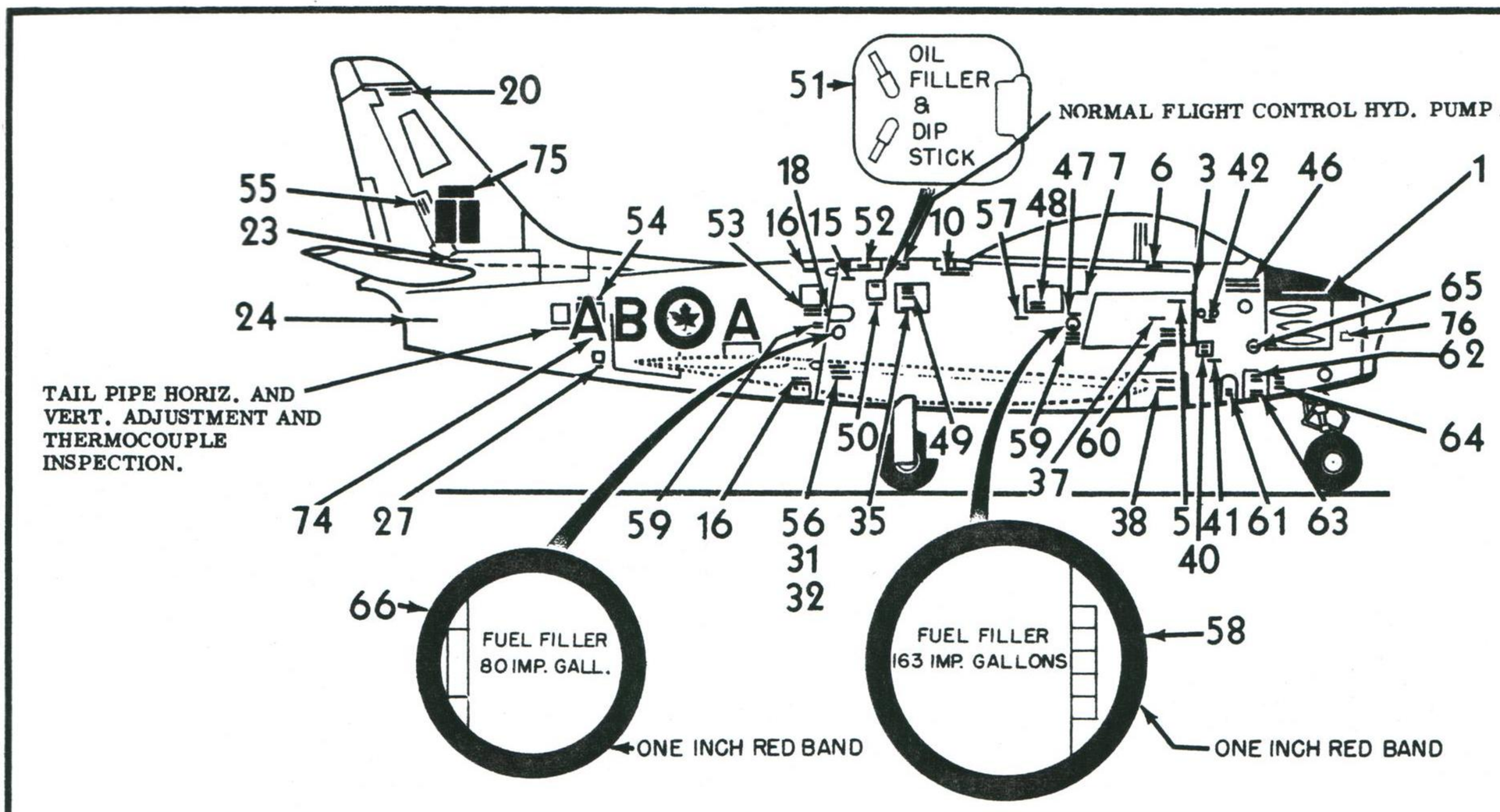






5E2-01-1D

Figure 1-2 Aircraft Dimensions



37 NO STEP.

38 AMMUNITION ACCESS, LOWER DOOR FOR STEP, GUN CHARGER

39 GUN ACCESS, GUN CHARGER AMMUNITION LOADING HOOK, CABIN PRESSURE CHECK INSIDE.

40 KICK-STEP.

41 COCKPIT DRAIN PLUG.

42 CANOPY, CLOSE-OPEN.

43 RED RING AROUND RECESSED PHILLIPS HEAD SCREW STA. 68 AND STA. 226. 125

44 AIRSPEED LINES DRAIN.

45 ANTI-GLARE MATT BLACK.

46 **WARNING:** THIS AIRCRAFT CONTAINS AN EJECTION CATAPULT CONTAINING AN EXPLOSIVE CHARGE. FOR COMPLETE INFORMATION SEE EO 30-115 AA-2 ON AIRCRAFT 23001 TO 23370 INCLUSIVE. SEE EO 30-115 AC-2 ON AIRCRAFT 23371 AND SUBSEQUENT.

WARNING: THIS AIRCRAFT CONTAINS A CANOPY REMOVER CONTAINING AN EXPLOSIVE CHARGE. FOR COMPLETE INFORMATION SEE EO 30-115 BA-2 ON AIRCRAFT 23001 AND SUBSEQUENT.

47 SERVICE THIS AIRCRAFT WITH EITHER SPEC. 3-GP-22a or 3-GP-23a FUEL.

48 GYROSYN COMPASS AND AMPLIFIER HYDRAULIC RESERVOIR. FUEL LEVEL TRANSMITTER. FIRE DETECTOR RELAY.

49 ACCESS FOR GROUND TEST FITTINGS, HYDR. AND ENGINE ELECTRIC DISCONNECTS.

50 USE OIL PER SPEC. MIL-0-6081A GRADE 1010

51 OIL FILTER AND DIP STICK.

52 ACCESS FOR UTILITY HYDR. PUMP, FLIGHT CONTROL ADJUSTMENT, OIL RETURN LINE AND ELECTRICAL DISCONNECTS.

53 SPARK PLUG ACCESS.

54 NORMAL HYDRAULIC FLIGHT CONTROL SYSTEM COMPENSATOR.

55 STAB CONTROL ACCESS. STAB TRIM AND ARTIFICIAL FEEL BUNGEE ACCESS.

56 OIL COOLER WATER DRAIN THROUGH RH WELL.

57 GROUND HERE. (L AND R).

58 FUEL FILLER. 163. IMP. GALS. FUSELAGE

59 FIRST FILL FWD AND CENTRE WING CELL SECOND FILL OUTER WING CELLS LAST FILL AFT FUSELAGE CELL.

CAUTION: DO NOT OVERFLOW.

60 GUN ACCESS, GUN CHARGER AMMUNITION LOADING HOOK.

61 GUN CHARGER AIR BOTTLE DRAIN.

62 GUN CHARGER AIR COMPRESSOR ACCESS.

63 ACCESS TO EMERGENCY NOSE GEAR SELECTOR RESET.

64 COMPRESSOR OIL RESERVOIR. AIR BOTTLE FILLER VALVE. (FILL TO 1700 PSI MAX) PRESSURE GAUGE.

65 OXYGEN FILLER INSIDE.

66 SERVICE THIS AIRCRAFT WITH EITHER SPEC. 3-GP-22A or 3-GP-23A FUEL. FUEL FILLER 80. IMP. GALLONS.

67 AIRPLANE MUST NOT BE TOWED WITHOUT WEDGE IN PLACE AS SHOWN.

CAUTION: RED ARROWS MUST BE ADJACENT BEFORE LOCKING STRUT.

68 TOW

69 RED ARROWS.

70 THIS FACE FORWARD.

71 JACK PER EO 05-5E-2

72 RED ARROW.

73 ONE INCH RED TIRE SLIPPAGE MARKS.

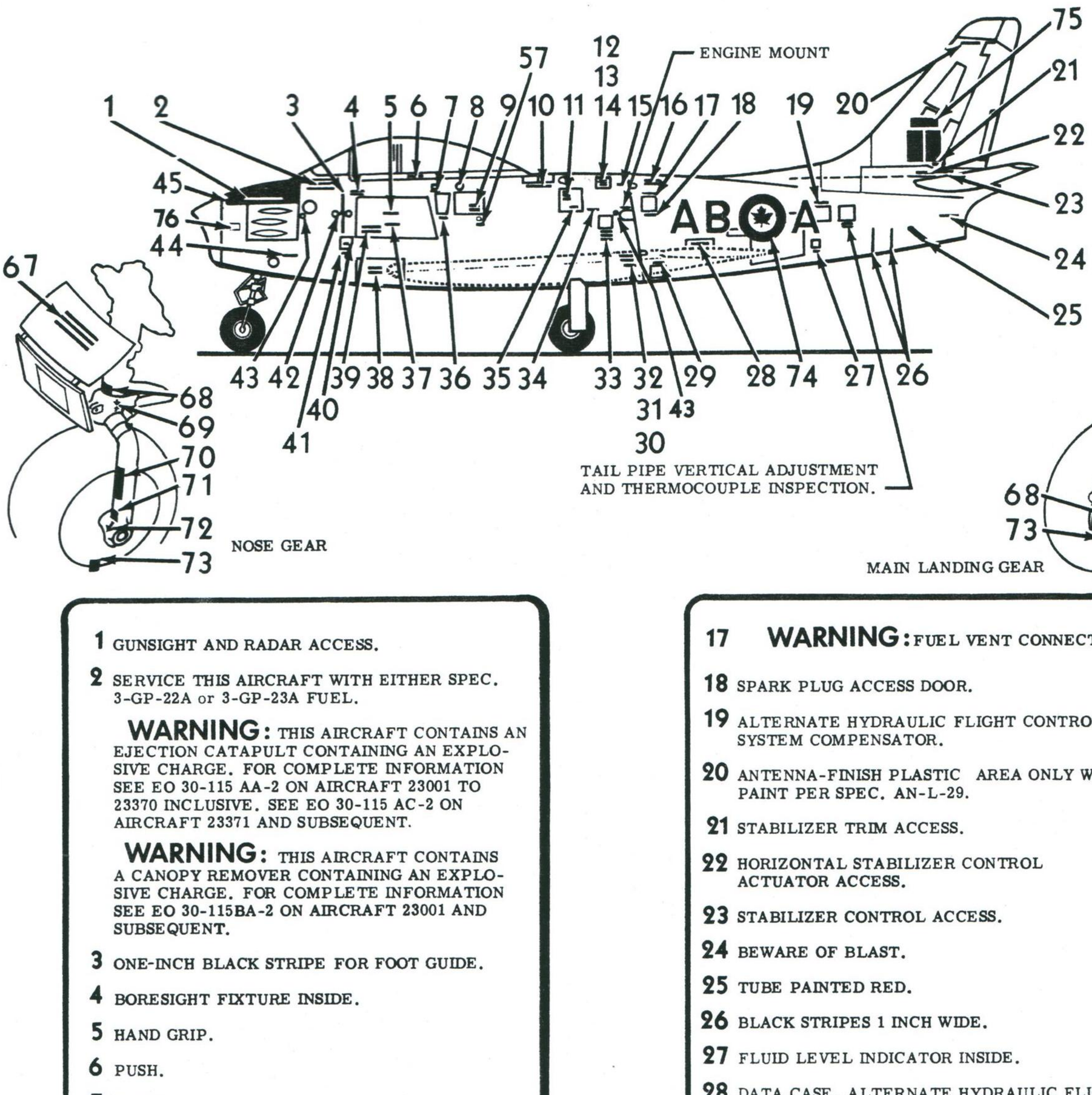
74 INSIGNIA.

75 IDENTIFICATION

76 BEWARE OF INTAKE, (AIRCRAFT 23636 & SUBS.)

5E2-01-35C

Figure 1-24 (Sheet 4 of 4) External Markings



1 GUNSIGHT AND RADAR ACCESS.

2 SERVICE THIS AIRCRAFT WITH EITHER SPEC. 3-GP-22A or 3-GP-23A FUEL.

WARNING: THIS AIRCRAFT CONTAINS AN EJECTION CATAPULT CONTAINING AN EXPLOSIVE CHARGE. FOR COMPLETE INFORMATION SEE EO 30-115 AA-2 ON AIRCRAFT 23001 TO 23370 INCLUSIVE. SEE EO 30-115 AC-2 ON AIRCRAFT 23371 AND SUBSEQUENT.

WARNING: THIS AIRCRAFT CONTAINS A CANOPY REMOVER CONTAINING AN EXPLOSIVE CHARGE. FOR COMPLETE INFORMATION SEE EO 30-115BA-2 ON AIRCRAFT 23001 AND SUBSEQUENT.

3 ONE-INCH BLACK STRIPE FOR FOOT GUIDE.

4 BORESIGHT FIXTURE INSIDE.

5 HAND GRIP.

6 PUSH.

7 HOIST.

8 EMERGENCY CANOPY RELEASE.

9 RADIO ACCESS. FUEL LEVEL CONTROL VALVE INSIDE.

10 CABIN COOLING UNIT ACCESS.

11 ACCESS FOR ALCOHOL TANK FILLER AND OIL FILTER.

12 SURFACE CONTROL ADJUSTMENT ACCESS. HYDRAULIC DISCONNECT COUPLING ACCESS. TARGET TOW MANUAL RELEASE DISCONNECT.

13 CAUTION: DISCONNECT ANTENNA CABLE BEFORE REMOVING REAR SECTION.

14 FUEL LEVEL TRANSMITTER

15 HOIST.

16 TORQUE BOLTS TO 160-190 INCH-POUNDS MAX.

17 WARNING: FUEL VENT CONNECTION.

18 SPARK PLUG ACCESS DOOR.

19 ALTERNATE HYDRAULIC FLIGHT CONTROL SYSTEM COMPENSATOR.

20 ANTENNA-FINISH PLASTIC AREA ONLY WITH PAINT PER SPEC. AN-L-29.

21 STABILIZER TRIM ACCESS.

22 HORIZONTAL STABILIZER CONTROL ACTUATOR ACCESS.

23 STABILIZER CONTROL ACCESS.

24 BEWARE OF BLAST.

25 TUBE PAINTED RED.

26 BLACK STRIPES 1 INCH WIDE.

27 FLUID LEVEL INDICATOR INSIDE.

28 DATA CASE. ALTERNATE HYDRAULIC FLIGHT CONTROL SYSTEM PUMP ACCESS. ENGINE REMOVAL DISCONNECTS.

29 TORQUE BOLTS TO 160-190 INCH POUNDS MAX.

30 FUEL FILTER ACCESS THROUGH LH WHEEL WELL.

31 CAUTION: DISCONNECT ELECTRICAL WIRING BEFORE REMOVING REAR SECTION.

32 JACK.

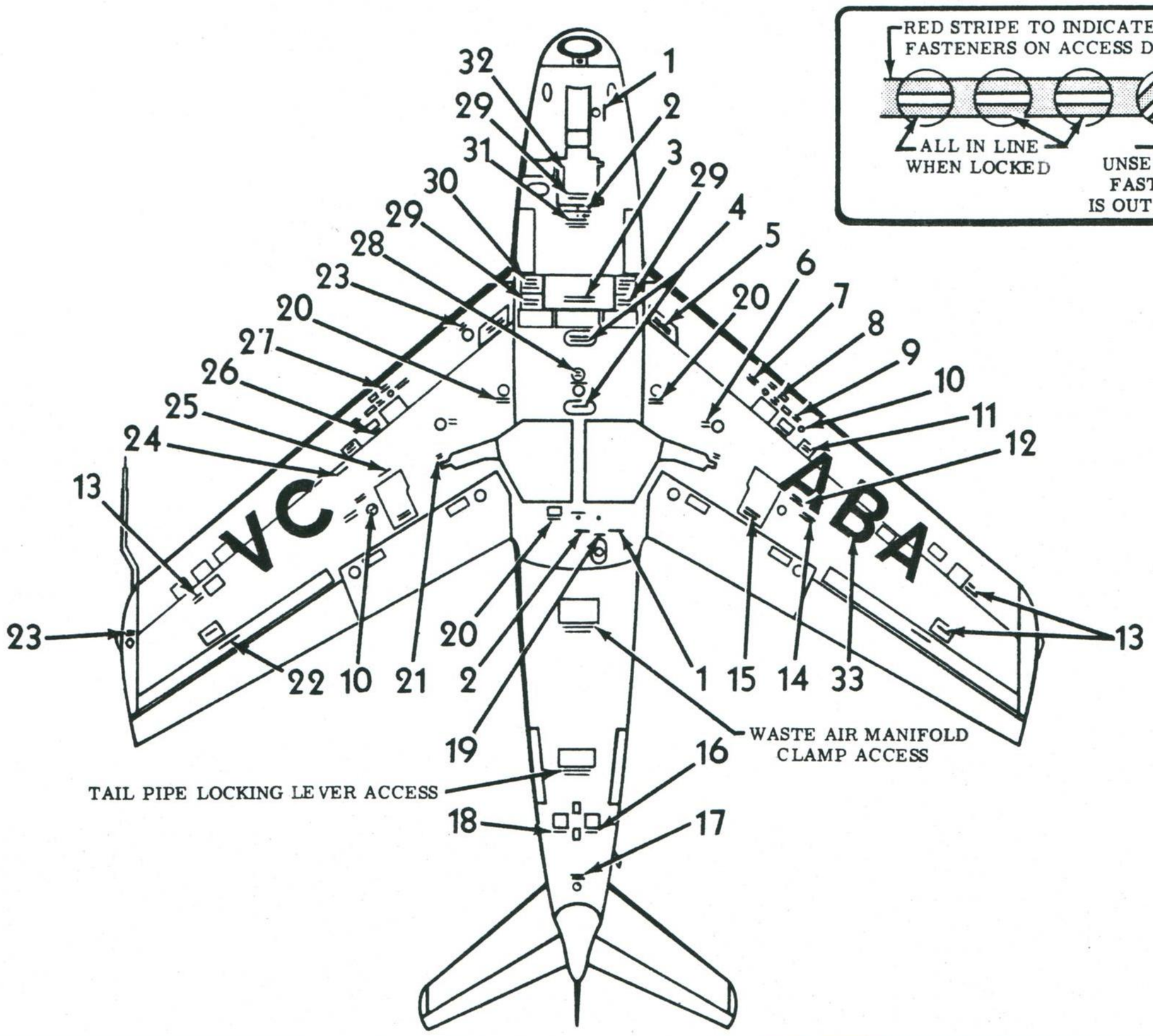
33 EXTERNAL POWER RECEPTACLE .24 VOLTS D.C. USE BOTH RECEPTACLES FOR ENGINE START USE NO. 1 FOR GROUND CHECK WHEN ONLY ONE RECEPTACLE REQUIRED. BATTERY LOCATION IN NOSE RADAR COMPARTMENT.

34 BORESIGHT FIXTURE INSIDE.

35 NO STEP.

36 STICK STOP ACCESS.

Figure 1-24 (Sheet 3 of 4) External Markings



1 PLUMB BOB

2 LEVELING

3 COMMAND RADIO AND AILERON TRIM ACCESS. **CAUTION:** TO LOWER THIS DOOR TURN HANDCRANK LOCATED INSIDE LH EXPENDED AMMUNITION DOOR.

4 FUEL BOOSTER PUMP.

5 DROP TANK FUEL AND PRESSURE DRAIN (L AND R)

6 WING FUEL CELL TENSION - COMPRESSION POST. (L AND R)

7 **CAUTION:** KEEP THIS HOLE OPEN. (L AND R)

8 DROP TANK FUEL CONNECTION. (L AND R)

9 CHEMICAL TANK CONNECTION. USE 832 X 1 SCREW. (L AND R)

10 DELETED

11 MANUAL RELEASE CONNECTION. (L AND R)

12 JACK (L AND R)

13 AILERON HYDRAULIC LINE ACCESS. (L AND R)

14 GROUND CHEMICAL TANK HERE. USE 832 SCREW, (L AND R)

15 FLAP ACTUATOR ACCESS. (L AND R)

16 ALTERNATE HYDRAULIC FILLER.

17 MOOR. THIS PLUG MUST BE INSTALLED FOR FLIGHT. REF. EO-05-5E-2.

18 NORMAL HYDRAULIC FILLER.

19 FUEL TRANSFER PUMP.

20 FUEL SUMP DRAIN.

21 AUXILIARY JACK PAD. (L AND R.)

22 AILERON SEAL AND HYDRAULIC CYLINDER. (L AND R)

23 AIRSPEED LINES DRAIN.

24 MOOR. REF. EO-05-5E-2. (L AND R)

25 AUXILIARY FUEL TANK SUPPORT. (L AND R)

26 BOMB RACK ELECTRICAL DISCONNECT ACCESS DOOR. (L AND R)

27 DROP TANK PRESSURE CONNECTION (L AND R)

28 DO NOT PAINT.

29 EXPENDED AMMUNITION ACCESS INSIDE.

30 **CAUTION:** INSTALL ALL INTERNAL ACCESS PANELS PRIOR TO CLOSING THIS DOOR. (L AND R)

31 JACK

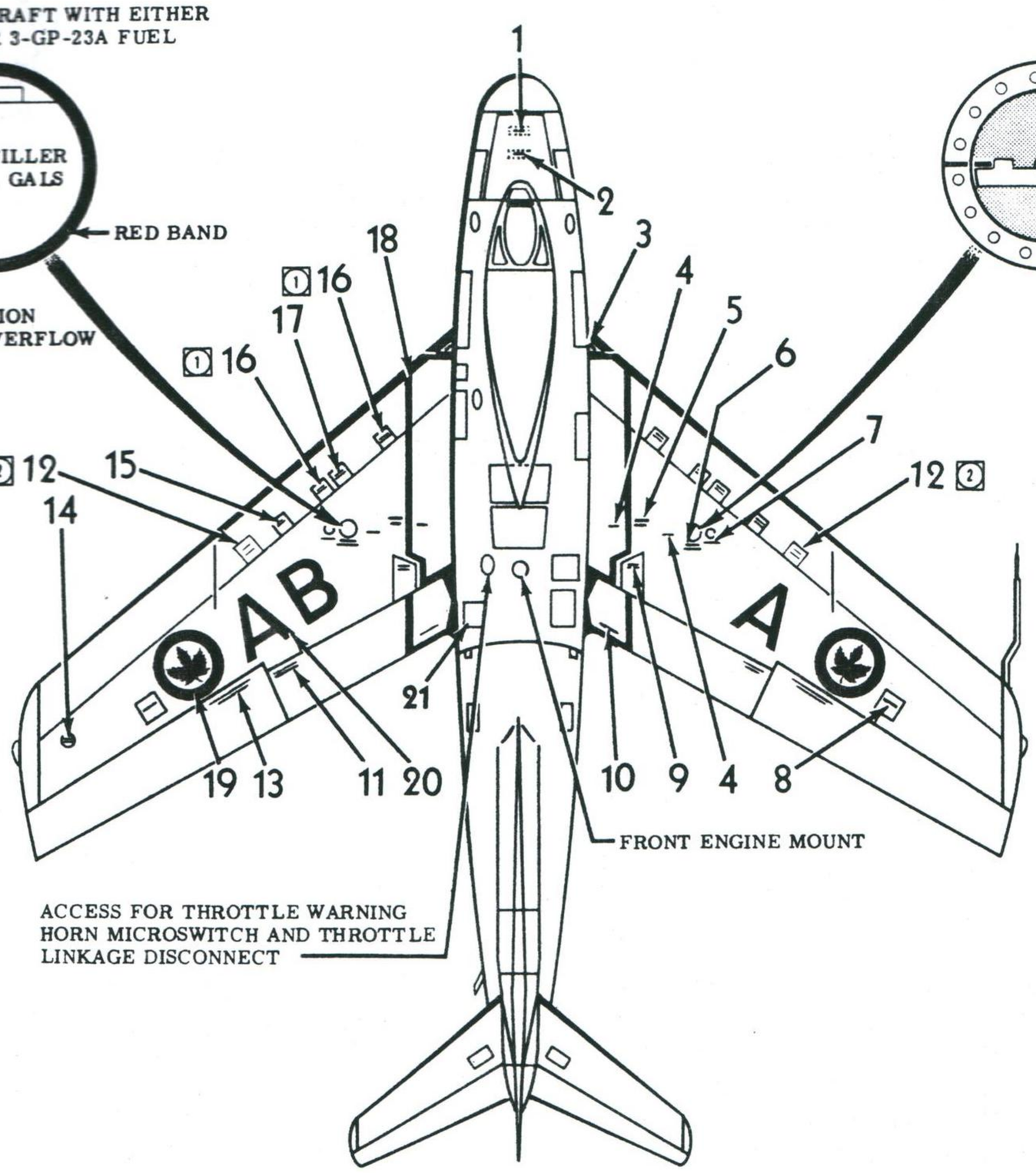
32 LEVELING PROVISION INSIDE.

33 IDENTIFICATION

AIRCRAFT 23001 TO 23610 INCLUSIVE

5E2-01-33B

Figure 1-24 (Sheet 2 of 4) External Markings



REFER TO DRAWING: 13A-49001

1 SHOCK STRUT FILLER ACCESS

2 ELECTRICAL PRESSURIZED DISCONNECT

3 NO STEP. TO REMOVE INSERT SCREWDRIVER, PUSH PIN AND SLIDE (L AND R)

4 HOIST (L AND R)

5 FUEL CELL TENSION-COMPRESSION POST (L AND R)

6 FIRST FILL FORWARD AND CENTRE WING CELLS. SECOND FILL OUTER WING CELLS. LAST FILL AFT FUSELAGE CELL

CAUTION

DO NOT OVERFLOW (L AND R)

7 GROUND HERE (L AND R)

8 AILERON CONTROL ACCESS (L AND R)

9 TRUNNION ACCESS (L AND R)

10 NO STEP (L AND R)

11 RED STRIPE (L AND R). (FLAP HALF DOWN)

12 DROP TANK FUEL FLOW INDICATOR ACCESS [2]

13 DO NOT SET AILERON ON FABRIC SEAL (L AND R)

14 REMOTE COMPASS TRANSMITTER INSIDE

15 SURFACE CONTROLS ACCESS (L AND R)

16 ROCKET JETTISON ACCESS (L AND R) [1]

17 DROP TANK CONNECT (L AND R)

18 BLACK BAND (L AND R)

19 INSIGNIA

20 IDENTIFICATION

21 TARGET TOW MANUAL RELEASE DISCONNECTS A/C 23001 TO 23430 INCLUSIVE

[1] Aircraft 23001 to 23210 inclusive.

[2] Aircraft 23201 and subsequent.

5E2-01-32C

Figure 1-24 (Sheet 1 of 4) External Markings

Canadair Sabre MK 1

(NFB) B-5-5964

B55964 (1)

B55964

THE NATIONAL FILM BOARD
OF CANADA

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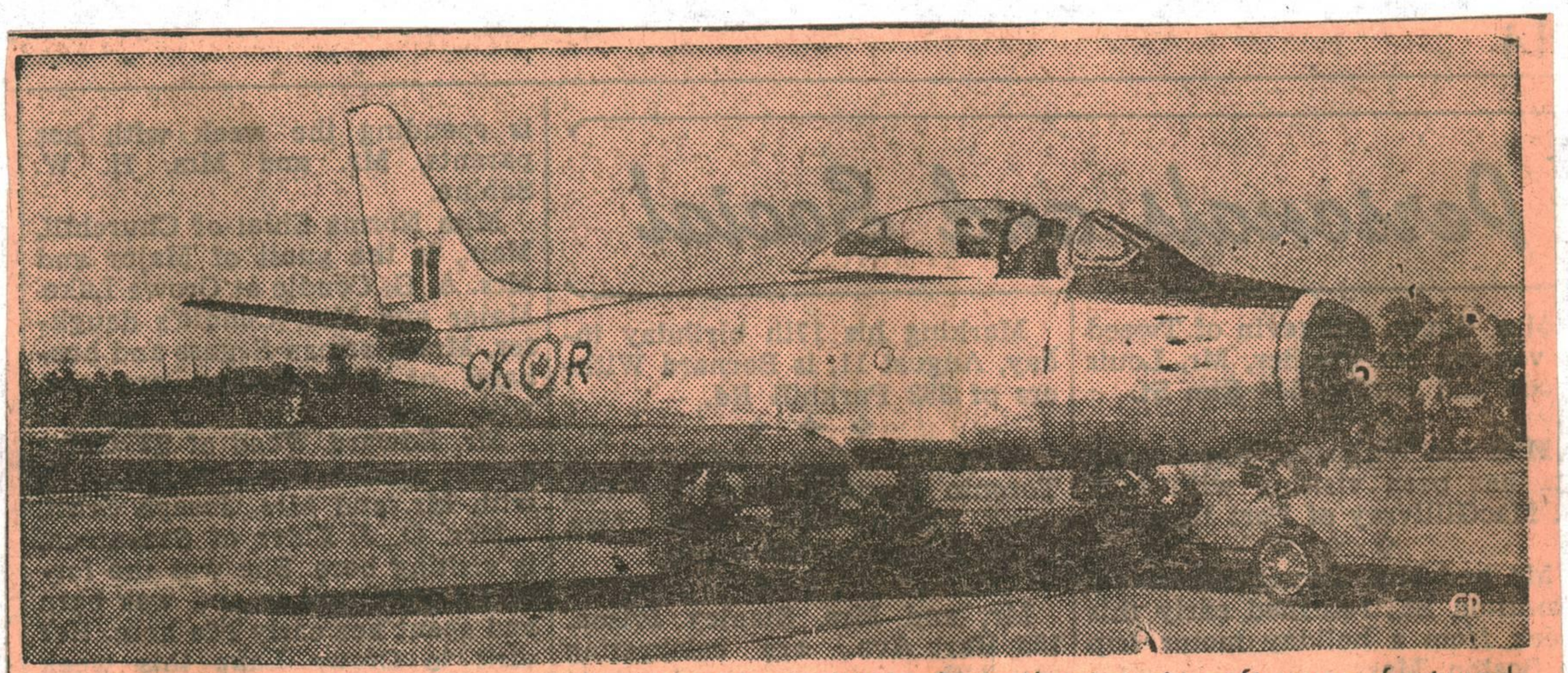
PLEASE CREDIT N. F. B.

Ron Wylie

CANADA'S NEW F-86 SABRE JET FIGHTER HAS TEST

THE FIRST OF 100 F-86 SABRE jet fighter airplanes made its initial test flight yesterday at Dorval airport, Montreal. At the controls was Canadair's chief pilot, Captain A. J. (Al) Lilly, a veteran with over 13 years of commercial and test-flying experience. This type of pl ane is capable of speeds in excess of 650 miles an hour



CANADA'S NEW JET — The RCAF F-86 Sabre is shown at Dorval Airport, near Montreal, shortly after it was put through a test flight before Defence Minister Claxton and other Commonwealth air experts. A similar jet aircraft, manufactured in the United States, holds the world's speed record of 670 miles an hour. Production of these aircraft in a Montreal plant is being speeded up to keep pace with the expanding RCAF.

An ORENDA powered SABRE built by Canadair and flown by Miss Jacqueline Cochran recently established five world's records including the 100 Kilometer record at 652.37 M.P.H. and the 15 Kilometer record at 670 M.P.H.

tribute to teamwork

Two years of constant association on the top-priority project of perfecting the ORENDA-SABRE for the R.C.A.F. has fostered teamwork of a high order between Canadair and AVRO Canada.

Installation of the ORENDA in SABRES for the R.C.A.F. being built at Canadair is now underway. This successful combination of two Canadian Jet Age products makes the ORENDA-SABRE the world's outstanding fighter aircraft in volume production.

Canadair's capacity to produce this new SABRE, one of which flew from Toronto to Montreal in 28 minutes, is assured through regular delivery of ORENDAS from AVRO Canada's Gas Turbine Division.

Current and planned ORENDA output is sufficient to meet all present and future production of SABRES and CF100's, as well as spares for the R.C.A.F. and NATO bases.

GAS TURBINE DIVISION

A.V. ROE CANADA LIMITED

MALTON, ONTARIO

MEMBER OF THE HAWKER SIDDELEY GROUP

Photo
B. Gibbens

Sabres, 23428

Photos
W. Wheeler

Sabres

Note crest on nose

Ottawa, Ont.

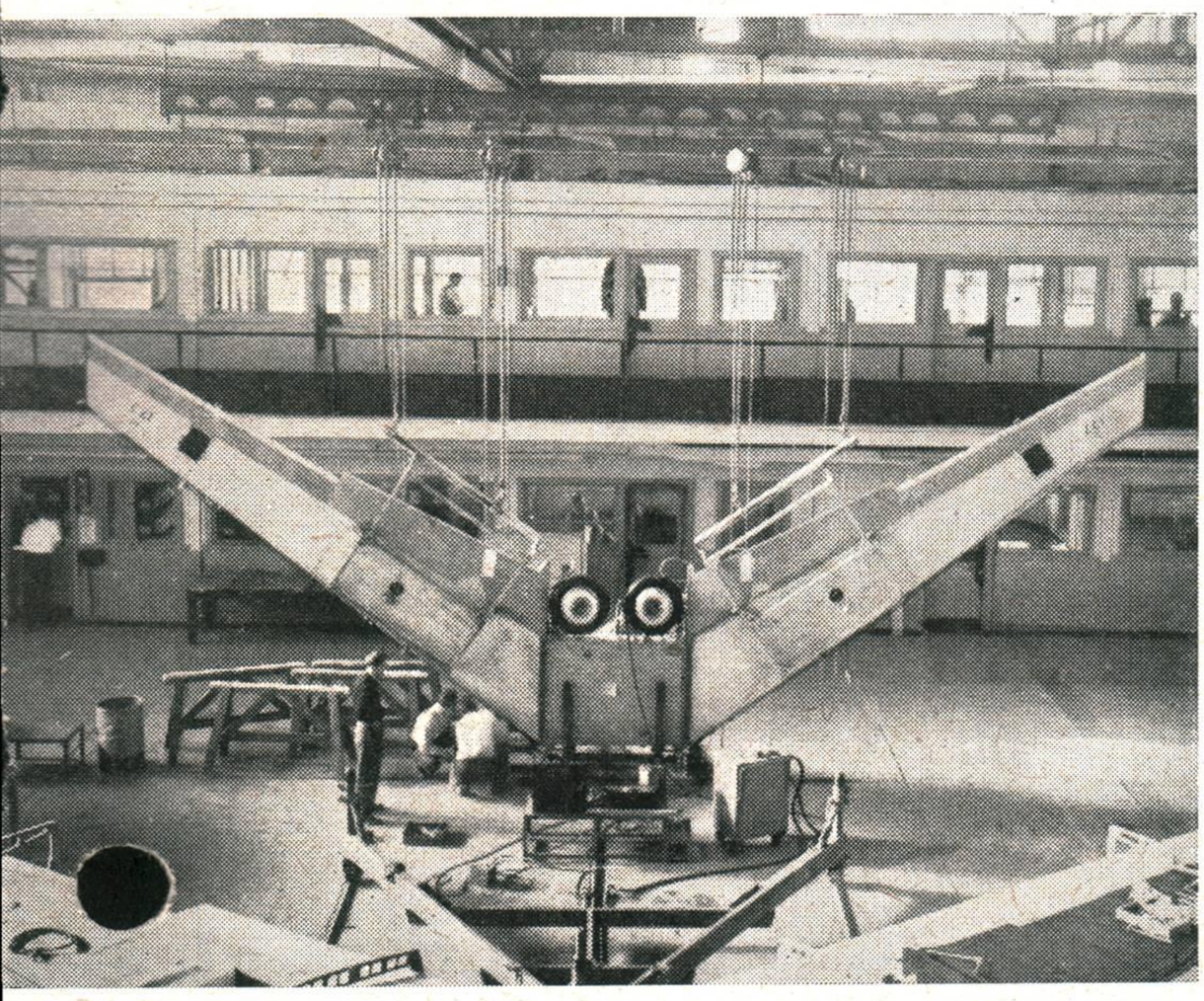
Photo
W. Wheeler

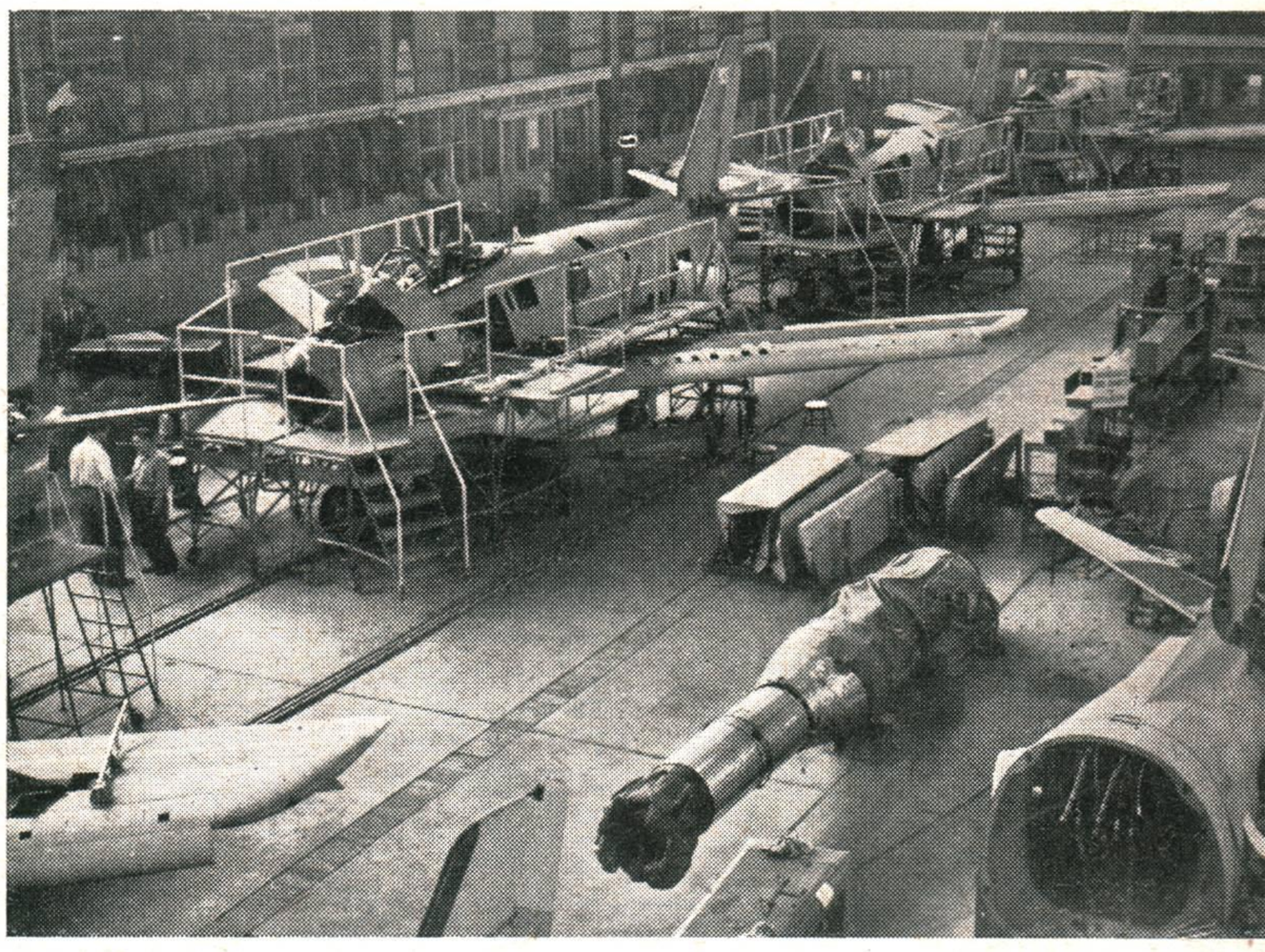
Sabre VI #23404 Uplands Sept 1961

in use by CEPE.

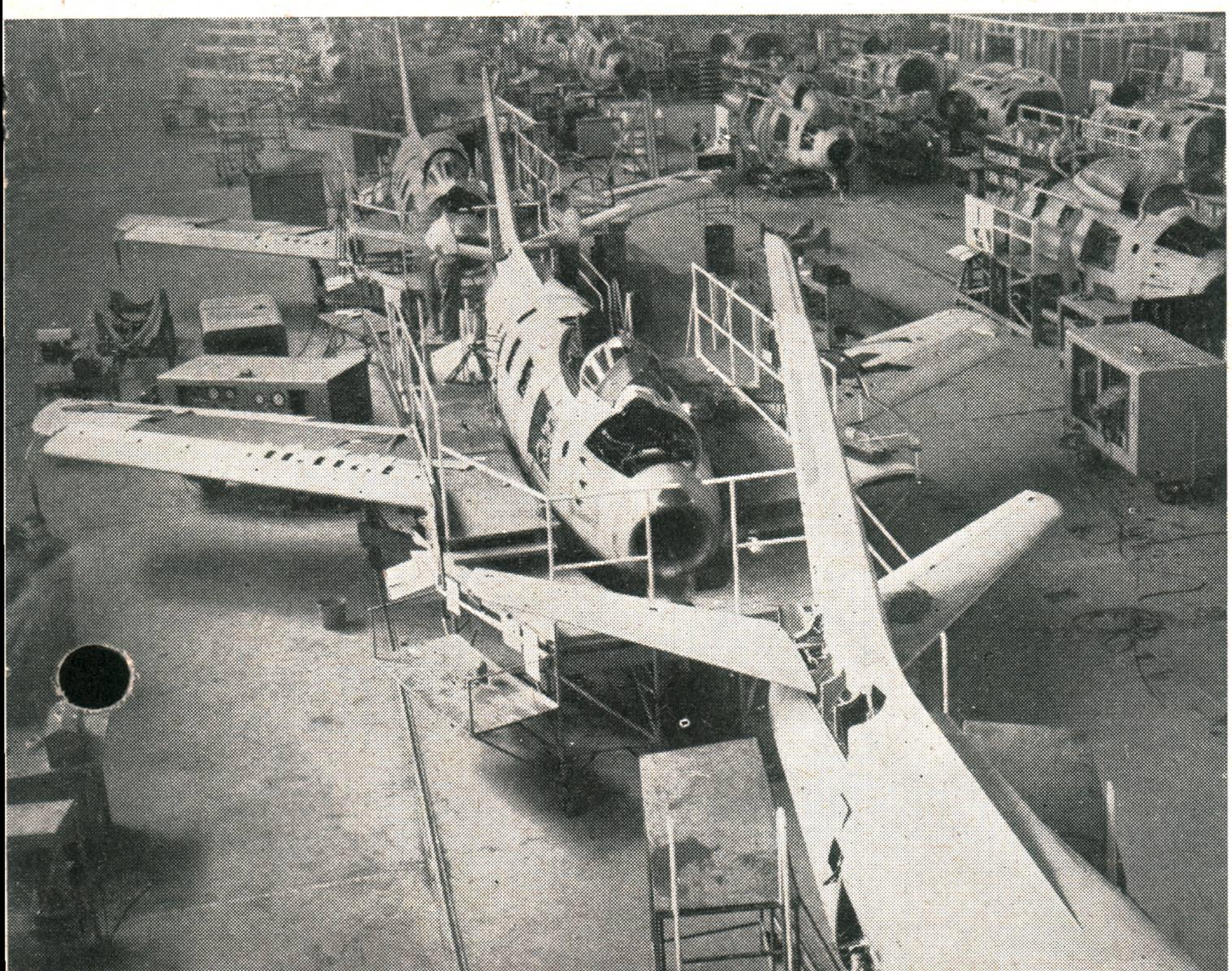
Production for NATO

Top, a general view of part of Canadair's impressive Sabre production. The final assembly line proper is on the left; smaller components are built in the bays down the left-hand side of the shop. Left, wing assemblies are completed on a small four-unit line at the start of the main assembly line.





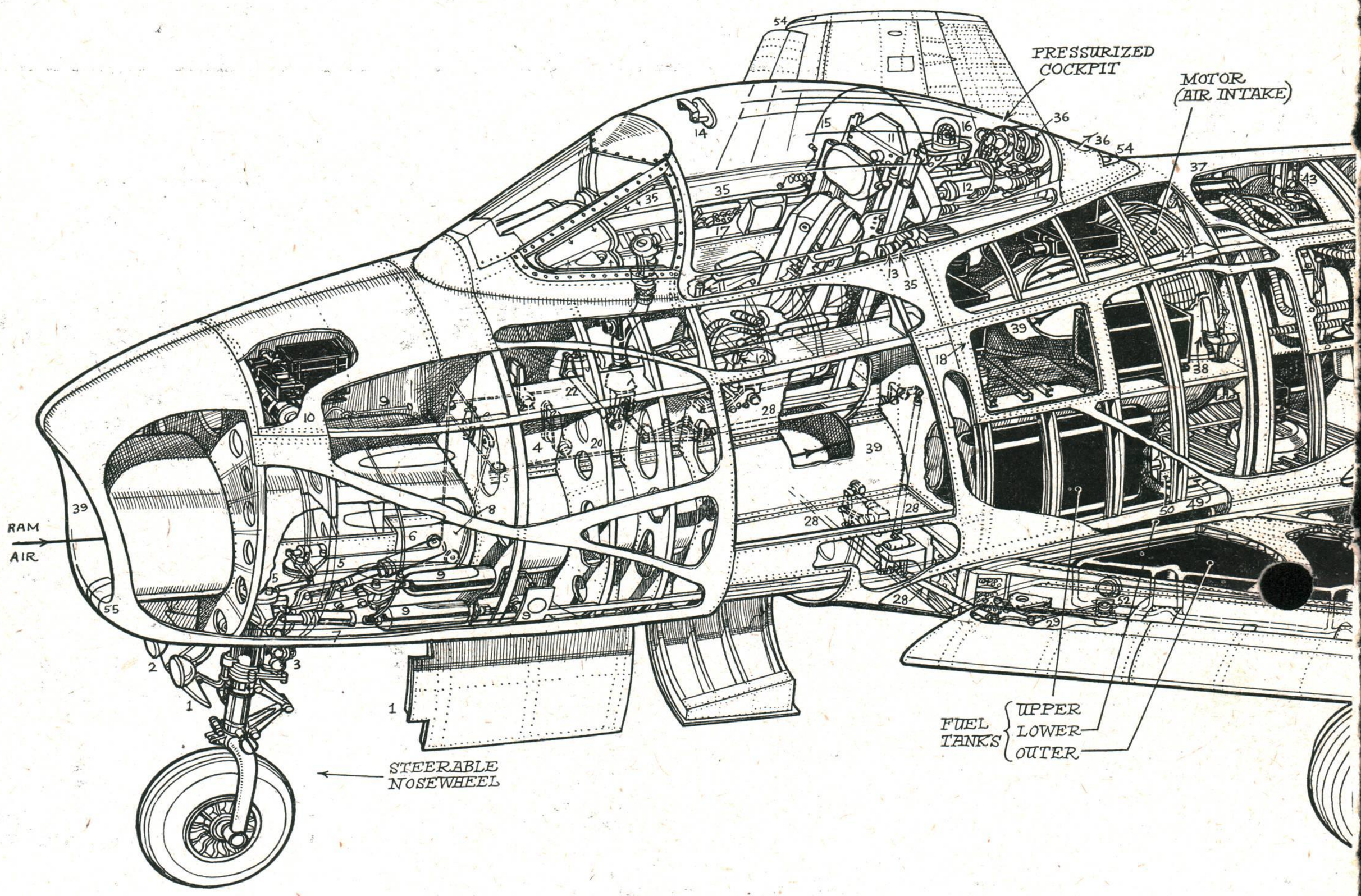
Right, a section of the final assembly line where the fuselage portions are married together and assembled to the wing. Below, another section of the production shop, where equipment and armament is being installed in the wings and fuselage.



Production of the North American Sabres for the R.C.A.F. and R.A.F. has been proceeding at Canadair's factory in Montreal at the rate of about 20 per month for some considerable time and this output is to be increased to two per day. Orenda-powered Sabres are expected to come off the production line in the near future. On the two following pages will be found a detailed cut-away drawing of the present standard Canadian-built aircraft.

CANADAIR F-86E* SABRE 2

One 5,200 lb. s.t.



1. Nosewheel doors.
2. Retracting lamps.
3. Hydraulic steering unit mechanical controller off rudder bars 4 via links and cables 5.
6. Main retraction jack.
7. Secondary retraction jack.
8. Wheel-well under air trunk.
9. Oxygen bottles (plus two on starboard side) and filler valve.
10. AC and DC system battery, circuit-breakers and relay panel.
11. Armour and ejector seat with release.
12. Cartridge for ejector canopy and release.
13. Undercarriage warning horn.
14. Hinged mirror.

RADIO

15. Radio compass sense aerial.
16. Radio compass loop aerial.
17. Side panel.
18. Compartment contains IFF radio, radio-compass, aerial assembly, VHF radio-static converter.
19. Antenna (in fin).

RUDDER CONTROL

20. Cables from rudder pedals to rudder.
21. Electrically-driven screw jack actuator to servo tab.

ELEVATOR CONTROL (Variable Incidence Tailplane Control)

22. Rod and cable connection from stick.
23. Bell crank to operate hydraulic supply valve 24.
24. Valve controls hydraulic jack to lift tail plane front spar 25.
26. Tailplane rear spar hinge.
27. Toggle gear automatically swings elevator with change of tailplane incidence.

AILERON CONTROL

28. Rods from stick.
29. Cable control of hydraulic valve 30.
31. Operating jack regulated by valve 30.
32. Aileron air seal.

FLAP CONTROL

33. Electric actuator.

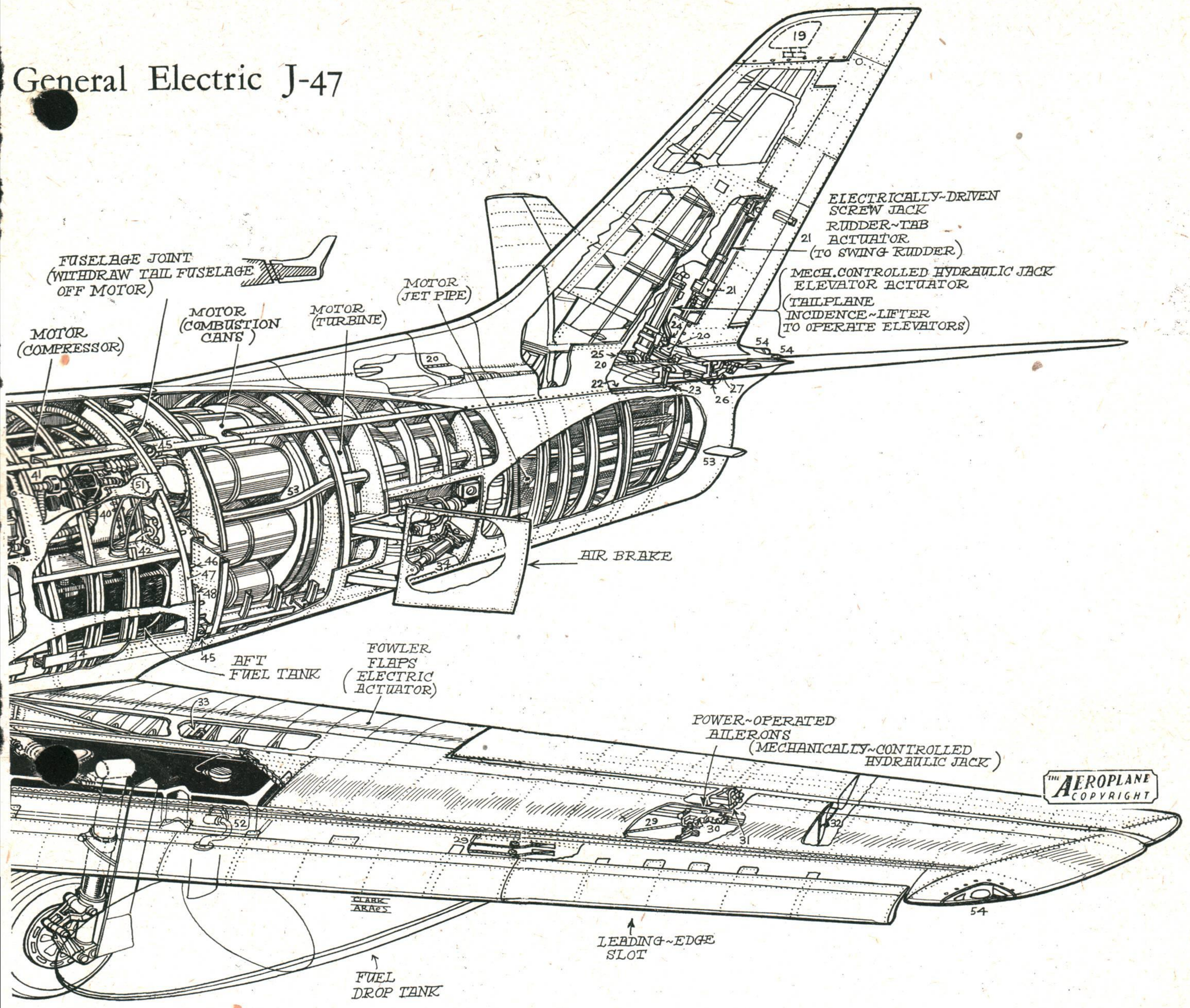
AIR BRAKES

34. Hydraulic operating jack electrically valved via restrictor, solenoid, control valve and accumulator, from cockpit handle.

PRESSURIZED COCKPIT

35. Canopy and windshield defrost
36. Pressure regulator and exit.
37. Air mixing valve.
38. Cooling air bleed off air trunk 39.
40. Primary heat exchanger.

General Electric J-47



41. Motorized shut-off valve.
42. Trunnion mounting for engine.
43. Front suspension point.

FUSELAGE

44. Top and bottom longerons.
45. Four tail fuselage pin fixings.
46. Row of locating pegs between facing end frames 47 and 48.
49. Undercarriage wheel-well.
50. Underfloor vertical spine carrying undercarriage doors with fuel connecting pipe running through from front to aft fuel tanks (booster pump—transfer pump).
Fuel filler cap.
Fuel level transmitters.
53. Fuel jettison.
54. Navigation lights.
55. Camera gun.

Drawing by
J. H. Clark, A.R.Ae.S.

Headquarters Air Command, South-East Asia, as Senior Air Staff Officer. He became military governor of Penang in September, 1945, and A.O.C. the R.A.F. base at Bombay two months later. On his return to Great Britain early in 1946 he was again appointed S.A.S.O. of No. 19 Group, with which he remained until he went to the Joint Anti-Submarine School in August, 1948.

Canadian Sabres Arrive in France

FIFTY-SIX Canadian-built F-86E Sabres of the R.C.A.F. No. 2 Fighter Wing arrived at Gros Tenquin, near Metz, France, on October 11 after a 3,000-mile flight from Canada. The wing, which left Ottawa on September 30, is the first Continent-based R.C.A.F. unit provided for N.A.T.O. by Canada. The Sabres are also the first N.A.T.O. aircraft on the Continent which are capable of meeting the MiG-15 on equal terms. The crossing was made under the direction of Wing Cmdr. C. C. M. Mussells, O.B.E., D.S.O., D.F.C. He was also task force commander of Exercise "Leap Frog One," the trans-Atlantic flight of No. 439 (Sabre) Squadron early this Summer.

Such elaborate arrangements were made for the crossing that the aircrew found it almost routine. Flg. Off. Wm. Marsh remarked that the trip was much easier than expected. Navigation was aided by continuous homing signals from Ocean Weather Ships at approximately the half-way points of each stage. Midway between the weather ships and land were U.S. Air Force B-17 Fortresses circling these points. Painted with yellow stripes, they were provided for weather reconnaissance and air-sea rescue. The Fortresses were nicknamed "Duck Butts," because from the rear they resembled the rear elevation of a duck. Their weather information was transmitted by a special teletype circuit.

North Stars with ground crew and supplies by-passed the Sabres at each point en route, giving rise to the exercise's name, "Leap Frog Two." Thus the ground crew of at least one squadron was always ahead of the Sabres. This technique may account for the high serviceability recorded.

Most of the weather flights were undertaken by the U.S.A.F., but the North Star tenders were also available. On the whole, the weather was better than during 439 Squadron's Summer crossing. However, the weather did close in and strand one squadron in Greenland, where pilots stayed at an intriguing hostel—the Hotel de Gink. Ceremonies in France were delayed until these Sabres could catch up.

Just outside Prestwick at 38,000 ft., Flg. Off. Douglas Fitzgerald had his oxygen fail. He lost consciousness, and his Sabre dived to 8,500 ft. before he was able to recover and pull out. Other pilots experienced minor difficulties. On the final stage, four aircraft landed at North Luffenham, Rutland. One was severely damaged during a belly landing which followed an engine failure.

At Gros Tenquin, General L. Norstad complimented the wing on its crossing. M. Leduc, of the French Central Mission, and General Pellisier, commanding the First French Air Force Region, also greeted the aircrew. By a coincidence, Air Vice-Marshal A. L. James, A.O.C. Air Defence Command, R.C.A.F., who had bade farewell to the wing in Ottawa, was also on hand.

At present, the hastily completed 1,000-acre base has one 8,000-ft. concrete runway. Pilots said it was superior to anything they had flown from in Canada. The flat-roofed huts, which will hold the base's 1,000 men, were pre-fabricated to a French design and N.A.T.O. specifications. Of plaster fibre-board construction, they are insulated with a honeycomb fibre and sheathed with aluminium. To the Canadians' relief, central heating is fitted.

The Sabres arrived at their new base in flights of twos or threes at two-minute intervals. A mass arrival would have been more spectacular, but it would have left too small a fuel reserve for stacking after the 655-mile flight from Prestwick. Like most stages of the crossing, it was made at 35,000 ft.

No. 416, one of the three squadrons in the wing, was one of the last four R.C.A.F. fighter squadrons to be based on the Continent during the Second World War. No. 421 was based at Odiham in 1950 before it returned to Canada to exchange its Vampires for Sabres. Pilots of the third squadron, No. 430, wore a Silver Falcon insignia on the shoulders of their flying suits. The unit is awaiting the approval of this badge by the College of Heralds.

The fighter wing at Gros Tenquin is the second that Canada has contributed to N.A.T.O. The Sabre wing now at North Luffenham will eventually be moved to the Continent, probably in 1954. A third wing will be stationed at an airfield now under construction at Zweibrucken, Germany, and another wing will follow in 1953.

Vampire Trainers for the R.A.A.F.

THE Royal Australian Air Force is due to take delivery of the first of several D.H.115 Vampire trainers early in December. These aircraft are being built by de Havillands in Sydney, and will be used for night flying, instrument approach procedures and armament practice.

R.A.A.F. pilots who complete their jet conversion on the Vampire trainer will be fully qualified to handle their own jet fighters, including Australian-built F-86 Sabres.

Malayan Operations in September

WHILE there was a decrease in the number of offensive sorties flown by aircraft of the Royal Air Force and the R.A.A.F. in operations over Malaya during September, there was an increase in the amount of supplies dropped from aircraft to dropping zones and jungle clearings.

Australian Lincolns and R.A.F. Brigands, Hornets, Sunderlands and Vampires flew some 250 sorties on air strikes throughout the Federation against terrorist targets, the majority being in the states of Selangor and Johore.

A feature of the month was the unusually large number of night strikes flown by the Lincolns. They supported two large ground operations. The first in Perak, in which for eight consecutive days Seletar, Tengah, Kuala Lumpur and Butterworth-based aircraft maintained repeated attacks on a large area of jungle containing a number of terrorist hide-outs, and the second in Kedah in which night strikes were mounted by R.A.A.F. Lincolns and a strong attack was made by Hornets.

R.A.A.F. Dakotas and R.A.F. Valettas dropped over 300,000 lb. of supplies to patrols, jungle teams and police posts. Of this amount the greatest portion was dropped to units in the Temerloh area. It was the largest monthly total dropped for some time and was achieved despite bad weather. The three R.A.F. helicopters in Malaya were also active.

"LEAP-FROG" OVER.—Sabres of No. 2 Fighter Wing, R.C.A.F. after arrival at Gros Tenquin, France.

NOTES AND DATES

Volunteers for the Royal Observer Corps numbered 248 men and 90 women during September. All areas need more volunteers, age limits for whom range from 16 to 45 for service at centres and 55 for service at posts.

R.A.F. individual squash rackets championships for men and women will be held at the Lansdown Club, Berkeley Square, London, W.1, from November 24 to 29.

No. 87 Squadron. Reunion. At the New Inn Restaurant, Westminster Bridge Road, 6.30 p.m., November 8. Tickets from: A. B. Ebrey, "Seaforth," Southfields, Hessle, E. Yorks.

No. 1473 Flight propose a reunion in the near future. Those interested please communicate with Flt. Lt. C. Thornhill, R.A.F. Melksham, Wilts.

THE FIGHTING SERVICES

On Patrol in "Ardent"

CLOSING STAGES of Exercise "Ardent" were busy moments for Regular and Auxiliary fighter squadrons at Biggin Hill, Kent.

After what the pilots described as a boring morning, 24 Meteor 8s were scrambled on a report of 20 attacking Vampires. Forty miles east of North Foreland, the Meteors, with 12 Sabres, attacked the "high-speed bombers," which did not break formation.

Additional Meteors were always on standby as a defence against low-level strikes. On several occasions the "terriers" were scrambled after Thunderjets flying at 300 to 600 feet.

The Air Ministry kindly arranged a flight for your correspondent in a Meteor 7 of a famous Regular fighter squadron, which took part in one of these rat-and-terrier exercises. We had not been waiting at the end of the runway long when three red Very lights signalled a wing scramble. Twenty-two Meteors took off, some over us at very low altitudes. As we later learned, they had a profitable afternoon.

About five minutes later, at 4.50 p.m., we took off to patrol a line from West Malling to Sheerness. The Autumn sunshine and enchanting scenery made the flight seem like a pleasure cruise in the Mediterranean. Appropriately, the pilot, Sgt. Roy Tappenden, pointed out the Roman road near Detling and other spots of interest. These included some Superfortresses which were being dealt with in an appropriate manner.

We had just turned over Sheerness at 7,000 ft. and were heading towards Biggin Hill when two Vampires were reported over the airfield at 1,000 ft. Our Meteor got under way like a tiger which had been stuck with a pin. Mach 0.72 and 450 knots were attained before we reached 500 ft. Sector then reported the Vampires were friendly.

Disappointed, we resumed our patrol at 240 knots to conserve fuel. We had hardly turned on course when four Sea Furies, one a silver two-seater, passed across our nose about 1,000 ft. below. Sector apparently had only six Sea Furies on its plot, but, after a brief delay, ordered us to attack.

At first the Furies, taking advantage of their smaller turning radius, eluded us. Our camera gun was unserviceable, and we left additional attacks to the section leader. He claimed two without being attacked himself.

Only a week before, during "Ardent," his section had engaged another flight of Sea Furies. Although the Meteors obtained two confirmed "kills," the Furies also pressed home their attacks. A study of the interception was made, and the new tactic which was developed was applied successfully on Sunday.

This continual analysis of exercises, even at junior levels, is an encouraging feature of N.A.T.O. exercises. Errors are made, but each exercise gets better than the last.

While we were engaging the Furies, the Meteor Wing had attacked a stream of thirty-plus Superfortresses over the Channel. One section of a Regular squadron alone claimed nine B-50s, while another section attacked three.

As the attacks were being discussed, Lincolns were straggling overhead in the dusk. One or two Meteors could be seen attacking the widely dispersed stream.

Even as the station commander congratulated Biggin Hill's team for achieving 300 sorties in four days, four Meteors were scrambled. Exercise "Ardent" was over, but the training was still continuing.—N.MCD.

Week-end Visit to Biggin Hill

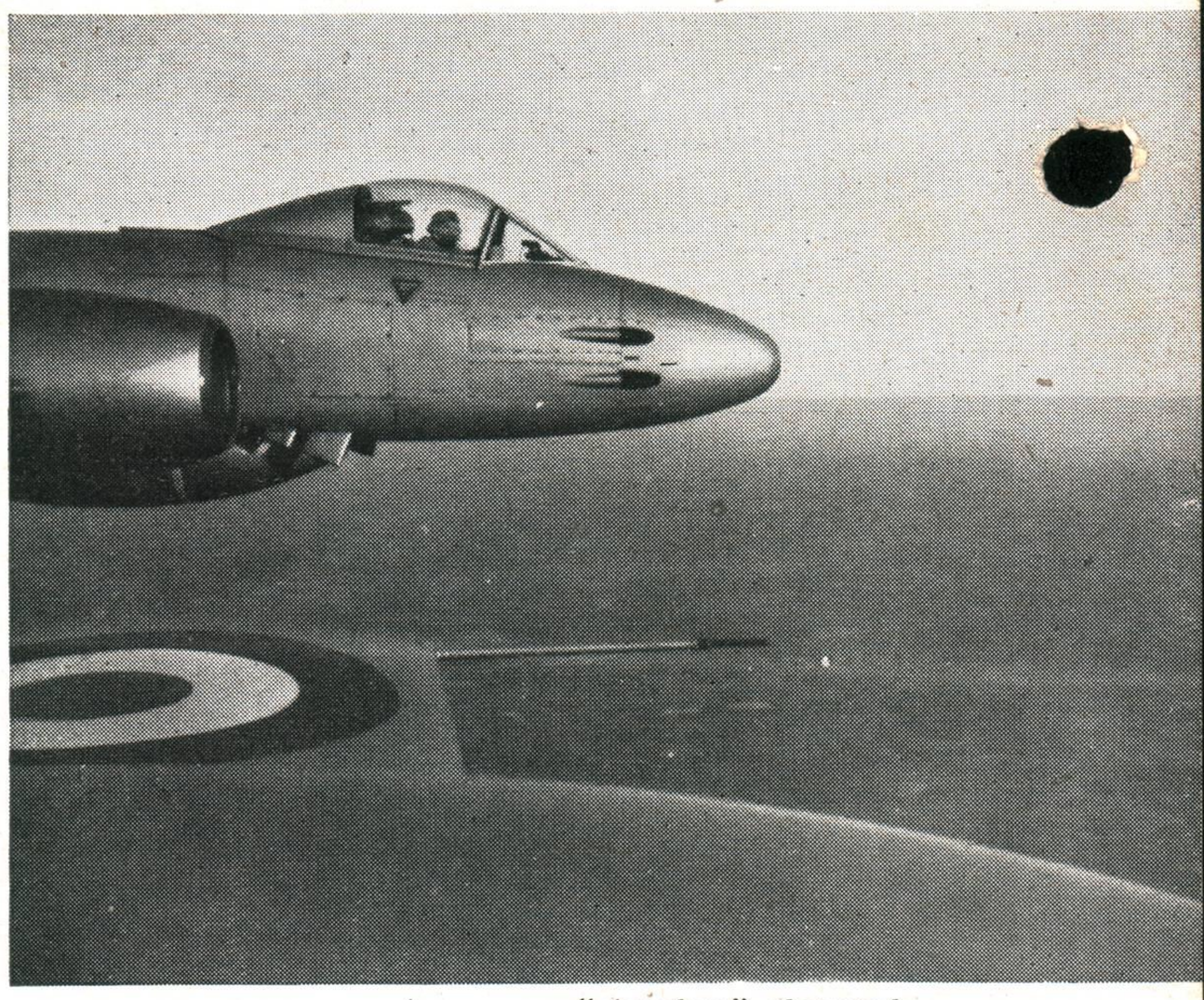
BIGGIN HILL'S reputation as a fighter base was maintained during Exercise "Ardent," if the number of sorties flown is any indication. On Sunday, October 5, sections of two Meteor 8s went off at regular intervals, and on three occasions, an entire wing was scrambled.

The week-end gave the two Auxiliary Air Force Squadrons, 600 (City of London) and 615 (County of Surrey), an opportunity to play a leading role.

Just before our arrival, a medium-sized force of Superfortresses, escorted by Vampires, flew over the field at high altitude, apparently en route to London. During the one-hour pause which followed, two Meteors were kept at readiness with their pilots in the cockpits. These eventually were scrambled, to be followed by other sections. Although the average was about two minutes, some sections were airborne one minute and 30 seconds after the brown smoke puff was fired.

One pilot claimed a Vampire, which he intercepted at 2,000 feet. Industrial haze near London made visual contacts difficult.

Any morning and noon-hour lulls were more than made up for by late afternoon "trade." The unmolested DC-6s and



"Aeroplane" photograph

ON THE PROWL.—A patrolling Meteor 8 from Biggin Hill seen from our correspondent's Meteor 7 during Exercise "Ardent."

Convairliners which had been ambling past the field were soon replaced by numerous vapour trails. To a Canadian, unused to such activity, they looked more like a Wooton painting than the real thing.

A report of 24 Netherlands Thunderjets caused the entire wing to be scrambled. By the time the second aircraft on standby was moving down the runway, the perimeter tracks were all but filled with aircraft. Although some aircrew had been at the far end of the field on 20 minutes' notice, it took only four minutes exactly to get 19 aircraft up. They had gone off at intervals which would have frightened most Canadian airfield controllers.

While two aircraft orbited the field to protect it against low-level attack, the remainder, including a Meteor 7 carrying a French journalist, circled Fighter Command Headquarters at Stanmore. No contact with the attackers was made, but they were intercepted over the Channel and near Stanmore by other Meteors.

If the wing did not see any excitement, the ground crew at Biggin did. For about an hour, the sky was seldom without a vapour trail. Eighteen Sabres, their swept wings obvious through binoculars, came over twice at about 30,000 feet. Other smaller formations passed nearby. Once, a B-50D Superfortress, flying at about 10,000 feet, seemed to be passing unnoticed. But it was soon set upon by four Sabres, which, as far as could be seen, attacked one at a time.

Meantime, an aircraft making two vapour trails was being hotly pursued by two single-engined aircraft. Then the Meteors began to return in flights of four, until the air was alive with aircraft. To one who had missed the S.B.A.C. Air Display, this was almost as good. The R.C.A.F. is so small and concentrated that a formation of 12 aircraft is unusual in Canada.

The local citizenry seemed impressed too, for they lined the airfield fence to watch operations. R.A.F. Alsatians patrolled the fences for "their psychological effect," as a corporal dog handler put it.—N.MCD.

R.A.F. Appointment

AIR COMMODORE P. D. CRACROFT, A.F.C., until recently Senior Air Liaison Officer, United Kingdom Service Liaison Staff, South Africa, has been appointed Air Officer Commanding No. 66 (Scottish) Group, Home Command, and will take up the post in November. Prior to his South African appointment in June, 1950, he was R.A.F. Director and commanding officer of the Joint Anti-Submarine School, Londonderry.

Commissioned in the Royal Air Force in 1927, Air Cmdre. Cracroft was mainly connected with Coastal Command during the War. At the end of the War against Japan he went to

The North American Sabre

A Technical Comment

ALTHOUGH it is one of the two most advanced fighter aeroplanes in operational use today, the F-86 represents the ultimate in conventional design rather than the embryo of a new generation. This statement is particularly true of the structure, although it can be applied nearly as sweepingly to the general aerodynamic design.

Fuselage Features

Taking the latter first and starting with the fuselage, this can be seen to be the practical application of the Gloster/Whittle E28/39 or the Heinkel He 178 formula of the "pitot" intake. A deeper and all-round larger fuselage makes it possible to place the pressure cockpit above the air-intake duct and so avoid having to bifurcate the duct.

Undoubtedly, the key to the Sabre's performance lies in this direct entry, which permits the engine to gulp in all the air it can consume without any boundary-layer bleeds, lips or deflectors. The only aid to air flow in the Sabre intake duct is a long conical fairing leading to the compressor's eye, the rest of the aerodynamic treatment consists in changing the duct cross-section from the almost circular entry lip to a flattish oval beneath the cockpit before making it circular again at the compressor entry.

The J-47 engine, although an axial, fits pretty tightly into the middle section of the fuselage and there is little enough space between the deep-sectioned frames and the engine for the considerable plumbing—flying tail, air brakes, etc.—needed for the rear fuselage. Engine-changing by removing the tail is not quite as simple as publicity notices would suggest and Ray Campbell, Canadair production engineer, admitted to the writer that a strange crew might well take days on the job, although once the tricks are known, such as using a sheet of aluminium as a "shoe-horn," it is a quick operation.

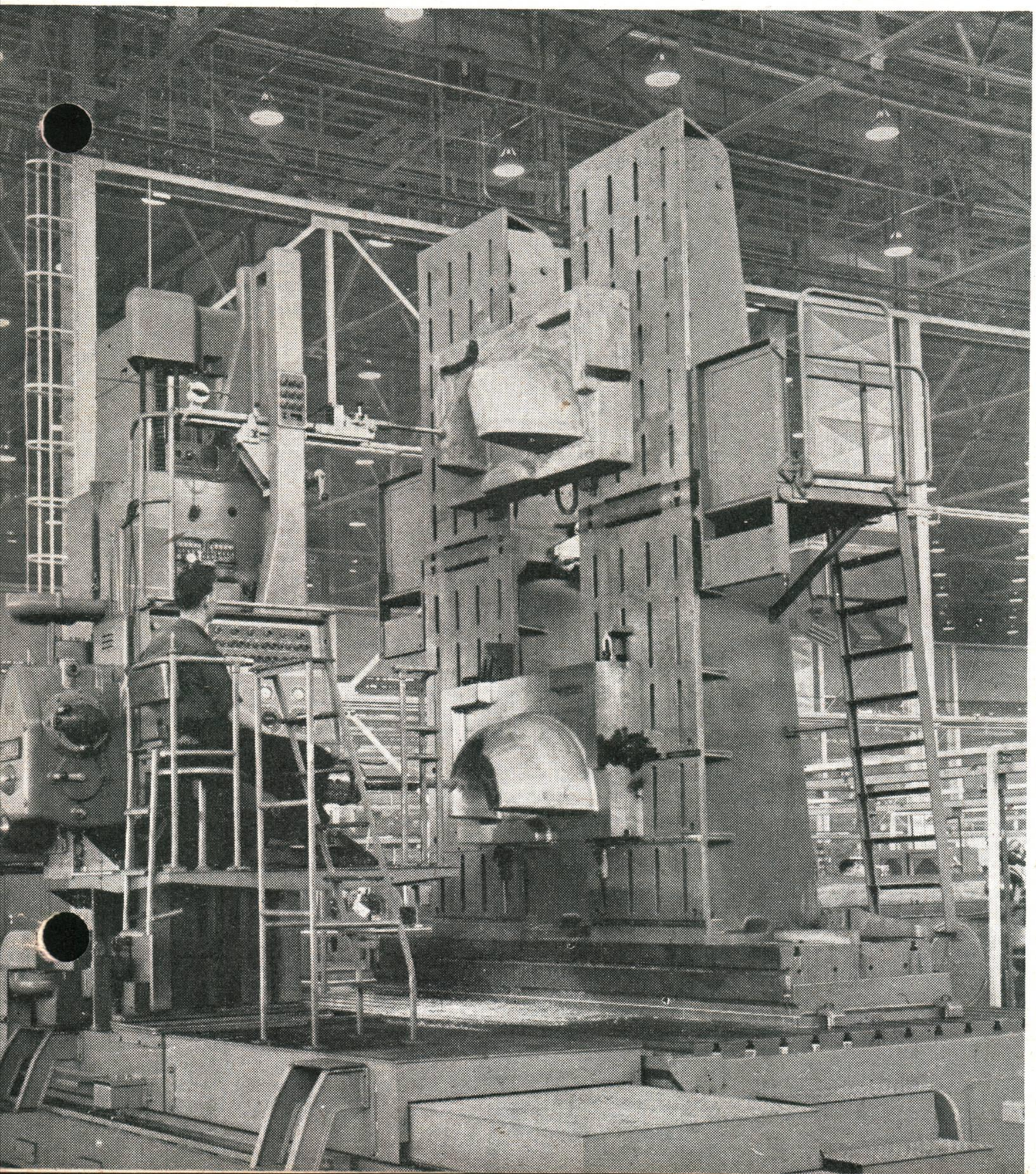
The jet pipe is average in length, being about three times as long as the tail cone. Probably the engine specialists would have prepared a shorter tail pipe for efficiency, but this would have entailed either a heavily-raked tail, as in the MiG-15, or a stepped rear fuselage like the SAAB J-29. In other words, the rear-end of the Sabre fuselage is made simple structurally, and clean aerodynamically at some cost in engine performance. Tapering the fuselage from the deep, fat, forward section to little more than jet pipe diameter at the rear has meant a stainless-steel structure at the tail because of the amount of radiated heat there.

The fuselage is very large for a single-seater, it has to be because of what it has to carry, and the clear-view canopy is a bulky excrescence. The lines, however, are good and the air is not made to pass round any fancy shapes or protruberances; that is to say the fuselage is an envelope containing everything instead of being a collection of close-fitting fairings. each ideal in itself, but collectively presenting a horrible whole.

The "tumblehome" cross-section of the fuselage is an excellent compromise between the ideal circular one and the flat sides that would mate best with the low wing. The open angle of the wing and fuselage juncture makes possible the use of very small root fairings at the trailing edge only. Despite its fast approach and stalling speeds, the Sabre lands easily and it is not unlikely that the relatively flat fuselage bottom helps this. It is a fact that flat-bottomed aeroplanes usually sit down more gently than do the rounded ones, apparently because of an air cushion effect.

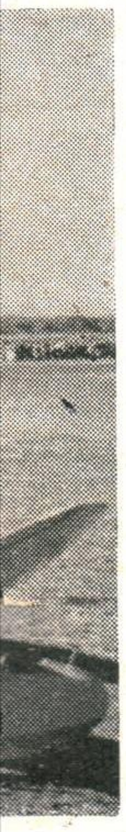
Wing Design

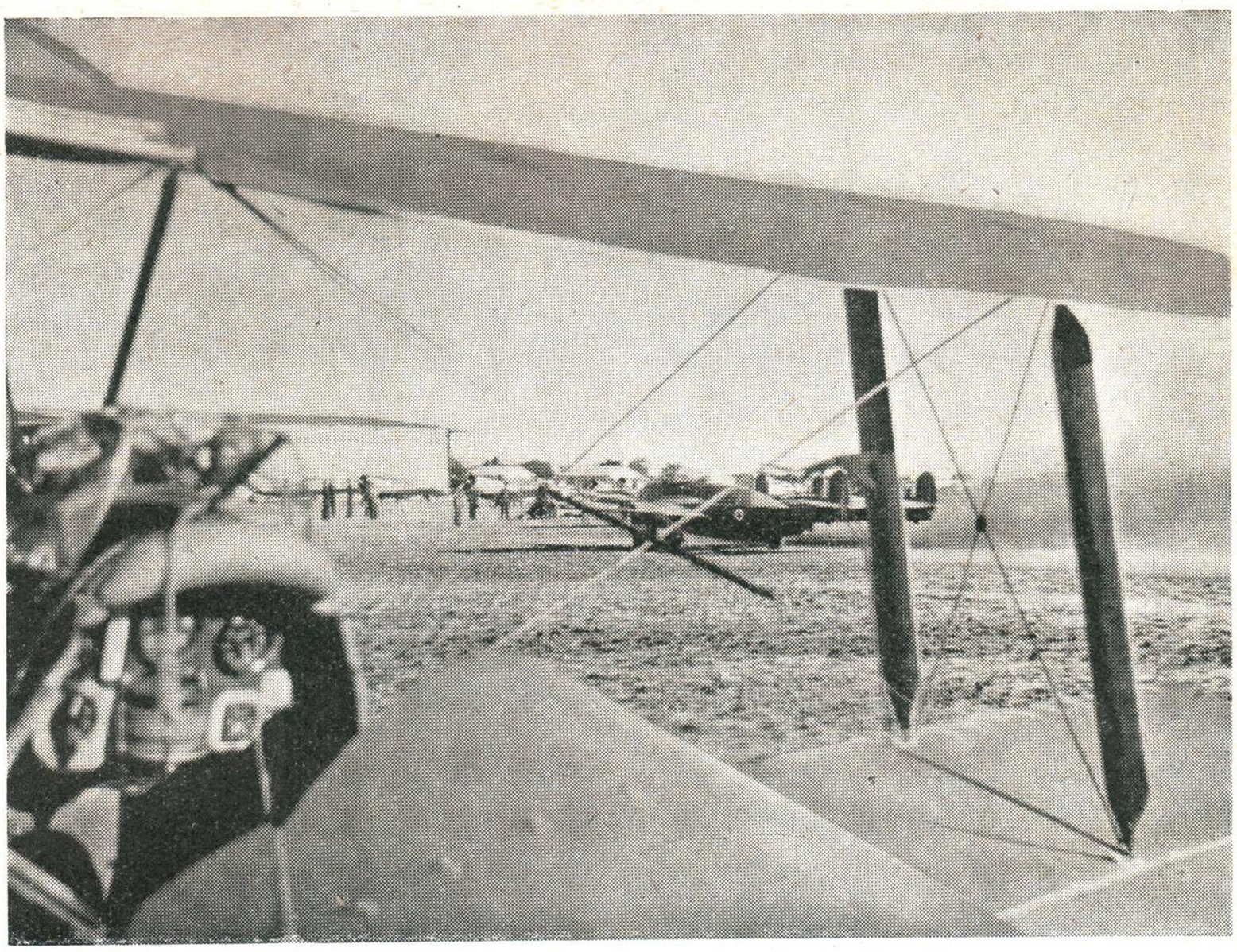
The wing of the Sabre is thin (12 per cent.), is of laminar-flow section, and is swept—these features make it appear more unconventional that it is. However, thin wings were flown on the S-6 in 1929, a laminar-flow aerofoil was used on the Spiteful, flying in 1944, and sweepback goes back to the days of Dunne—albeit the reason was different. Handley-Page



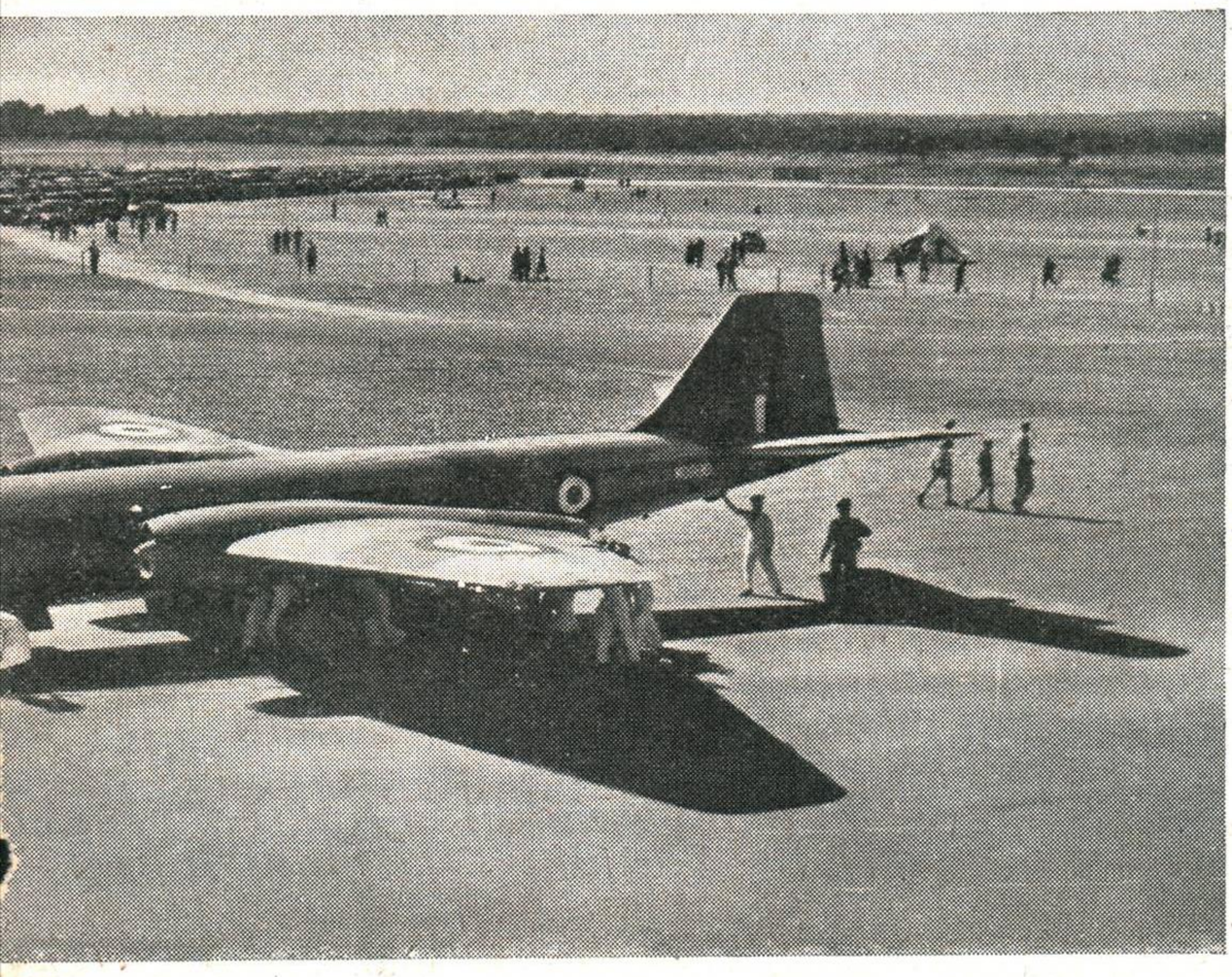
Right above, the port and starboard wings of the Sabre have to be assembled to the centre section complete with retractable undercarriage before being mated up with the fuselage. The flexible wing tanks also have to be installed prior to this operation.

Left, one of the large Keller profiling machines which are so much in demand these days for die-sinking, at work in the Canadair factory.





Left, an excellent idea of the local topography and of the crowd gathered for the occasion is to be obtained from this picture of the parked light aircraft and gliders. Right, one of the Venoms of No. 266 (Rhodesian) Squadron framed between the wings of a Tiger Moth.



Lincoln. During the fly-past with first the starboard outer and then both starboard engines feathered, the Lincoln's outer turned slowly, not quite still.

The sun was lower but the afternoon still warm, when the main event began, a combined attack on an "enemy radar station" just in front of the crowd. And what a splendid effort it was, due mainly to the forethought of Major Wilson.

Opening the attack, armoured cars attempt to soften up the resistors, and the airport shakes with every thrilling crump. But air assistance is required and four Spitfires, shrouded in flak, come in, dropping visible bombs which skate over the ground with red streaks and loud bangs. Four dive-bomber Harvards fly directly overhead, again shrouded in flak, simulated by their own smoke Very cartridges, while sundry explosions go off behind the crowd, and the Spitfires come strafing back, this time directly towards the spectators.

But all is not well. Two enemy fighters, Spitfires in gaudy coats of red and yellow, appear and shoot down two Harvards, which fall away streaming white smoke.

But the jubilation of the enemy patrol over their victory is short-lived, for the ground-attack Spitfires see them, roar in and the enemy roll away streaming smoke, to disappear in the trees of the distance.

Air superiority now achieved, the dive bombers swoop amid the flak and each drops four remarkably accurate bombs on the mark.

The commentator informs us that the target will only blow up if set off by the bombs from the "bombers" and, sure enough, the third sends up a huge plume of red and black, as the "radar post" disintegrates. Finally, the Army moves in and presumably takes all the credit.

A most exciting display.

But the day was not quite over; for an encore four 266 Venoms took off and gave a splendid display of how formation aerobatics really should be done. A loop, 360-degree low turn, barrel roll, another loop, stall turn, and another barrel roll and finally a landing, the four still in the most perfect formation.

So Saturday came to a close, with a continuous stream of cars nose to tail, from the aerodrome to Salisbury.

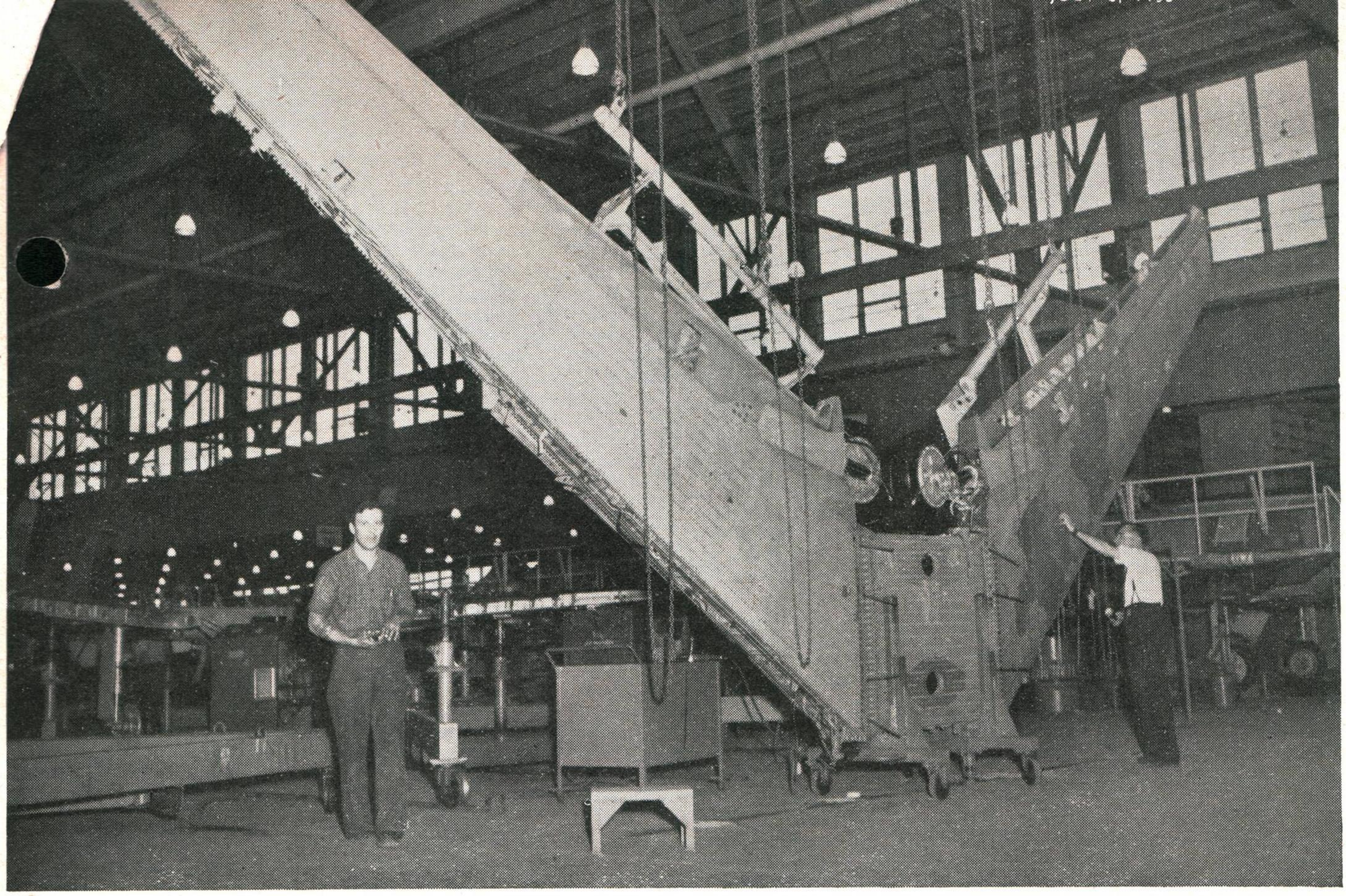
Sunday, tragically, was marred by a fatal accident to two of the Royal Air Force Harvards. At the start of their display, the second on the programme, three aircraft had to break away from the main formation. One collided with one of the remaining nine, cutting it in two, and both machines fell to the ground only a few hundred feet from the crowd of 20,000, the striker exploding. The formation continued, including their "E" for Elizabeth, one short.

Racing Events

The first race in the morning, the 105-mile closed circuit race, over three laps, had an entry of 20. H. C. Perrem, of Umtali, won in an Autocrat at 103.5 m.p.h., a good speed at the nearly 5,000 ft. altitude of Salisbury. Roy Griffin, of Salisbury, was second, also in an Autocrat; and Howard Knill, of Central African Airways, was third in a Tiger Moth. Fastest time was 184 m.p.h. by Colman Myers in a Beechcraft Traveller.

The exciting pylon race of 10 laps over a three-mile course had eight starters and was won by Lt. C. Graves, of the S.R.A.F., who had a comfortable lead over Capt. D. M. White, S.R.A.F., and T. Posselt, of the Enkledorn Flying Club, a recent addition to the very few clubs in Southern Rhodesia. Unfortunately, during this race, Derek Kay's Tiger Moth was flown a little too low by John Heap; one wheel touched during a turn and the machine somersaulted, considerably damaging the machine but not harming the pilot.

Presenting the prizes after the afternoon events, Mr. G. A. Davenport, Minister of Mines and Transport, and Acting Prime Minister, said: "There is one duty we owe to the men who have been flying here yesterday and today. Two Harvard aircraft, flown by R.A.F. instructors from Thornhill, crashed and their occupants were killed in the accident on the edge of the airfield this afternoon. Again the price of progress has been paid. The display went on without interruption, for that is the Air Force way. This Centenary Rally is, like all military flying displays, a part of the Air Force continuous training. These men have therefore given their lives in the cause of the Commonwealth, as much as if they had been killed on active service. I ask you all to stand with me in silence for a minute as a mark of respect and homage."—A. L. COLE.



automatic slats and slotted flaps are also far from novel.

The sweepback of the Sabre wing is 35 deg. on the quarter-chord line and the resulting small tip clearance on landing has made it necessary to fit easily-replaceable stainless-steel wingtips. These wingtips are squared off with a very slight curve; curiously the small navigation lamp fairings project—suggesting that wingtip airflow is something about which little can be done. The full-span leading-edge slats are completely automatic, without locks, and will extend in a high-speed stall.

The ailerons are of large span and relatively high aspect ratio. Current thought on "sonic" ailerons suggests very low aspect ratio or even their complete replacement by spoilers or some novel form of control. Although power-operated, without any manual connection or reserve, the ailerons have a sealed pressure balance system. It is worth noting that the ailerons, like the other control surfaces, are not inset from the tips of the main surfaces. Because of the large aileron span the flaps are of small area for so heavily loaded an aeroplane.

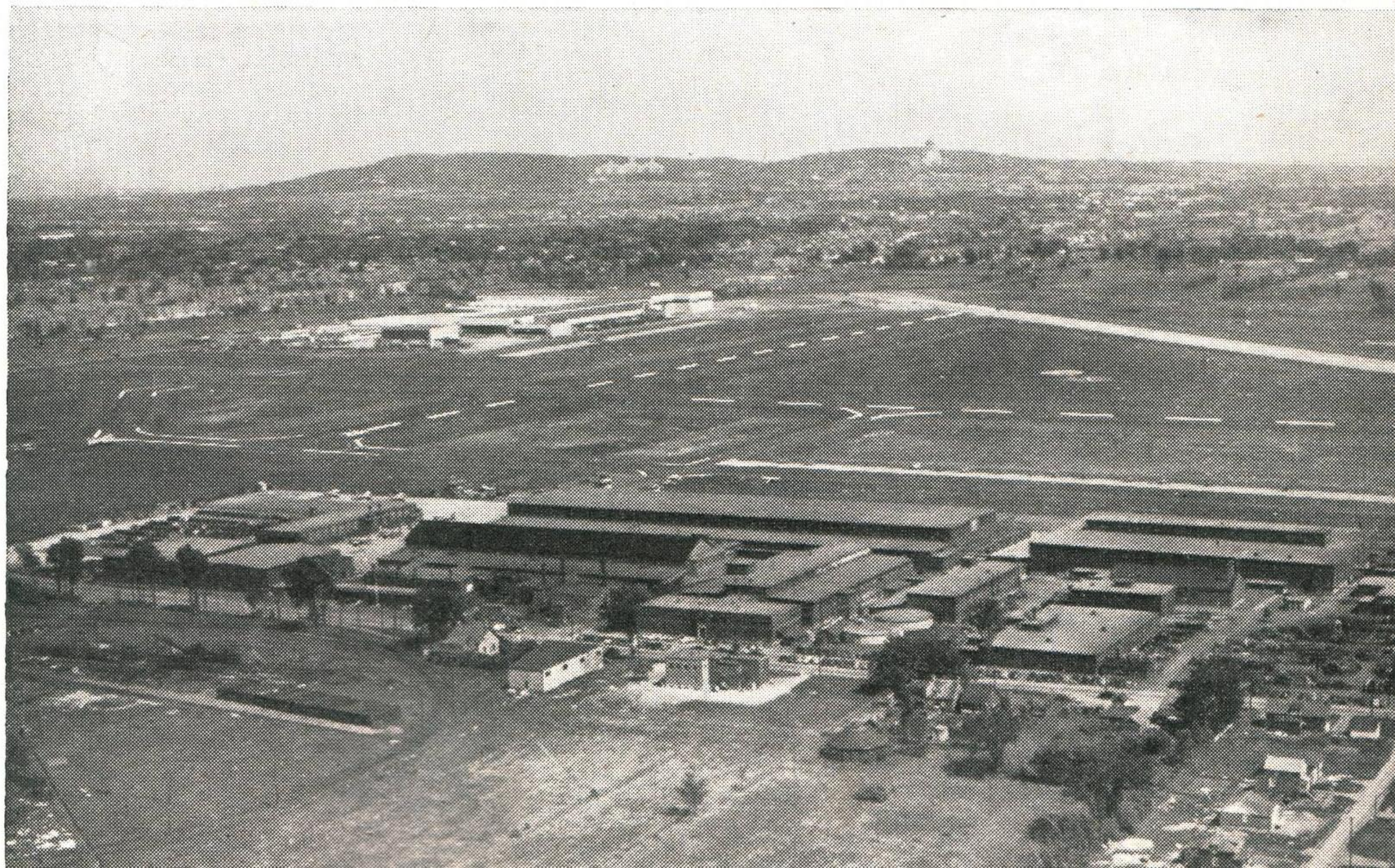
A supersonic pitot head is fitted on the starboard wing tip. This unit is a long steel tube with a small pressure-head hole and the static slots well back. It replaces the plain pressure tube and fuselage static vent that have held sway for the past ten years, since it has been discovered that boundary layer flow is too unpredictable in the compressibility range to allow accurate placing of the vent. So now we are back to a modification of the traditional pitot head. Incidentally, the Sabre's pitot has a negative incidence, is at eye level and is very sharp and dangerous—the writer met one flight-shed engineer at Canadair who had lost an eye through it, despite all precautions.

The Flying Tail

The tail of the Sabre is, of course, a focal point of interest. The F-86E was the first to have a "flying tail"—which is simply a way of saying that the whole tailplane is used as an elevator. In fact it is a complex application of the pioneer's one-piece elevator. The reason for the all-moving tail is that as the aeroplane enters the compressibility zone, the turbulence of the air flow over the rear part of the tail unit reduces elevator effectiveness. In the trans-sonic range as much as 15 or 20 degrees of elevator deflection is necessary to obtain control response. On the other hand, 1 degree change in tailplane incidence will give the same result—and without the turbulence and other ill effects produced by the large elevator movement.

The tail of the Sabre is arranged so that both tailplane and

Right, Canadair's No. 2. plant in the foreground where Sabre assembly takes place.



elevator move as one when incidence is increased; but in the opposite sense the elevator rises first for about 10° before the tailplane starts to lose incidence. Thus, when nose-down trim change is required the tail moves with both parts in line as a single straight aerofoil; but for nose-up trim the tail is, in effect, first changed to a negatively cambered section. The advantages of this latter arrangement are that the tail is very effective for low-speed manœuvring and there is no fade-out of elevator control near the stall, while the "lead-in" of the double-acting surface ensures smoothness at high Mach numbers.

The "flying tail" is actuated with a snap response from the stick, movement being proportional both in time and distance to stick movement, and at a slower, steady rate from the trim button in the top of the stick. From this it can be seen that since the trimming system operates the same controls as the stick, its action is to re-set the neutral position to suit varying flight conditions.

The mechanical complexity of the tail is considerable. In the first place, the dihedral angle of the surfaces complicates the connection of the port and starboard elevator spars and necessitates two universal joints and a cross-tube in the fuselage. Secondly, the follow-up action of elevator and tailplane require a complex linkage reminiscent of a Chinese puzzle—or of a folding-wing mechanism. Thirdly, there are the actual control run and the power linkage.

The stick is connected to the control valve in the tail by conventional control cables, but they are only 5 cwt. wires, incapable of actuating the control surface direct even if they were connected, and the stick is locked solid when there is no hydraulic power. (The aileron system is the same.) An engine-driven pump provides normal hydraulic power, there being an electric pump for emergency use and a small accumulator.

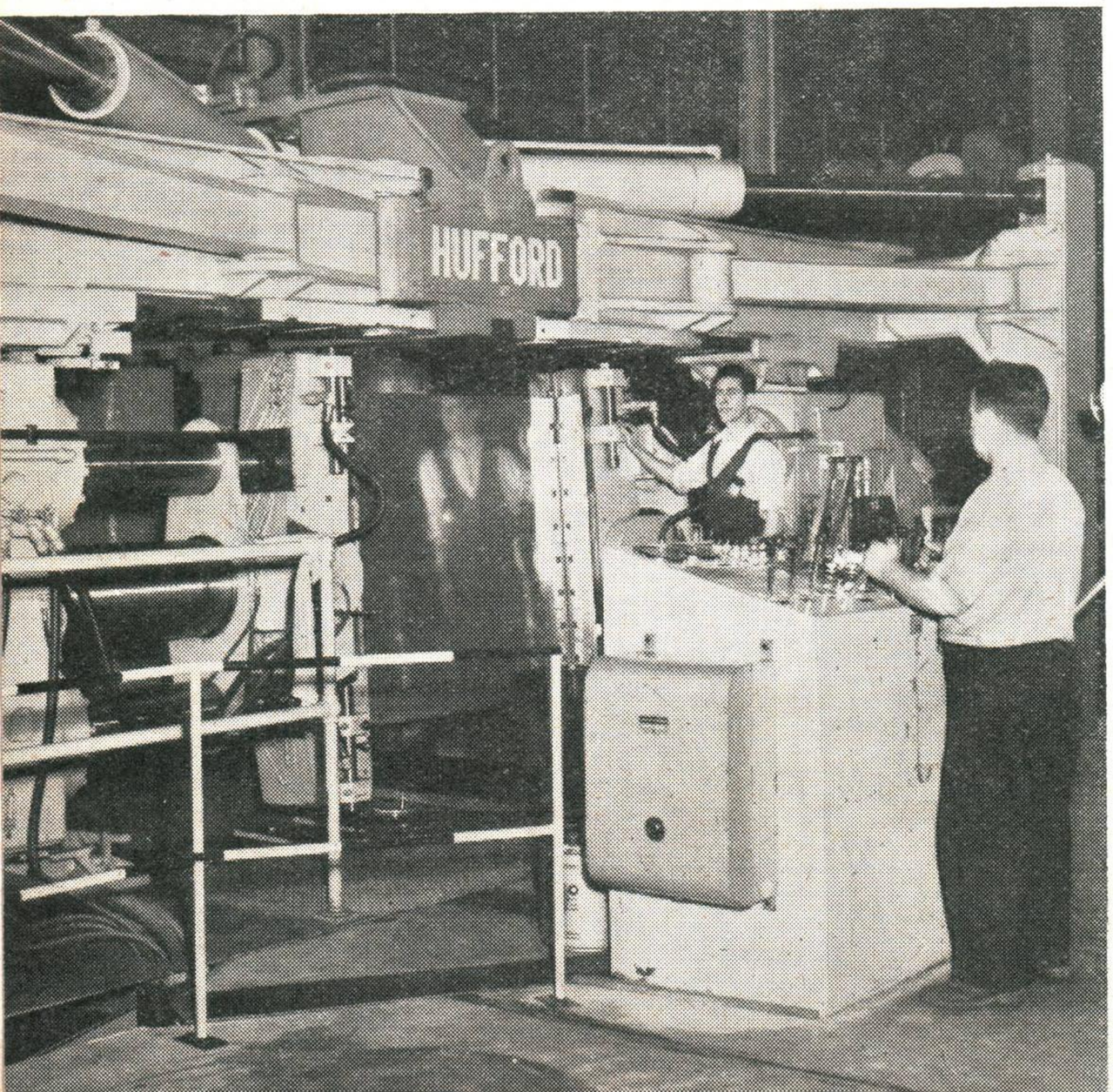
The hydraulic control valve is duplicated (with a single body), but the operating jack in the fin is not.

So far as the writer is aware, such a complete reliance upon power systems, without any manual stand-by, is a transatlantic outlook as yet foreign to this country. One always feels it is good to have a manual last resort—yet such controls are probably as likely to be damaged in combat as are the power systems.

The power system, for the stick only, incorporates an artificial feel which increases with air speed reading. The rudder is not power-operated, since this control is inoperative at high Mach numbers, but it has spring-tab assistance.

The shape of the tail is simple, the surfaces having a similar medium aspect ratio and sweep to those of the mainplane. The curious rectangular rise of the fuselage top decking at the tail was made necessary by the movable tailplane and it appears to have no ill effect on the air flow—it has recently been flattered by imitation on the SAAB Lansen. Tail dihedral, with its attendant complications, was apparently chosen as the lesser evil to mounting on the fin, where structural and intersection fairing problems would have arisen. The deepness of the Sabre's fuselage, and the absence of wing-root fillets, make the 10° dihedral a sufficient precaution against wing-wake buffeting.

There is a curious difference in the control surfaces. In contrast with the sealed pressure balances of the power-operated ailerons, the powered elevators have rounded leading edges without a tailplane shroud, while the tab-balanced rudder has inset hinges and a shrouded leading edge. One would like to know the reasons behind this unusual, if not actually unique, combination in a single aeroplane.



A close-up of the Hufford press used for Sabre production by Canadair at Montreal. This type of stretching press is, of course, coming into increasing use in England.

The Structure and its Making

The core of the Sabre's fuselage is the massive air-intake duct. It is the first part to be fabricated and upon it are fastened the front fuselage frames which carry both the outer skin and the inner shell of the cockpit pressure box. The detail structural design is conventional enough and the only severe complication arises from the large number and area of the access panels required for guns, radar sight, instruments and "plumbing." It is here that the stiffening effect of the hollow stem of the robust air intake must more than pay for its weight.

Aft of the wing, the fuselage is a conventional stressed-skin shell of which the ample cross-section ensures excellent stiffness for the tail. Where the fin joins the fuselage, stainless steel is used instead of 75 ST light alloy for the fuselage frames because of the proximity of the jet pipe. Under the tailplane the whole structure, including the skin, is of stainless steel.

There is one other complication in the rear fuselage, or rather a pair of them, the two air-brake doors. These entail a carry-over of the fuselage stresses through the panels that line the insides of the recesses. These panels have to be well stiffened, since upon them are mounted the powerful brake-operating hydraulic jacks.

The small dorsal fin is built integrally with the fuselage top, but the major part of the rectangular tailplane root fairing is formed from detachable access panels.

Returning to the front of the fuselage, the dark air-intake lip was once a cause of considerable comment. The colour was occasioned by the use of di-electric material, actually moulded fibreglass, because of the radar gunsight scanner mounted inside the characteristic snout. Erosion of this lip, both from weather and from grit when running the engine at full power on the ground, led to the replacement of this plastic lip by a metal one. Only the snout is now made of fibreglass and the small panel is easily replaced—albeit damage is much less since it is above the intake.

The top decking in front of the cockpit is used to house the radar sight and other instruments. At the rear of this bay there is an armour bulkhead before the cockpit. In the later Sabres the central panel of the windscreen has a slight V-section to improve air flow, with an armoured glass panel inside.

The cockpit is neatly laid out in the American tradition, that is to say controls, switches, and fuses are on port and starboard shelves and there is a short unjointed stick with a simple "bicycle" grip. The instrument flying panel is of the standard NATO type, which has two more instruments than does the R.A.F. one. All panels are hinged, so that by undoing a few fasteners they can be folded forward for instrument maintenance. Toe-pedal, hydraulically-operated brakes are fitted.

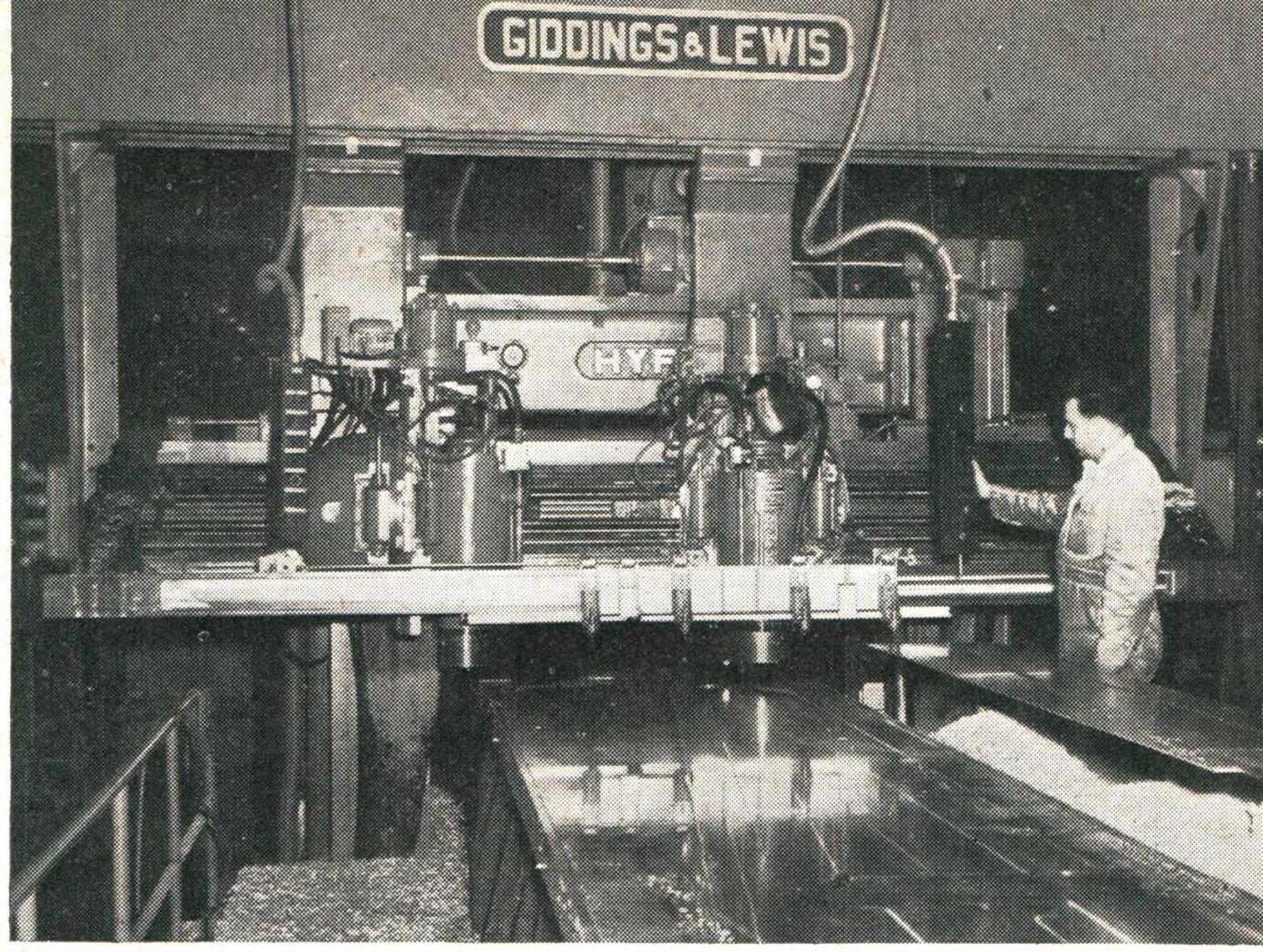
The ejector seat is of North American design and struck the writer as being unusually simple and compact. There is no information available about its effectiveness. The canopy is a fine example of blown plastic and is much larger than photographs suggest. Internal ridges, which look as if they were for stiffness, contain suppressed aerials. The canopy is operated electrically and is sealed by an inflation strip to withstand a differential of $2\frac{3}{4}$ lb./sq. in. below 18,000 ft. (and for combat) and 5 lb./sq. in. above that height.

Apart from the canopy dome, the pressure cockpit is a rectangular box mounted on top of the air intake duct. In the space between cockpit and duct and the fuselage skin are mounted, on each side, the six .5-in. machine-guns. The magazine is behind the cockpit and, because of the speed of the Sabre, empty cartridge cases are collected in the bottom of the fuselage instead of being ejected.

Wing Structure

The wing of the Sabre is, once again, an adaptation of the conventional. The structure is divided into a centre section, of fuselage width, outer planes, and detachable wing-tips. The centre-section joint is a formidable one and is made before the wing is assembled to the fuselage. Therefore, in the sense that the fuselage has to be removed before the wing can be dismantled, it is a one-piece wing. The three self-sealing fuel cells, however, are inside the centre section and outer planes and can only be removed through the centre-section joints.

The main air loads are taken by a torsion box extending from 10 to 55 per cent. of the chord from the leading edge. Because of the thin wing section this box is of necessity very shallow. It is composed of the legendary machined skin, which



Right, the Hypro skin milling machine used to machine the Sabre wing skins to the appropriate thickness.

forms, with the spar webs, a box that is almost devoid of internal structure. To get the required strength, ¼-in. plates of 75 ST alloy are machined on a Cincinatti Hypro miller to a series of graded tapers. The inner half span of the skin is stiffened by overlapping V-section spanwise stiffeners and an inner skin, which serves the double duty of stabilizing the stiffeners and presenting a smooth surface for the fuel cells.

The making of this skin is a complicated operation. The machined outer skin is first clamped, with the stiffeners, to the specially contoured worktable of a Drivmatic combined drilling, counter-sinking and riveting machine. This machine automatically sets off the pitch of the rivets without pilot holes and gets the work done at an amazing rate.

When removed from the Drivmatic, the skin and stiffener assembly is correctly cambered for fitting to the wing, thus eliminating the need for ribs—except toward the tip, where there are fewer stiffeners, and the aileron hinge loads have to be carried. The outer skin/stiffener assembly is put into a jig, to preserve its contour, and the inner skin is then assembled to it with Dupont explosive rivets.

The spar webs are of simple design and there is little emphasis on the flanges, as one would expect in a relatively pure torsion-box. The rear spar—because of its comparatively forward position—is the heavier and is rather curiously composed over its inner part, as far as the undercarriage, of two extruded sections joined along the neutral axis. The upper part is a T-section, joggled to overlap the lower L-section. Outboard, T and L extruded flanges are riveted to a conventional plate web.

The front spar is a plate web with flanges made up from L-section extrusions and hinges. The latter, which are used for the attachment of the leading edge are refined versions of the familiar piano hinge and are closely machined parts.

The leading edge is a unit made up from closely-spaced conventional flanged-blank riblets and a thick skin. It is jigged to close tolerances, since it has to support the slides for the automatic slats. The slats themselves are exceedingly robust and are almost solid; to cater for wing flexion they are each made in four sections.

Since the main loads are taken by the torsion box, the wing trailing edge is comparatively light, as it only has to support its own local aerodynamic loads and those of the flaps—it is, in fact, really a large flap shroud. It also has to act as a housing for the undercarriage legs—the wheels lie in the fuselage just behind the centre section. Outboard, the trailing edge is no more than a shroud for the ailerons, the under panel being hinged for access to the aileron hinges.

Ailerons and flaps are robust examples of conventional practice. Workmanship is good, but there is no super-finish. (Indeed this is also absent from the rest of the wing, where the leading-edge hinge, at a critical point in the aerofoil, provides a distinct break in continuity. Of course, since the slats are automatic there must inevitably be a small slot there to ensure opening). A knifelike trailing edge, formed by a wedge-section extrusion is reminiscent of the Mustang and is contrary to general practice on British control surfaces.

The centre section, as may be imagined, is an almost ponderously massive box, with a heavy double skin on top and bottom. The joints between centre section and outer planes are bolted peripherally; the bolts are working mainly in tension. Attached to the skins are light-alloy flanges machined from extruded sections. These flanges are slotted and drilled to take the jointing bolts and nuts, which, together with those in the spar webs, number 70 and are all of ⅜ in. diameter.

Tail Unit

The "fixed" tail surfaces are of two-spar construction with a thick skin and their design shows the same practical outlook as does that of the wing. The fin design is complicated by the low-strength di-electric panels for the ailerons and by access panels to the hydraulic actuator jack and control valves.

The fin is particularly sensitive and the writer was told that in the early days of Sabre manufacture at Canadair a slight buckle between the 2-in. pitch fasteners of the magnesium-alloy plate over the tail actuator threw out the whole trim. So small was the discrepancy that the trouble took a fortnight to track down and cure.

The flying control surfaces are conventional, like the ailerons, and have the same knife-edge finish. This is understandable with the elevators because hinge moments are of no concern with powered controls, but is surprising on the rudders—since this is the control surface most prone to have trimming strips or bulbous trailing edges on British aeroplanes.

Landing Gear

The undercarriage is short and neat, without any frills, such as trailing nosewheel or lever-action main legs. Leg fairings are attached to each unit and the wheel doors, all three hinged to the fuselage, close on the ground as well as in flight.

The main legs, which retract into the wing behind the torsion box, are carried on a bracket mounted on the aft face of the rear spar. This bracket (which has to cater for touch-down speeds of something like 130 kts.) is made up from two steel forgings welded together. It is acknowledged to be one of the most tricky parts on the Sabre because it is so complex and the tolerances have to be so close to ensure reliable functioning of the undercarriage.

General

The underwing drop tanks of the F-86 are a speciality. Because of wing sweep, the tanks have to be mounted well inboard, just outside the undercarriage, in order to avoid large c.g. movement with fuel consumption. These tanks were quite a design problem and much work was done on them before their final shape was evolved. The flattened ellipse cross-section, with an inverted negative-incidence aerofoil elevation and downward deflected tail fins is a shape that insures clean jettisoning without the tank lifting up into the wing.

The tank is, naturally, a highly-stressed unit because of the load which it carries and is considerably more than a simple shell. The skin is pressed at Canadair on a large hydraulic press, using metal male and female tools because of the large quantity ordered.

Owing to the thinness of the Sabre wing, the release mechanism is incorporated in the so-called "pylon," only the shackle being in the wing, so that the intricate machined parts go with the tank. In Korea, the tanks are used on almost every flight, either for fuel or as napalm bombs, and are usually jettisoned. The usage rate is very high and real mass production orders have been placed—that for the R.C.A.F. alone running into many thousands.

Some idea of the Sabre's complexities may have been gathered from the structural description: hydraulic ancilliaries, undercarriage, air and wheel brakes; hydraulic flying controls, ailerons and elevator; electrical services, flaps, hood, gun firing, drop tank release, fuel system and hydraulic emergency pumps; air conditioning, cockpit pressurizing, heating and cooling; electronic gun sight and engine controls. Further information can be gathered from the cutaway drawing which appeared last week.

Production engineers at Canadair summed the Sabre up to the writer in the following way. It is one of the most perfect pieces of mechanical ingenuity that has yet been devised. It works beautifully, but if anything goes wrong the troubles are equally bad. For this reason the most careful checks and re-checks are made on the functioning of every system during assembly.

For instance, the fuel tanks are tested after fitting to outer planes and centre section, and again leak and flow tested when the wing is joined, before the fuselage is fitted. Control surface movements are checked three or four times before flight. Almost all installation work on the Sabre is done in the sub-assembly stage and the final line is really a series of functional checks—which take a remarkably high percentage of the whole manufacturing time.

JAMES HAY STEVENS.

THE FIGHTING SERVICES

A Joint Effort

THE Fleet Air Arm of the Royal Navy welcomed the U.S.S. "Antietam" to Home waters, on June 23, by flying off two of their latest type of operational aircraft to the ship as she approached Portsmouth. The "Antietam" is the first aircraft carrier to incorporate the angled flight deck, which has been designed to speed up the operation of aircraft from aircraft carriers.

After circling the ship, the two aircraft—a Hawker Sea Hawk jet fighter flown by Lieutenant-Commander P. C. Chilton, R.N., Commanding Officer of No. 806 Squadron; and a Supermarine Attacker jet fighter piloted by Lieutenant R. Fluker, R.N., of No. 703 Squadron—landed on the aircraft carrier and became the first British aircraft to use the new technique in a U.S. aircraft carrier. It was also the first time that these types of jet aircraft had landed on any American carrier. They were brought on board by Landing Signal Officer Lieutenant R. Bellamy, R.N., from the Royal Naval Air Station, Ford, who had joined the ship by helicopter an hour earlier.

After being received by the Commanding Officer of the "Antietam" (Captain S. G. Mitchell, U.S.N.), meeting other members of the ship's company and lunching on board, the two pilots climbed into their cockpits, took off and returned to Ford, from where they had originally set out.

The angled deck is a new landing technique designed by the Royal Navy in conjunction with technicians from the Ministry of Supply. The idea was made known to the U.S. Navy, who modified the "Antietam's" deck to provide the first opportunity of developing the technique in a carrier fully converted for this method of landing. Trials have, however, previously been completed by Fleet Air Arm aircraft in H.M.S. "Triumph" and H.M.S. "Illustrious," whose decks were temporarily adapted for the purpose, but not fully converted.

After conversion at the New York naval shipyard the "Antietam" conducted trials with U.S. naval aviation units.

The Reserve Flying Schools

MR. JOHN GRIMSTON (Cons., St. Albans) raised the question of the closing of the R.A.F. Reserve Flying Schools, on the adjournment of the House of Commons on June 17. He agreed that economies were necessary and he did not regard these reserves as a source of operational jet fighter pilots in the event of war but he was concerned about the effect of the move on the future supply of pilots for Coastal and Transport Commands and for civil aviation. He also pointed out that closing down these schools would bring too great a burden of overheads on the civilian flying element left on the airfields.

The Under Secretary of State for Air said that the decision had been made after the most careful examination of the size and shape of our aircrew reserves. This examination left no doubt but that seven schools could be closed at once. All pilots had now been told and all signallers and navigators would be told by the end of the week.

With the letter to each Reservist went a personal message from the Secretary of State for Air explaining the reason for the action and expressing the Air Council's appreciation of the service that Reservists had given to the R.A.F. and regret that his training had to be ended. It was hoped that many of them would continue to serve in the R.A.F. in a ground branch.

A total of 3,200 aircrew would remain out of the original 7,600 and taking pilots only, 2,200 out of 5,000. That would include about 250 qualified instructors who might be needed at the flying schools on the outbreak of war. The 3,200 would continue their training and a large number would voluntarily go to R.A.F. Stations to do their continuous annual training on operational types of aircraft.

For the future, aircrew reserves were now beginning to benefit from the flow of young National Servicemen and short-service Regular aircrew who had completed their full-time service in the R.A.F. and were up to date on modern types of jet aircraft. Before long there would be far more jet aircraft than piston-engined types in the Royal Air Force.

Out of the 3,200 who were being kept, nearly 1,000 had had transport experience and those with this experience would be kept on till they were 40 years of age. Nearly 500 experienced in Coastal Command flying were being kept. As regards civil aviation the more people who would go into the R.A.F. for four- and eight-year engagements, the better it would be for civil aviation.

Group Captain Ward concluded his statement by a special reference to No. 1 Reserve Flying School at Panshanger which, he said, was the original de Havilland School of Flying and the oldest school to train R.A.F. Reservists—a task begun at Stag Lane 30 years ago. The knowledge of the fine work done by these schools had made the Air Ministry's decision all the more difficult and he would like to say once more how much they appreciated all the work that had been done in the past.

Launch of H.M.S. "Salisbury"

FIRST of the new type of air direction frigates, H.M.S. "Salisbury," was launched at Devonport Dockyard on Thursday, June 25. Lady Mansergh, wife of Admiral Sir Maurice J. Mansergh, K.C.B., C.B.E., Commander-in-Chief, Plymouth, performed the naming ceremony.

The frigate is of 340 ft. in extreme length and has a beam of 40 ft. She will be powered by Admiralty standard-range Diesel engines. Her main armament will consist of two 4.5 inch guns and she will have two smaller guns.

Introducing the Navy Estimates for 1952-53, the First Lord of the Admiralty (The Rt. Hon. J. P. L. Thomas, M.P.) stated that the new frigates are of four types—two types for anti-submarine work, third for anti-aircraft and a fourth for aircraft direction. "Honourable Members," he continued, "may wonder why it has not been possible to produce an all-purpose vessel. The answer is that modern equipment is now so great that it will not go into one vessel of a reasonable size. No one ship, therefore, can carry all, but at the same time each type can do some of the work of the other types."

The Bisley Championships

FOLLOWING our report on R.A.F. Week at Bisley, which appeared on page 816 last week, we now append the results; unfortunately we are not able to include photographs as we had hoped.

The Individual Rifle Championship S.R. (a): Senr. Technician J. Witts, 16 M.U., Stafford, 352; Sqn. Ldr. C. C. Willott, H.Q. (U) T.T. Command, 348; Senr. Technician Breislin, Coningsby, 345. The winner of this event was chaired with traditional ceremony in a procession headed by the Central Band of the R.A.F.

The Command Rifle Team Competition S.R. (a): Maintenance Command, 1322; S.R. (b) Technical Training Command, 1303.

Combat Snap Shooting: St. Athan "B", 64 seconds; Henlow, 68 seconds.

Station (Revolver) Team Match (Salmond Challenge Cup): H.Q. (U) Technical Training Command, 325; R.A.F. College, Cranwell, 319.

The Command Revolver Team Match (Station Challenge Cup): Flying Training Command, 653; Technical Training Command, 635; Home Command, 620.

The R.A.F. Revolver Championship and Grand Aggregate Challenge Cup: Wing Commander R. F. B. Guy, Air Ministry Unit, 194; Sqn. Ldr. C. C. Willott, H.Q. (U) T.T. Command, 193; Cpl. Creasey, Gutersloh, 191.

The Station Rifle Team Match (Trenchard Challenge Cup): Locking, 1,254; R.A.F. College, Cranwell, 1,238.

The Squadron Rifle Team Match (Brooke-Popham Steel Challenge Cup): No. 63 Squadron, Waterbeach, 625; No. 116 Squadron, Watton, 581.

The Rifle XX Match S.R. (b) (Halahan Challenge Cup, NRA Silver Medal, Donegal Badge): Flt. Lt. Dugdale, Worksop, 143; Sgt. F. Brunt, Dishforth, 143; F. S. Rowles, 95 M.U., 142.

The Tyro Match, S.R. (b) (Karachi Challenge Cup and Presentation Rifle): F. S. Harris, Pembrey, 142; F. S. Isham, Kirkham, 142.

University Air Squadrons Match S.R. (b) (Kingsley Wood Cup): Nottingham University Air Squadron, 793; Bristol University Air Squadron, 739.

R.Aux.A.F. and R.A.F.V.R. Challenge Cup S.R. (b): Plt. Off. Griffiths, 141; Cadet Pilot Christie, 136.

Old Comrades Challenge Cup S.R. (b): Sgt. Prince-Cox, 136; W. A. Bennett, 134.

Apprentices' Rifle Team Match S.R. (a): Halton 1 Squadron, No. 1 Wing, 355; Locking "A" Team, 329.

Apprentices' Championship S.R. (a): A/A Wilson-Apperson, Halton, 92; Cpl. A/A Hannam, 91.

Boys' Rifle Team Match S.R. (a): Cosford "B", 340; Cosford "D", 331.

Tyro S.R. (a) Longcroft Challenge Cup: Flt. Cadet Biddiscombe (Cranwell), 117; Sgt. Greenlee (Ballykelly), 115.

Non Tyro, S.R. (b): Snr. Tech. Martin (Winthrop), 120; Flg. Off. Gregory (30 A.M.B., R.C.A.F.), 120.

Young Officers' and Airmen's Competition (Whitelock Challenge Cup): Flt. Cadet Biddiscombe (Cranwell), 173; Cpl. Creasey (Gutersloh), 172.

Reserves Club Luncheon

NEXT Luncheon for the R.A.F. Reserves Club is to be held at the Criterion Restaurant, London, W, at 13.00 hrs. (until 14.15) on Thursday, July 23. The Guest Speaker will be Sir Miles Thomas, D.F.C., Chairman of B.O.A.C., discussing the present and future operations of the company. Tickets, price 12s. 6d. are available from the Secretary.

The Reserves Club Annual Dinner will be held this year on October 16.

Reunion

No. 70 Squadron.—First post-war reunion dinner for Officers of No. 70 Sqn., R.F.C. and R.A.F. on Friday, October 30, 1953. Further particulars from Wg. Cdr. Reavell-Carter, M.B.E., P.8, Air Ministry, Adastral House, London, W.C.2, or Sqn. Ldr. C. W. Griffiths, R.A.F. Club, 128 Piccadilly, London, W.1.

simulated high-speed bombers; "Ardent" showed the real thing to be considerably more effective than the counterfeit. Washingtons, B-50s, B-45s and the weary Lincolns provided little new in the way of tactics for the defence system to cope with, but F-84 Thunderjets of the N.A.T.O. air forces, plus a few Mosquitos caused several diversions with their attacks, at very low level, on airfields and similar tactical targets.

In contrast with previous exercises, where attacking aircraft were routed over defended areas for the maximum practice of both sides, there was a much greater element of surprise in "Ardent," which was correspondingly more realistic. This was evident in the early stages, when on the first Sunday, 24 F-84s of the Royal Dutch Air Force swept low over the coast and came round for an attack on Fighter Command Headquarters at Stanmore, Middlesex. They encountered some Meteors en route which engaged them and many more came up into the target area, where a furious dog-fight ensued, just above the roof-tops, watched by the C.-in-C. and his staff.

During the first 24 hours of the exercise, weather favoured the attackers—the skies were clear, but there was a certain amount of mist and fog over the defending airfields—and raids were made against Glasgow, Edinburgh and Manchester simultaneously, with a diversion raid and mine-laying attacks on the Firth of Forth, Eastern Approaches and the Isle of Wight.

At dawn a 100-bomber raid was launched against Liverpool, together with the high-altitude attack against Birmingham by the Canberras. Attacks mounted to a peak in the early afternoon, and in the first 18 hours of the exercise, 600 offensive sorties were countered by more than 1,200 defensive sorties. Vampires of 2nd T.A.F. simulated jet bombers once more on a high-altitude attack against a target in Norfolk, and were intercepted by the handful of Venoms in Fighter Command, and some F-86s.

Two fighter squadrons and a strike squadron of the R.N.V.R. attacked a convoy in the Channel with their Fireflies, Sea Furies and Seafires, and a fourth squadron of R.N.V.R. Fireflies attacked a second convoy moving North up the North-east coast, being intercepted by apparently just one Sea Hornet N.F.21 after the first attack.

According to the Air Ministry, subsequent interrogation of the Canberra crews after the Birmingham raid revealed that the attacking aircraft were intercepted before reaching the coast by Venoms, but those of the crews to whom we spoke did not remember seeing any of these aircraft. The Venoms, incidentally, were operating in their second exercise, which like the first in Germany a week or so ago, was for them largely of an experimental nature since they are not yet in full squadron service. They may well prove capable of coping with the Canberra, even at its highest and fastest.

After visiting Bomber Command on the first day of the exercise, the Secretary of State, Lord de L'Isle and Dudley, V.C., accompanied by the C.-in-C., Air Chief Marshal Sir Hugh Pughe Lloyd, flew to Binbrook for his flight in a Canberra, piloted by Sqdn. Ldr. A. W. Southall, D.S.O., D.F.C., A.F.C. The Canberras flew out over the North Sea to Borkum and then turned North-west before coming down to cross over Edinburgh on the way to the main target in the dock area of Liverpool, which was attacked at 22.00 hrs. Forty-five minutes later, the Secretary of State landed back at Binbrook, much impressed by the smoothness and comfort of the flight.

Heaviest raid of the night was by a very strong force of Bomber Command Washingtons and Lincolns, with the few remaining Mosquitos (soon to be replaced by Canberras), as a Pathfinder and Marker force, against Glasgow. A large part of the night-fighter force was vectored onto the bomber stream before its main attack, under favourable conditions, and in 200 defensive sorties, there were many interceptions.

In addition to the Dutch Thunderjets, 2nd T.A.F. Vampires, Belgian and U.S. F-84s made low-level attacks during Sunday, October 5, against a wide range of targets, and B-50s of the 7th Air Division, U.S.A.F., made high-altitude attacks against Glasgow, Liverpool and London, being intercepted by Meteors.

As the only sonic fighters taking part in the exercise, the R.C.A.F. and U.S.A.F. F-86s were reported as creating numerous "supersonic bangs" over various parts of the country. Tactically, of course, this means little, as the Sabre ceases to be an effective gun platform at well below Mach 1.

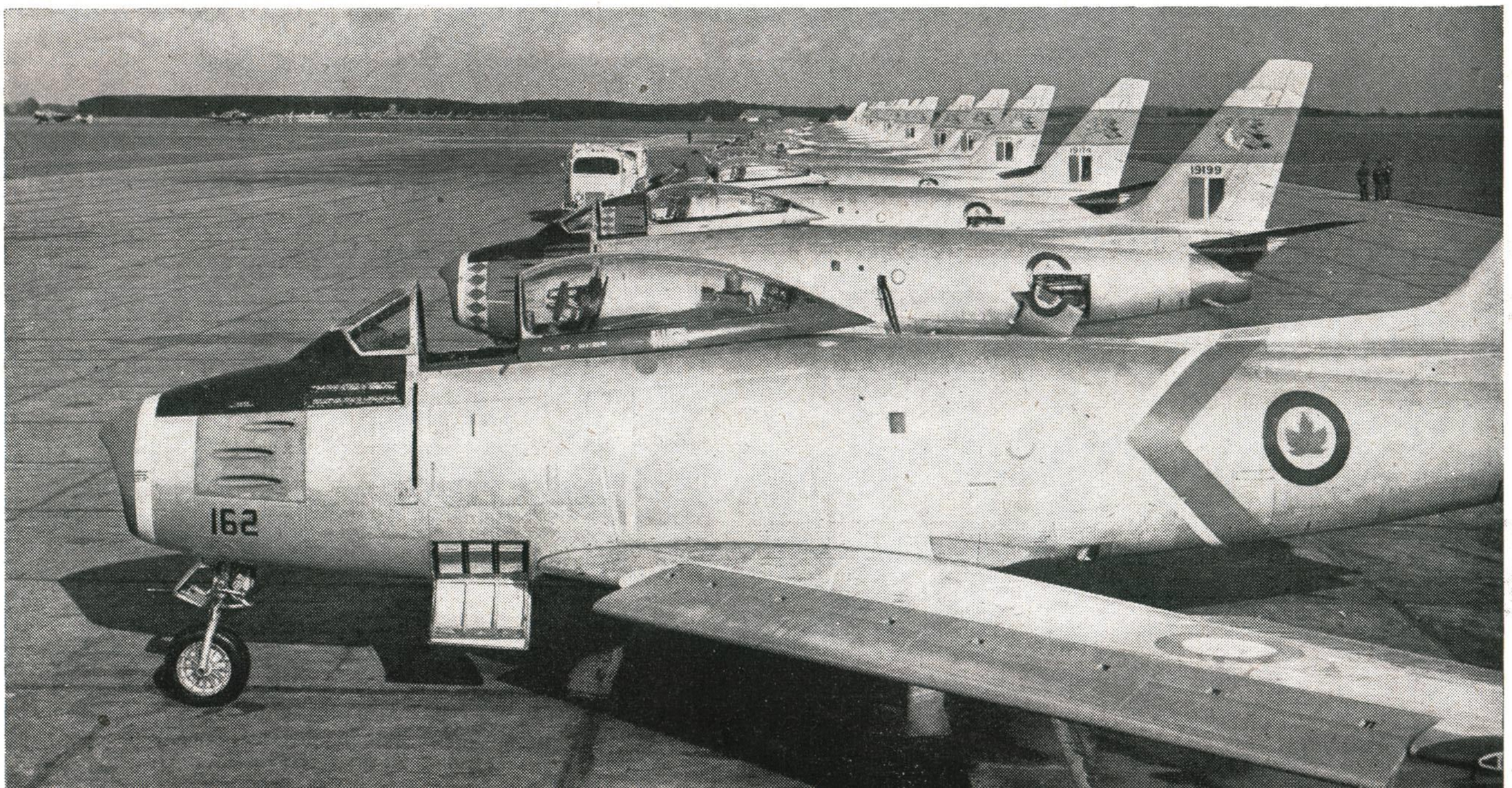
For the mid-week phase of the exercise which lasted overnight on October 9/10, we travelled to Binbrook, where in common with other bases, the station was in darkness except for the essential electrical services for flying. Power had been cut off in messes and barrack blocks, and further realism was provided by an attack by the aircrew on the camp. All airmen and officers were carrying arms; there was a sustained battle which was not unbloody and in which quarter was neither given nor asked.

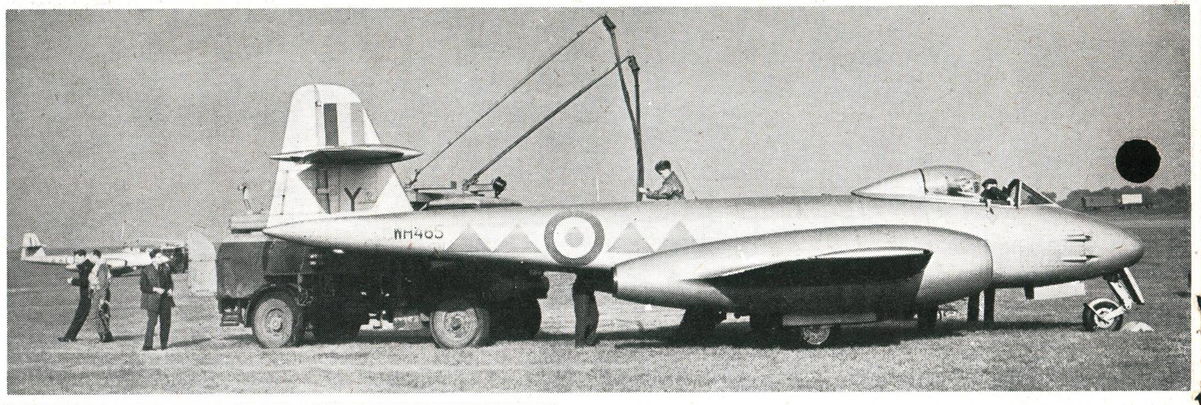
We watched several Canberras taking off just after midnight for an attack on Bristol at high altitude, after a long circuitous flight over the North Sea and the Low Countries. Medium raids were also made by Bomber Command that night against Liverpool, Sheffield and London, and there was pin-point bombing with practice bombs on ranges in Lincolnshire, Yorkshire, Salisbury Plain, and Luce Bay, Scotland. The attacking aircraft flew at heights ranging from 11,000 ft. upwards, and as a further test of the defences dropped "window" to confuse the radar screen. Belgian Mosquitos were employed to act as intruders over airfields in the United Kingdom.

Throughout the period, the defending components were fully active, and over 100 sorties were flown by night fighters, including Royal Naval aircraft. Many claims were made, and one force of attackers coming in from Le Havre was intercepted at an early stage while still over the Cherbourg Peninsula. Bomber Command, however, was officially stated to have been very satisfied with the night's operations, which indicates an urgent need in Fighter Command for the Gloster Javelin to put an end to such complacency.

In the concluding stages of the exercise, over the week-end of October 11-12, attacks were intensified, and culminated with a 100-bomber (atomic-age equivalent of the former 1,000 bomber) raid on London, by a mixed force of Canberras, Lincolns and Washingtons, which were intercepted by a large number of fighters. On the last day of the exercise, the height restrictions imposed on the Canberras were lifted, and the result was a clear unintercepted run for all these aircraft save one, flown by the Station Commander at Binbrook. Group Capt. N. C. Hyde, who came down to about 12,000 ft. to atomize Dagenham, and was intercepted for his pains.

There can be no doubt that Exercise "Ardent" provided a great deal of very valuable information not only to the Air Ministry planning staffs, but to the participating aircrews, ground staffs and also our military aircraft designers. By its superiority over not only the elderly Meteor but also the comparatively new Sabre, the Canberra has emphasized the logical thought behind low wing-loadings for ultra-high-altitude performance, and it is obvious that this must apply equally to the fighters which are to be the antidote. Therein lies the significance of the delta.—J.E.F.

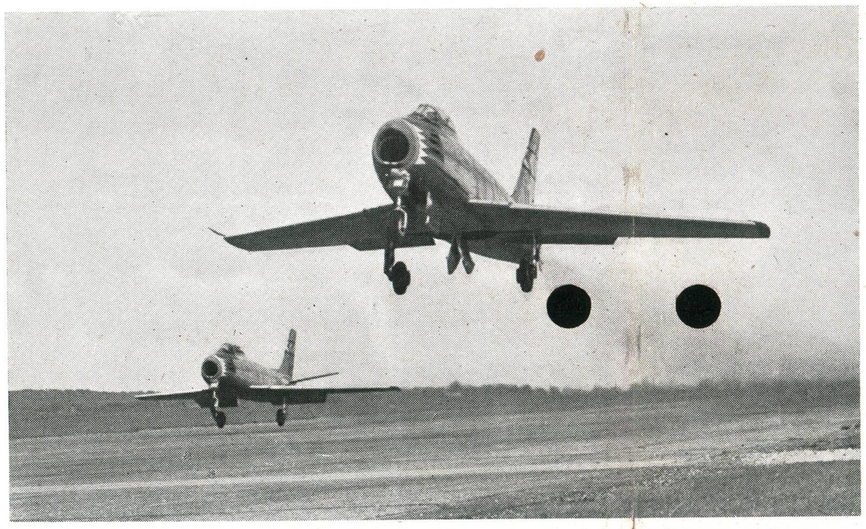




"Ardent" Illustrated

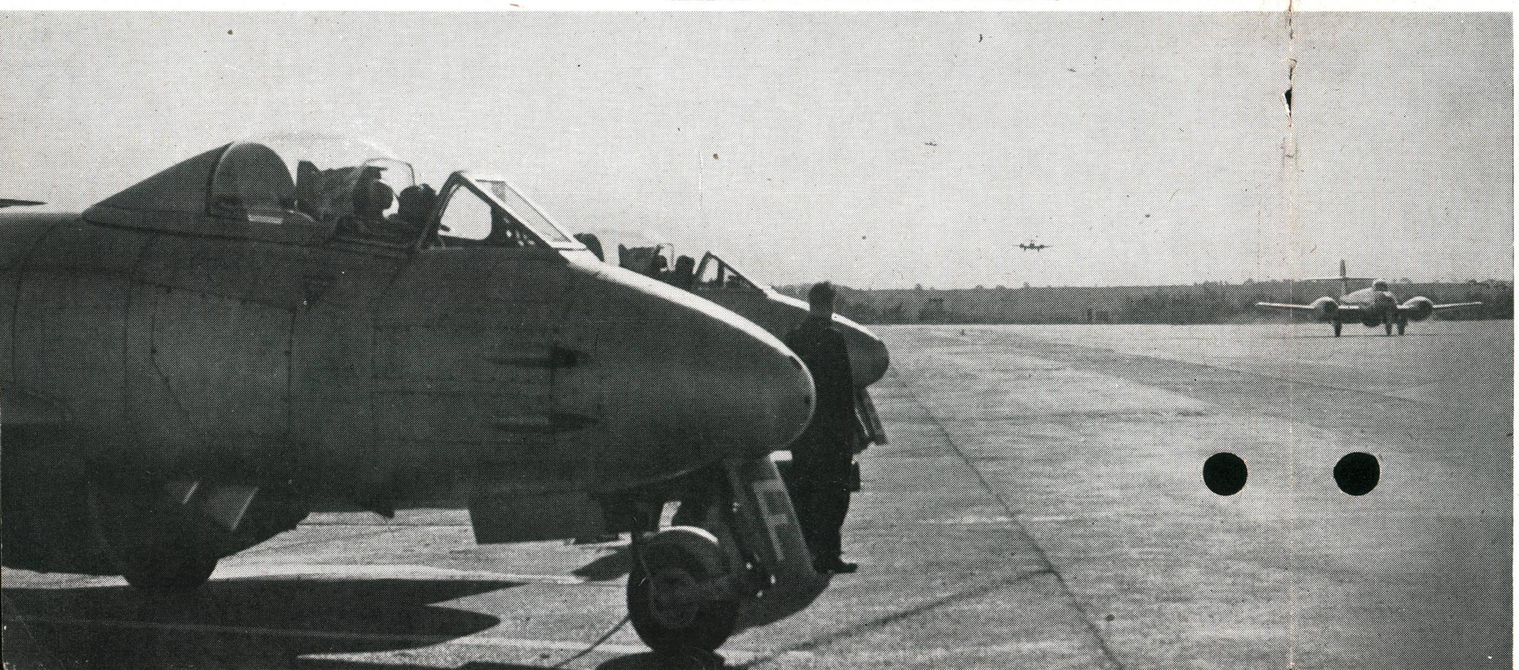
"Aeroplane" photographs

Top, a No. 600 (City of London) Sqn., R.Aux.A.F., Meteor 8 refuelling in between sorties, while (above) the C.O., Sqn. Ldr. J. P. Meadows (left), talks to some of his pilots. Below, No. 615 (County of Surrey) Sqn. aircraft stand at readiness while 600's aircraft land.

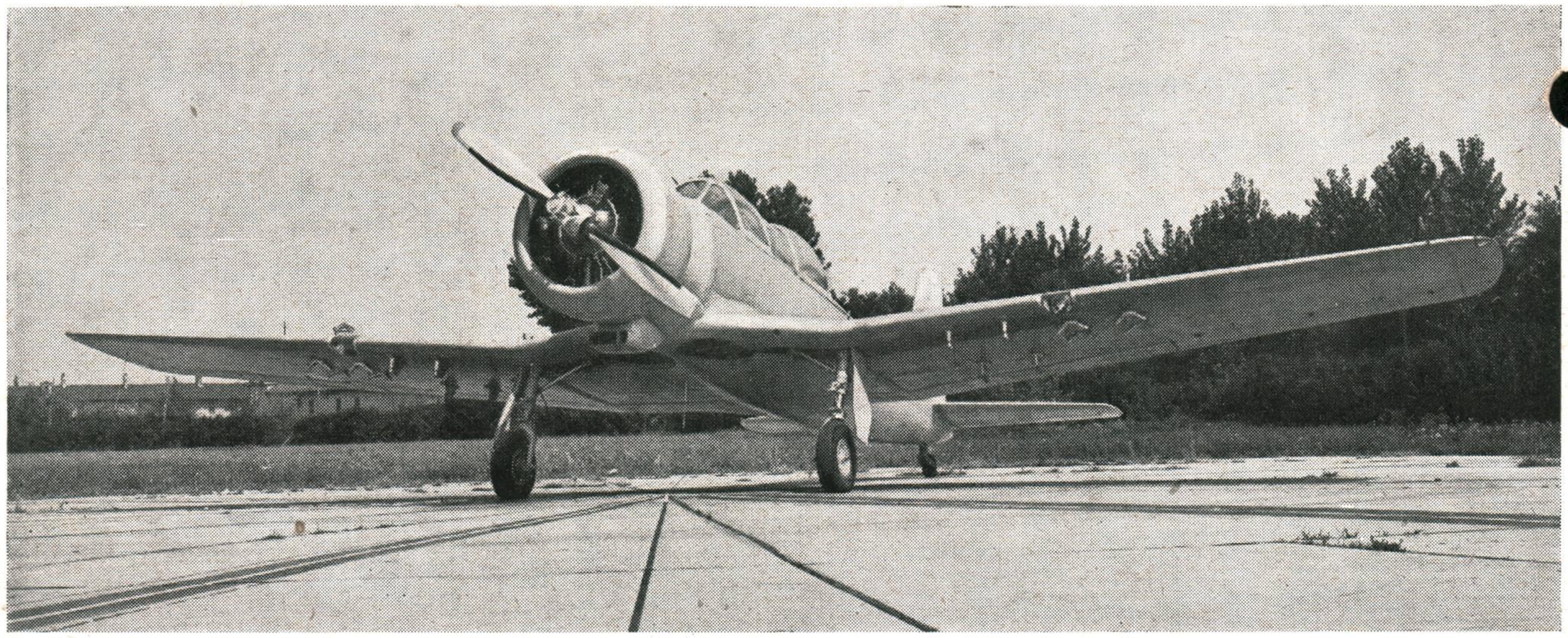


Left, Sabres scramble from North Luffenham, the R.C.A.F. base in England. Above, pilots of No. 441 Silver Fox Squadron, R.C.A.F., complete with G-suits.

Right, Canberra crews climb into station transport en route for their bombers, preparatory to a night sortie. Below, Auxiliary ground personnel at Biggin Hill watch the air battle.



Fiat's New Trainer



CONTINENTAL member countries of Western Union and N.A.T.O. are slowly but surely playing an increasing part in providing their own aircraft. This increase is particularly evident in the training side of flying. Last year saw the initiation in production of an Italian primary trainer, the side-by-side Piaggio P-148, and of a Dutch advanced trainer, the Fokker S.14, also with side-by-side seating. The prototype Fiat G.80 of similar type with tandem seating flew earlier this year.

Recently, a third Italian trainer made its first flight and thus completed the trio of aircraft needed to take a pupil pilot from his first solo to his final transition to the modern jet fighter. This machine, the Fiat G.49, is an intermediate-stage trainer suitable for pilots who have graduated from such aircraft as the Piaggio P-148.

Conventional in conception, the G.49 conforms to Fiat practice in that it provides tandem seating. Two versions have been designed, the G.49-1, which is fitted with an Alvis Leonides 502/4 engine, and the G.49-2, powered by a Pratt and Whitney R-1340 engine. Equipment and aircraft performance are designed to cater for both day and night flying, instrument and radio-controlled navigation, aerobatics and armaments practice.

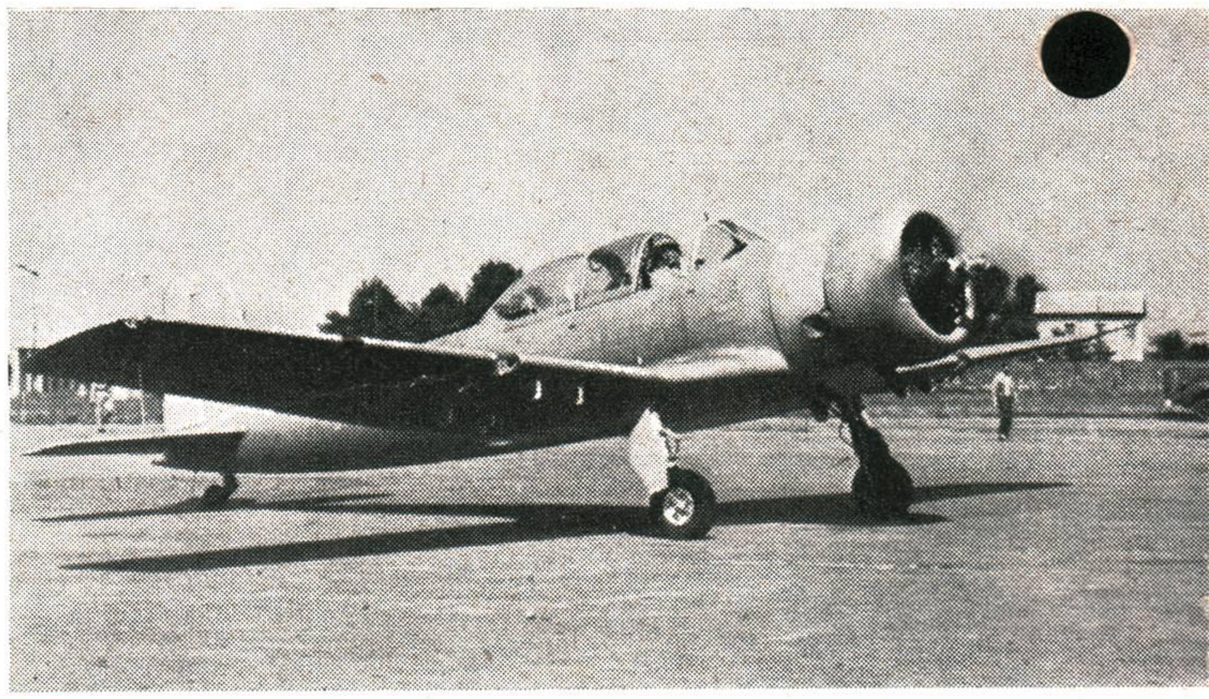
Structure and Controls

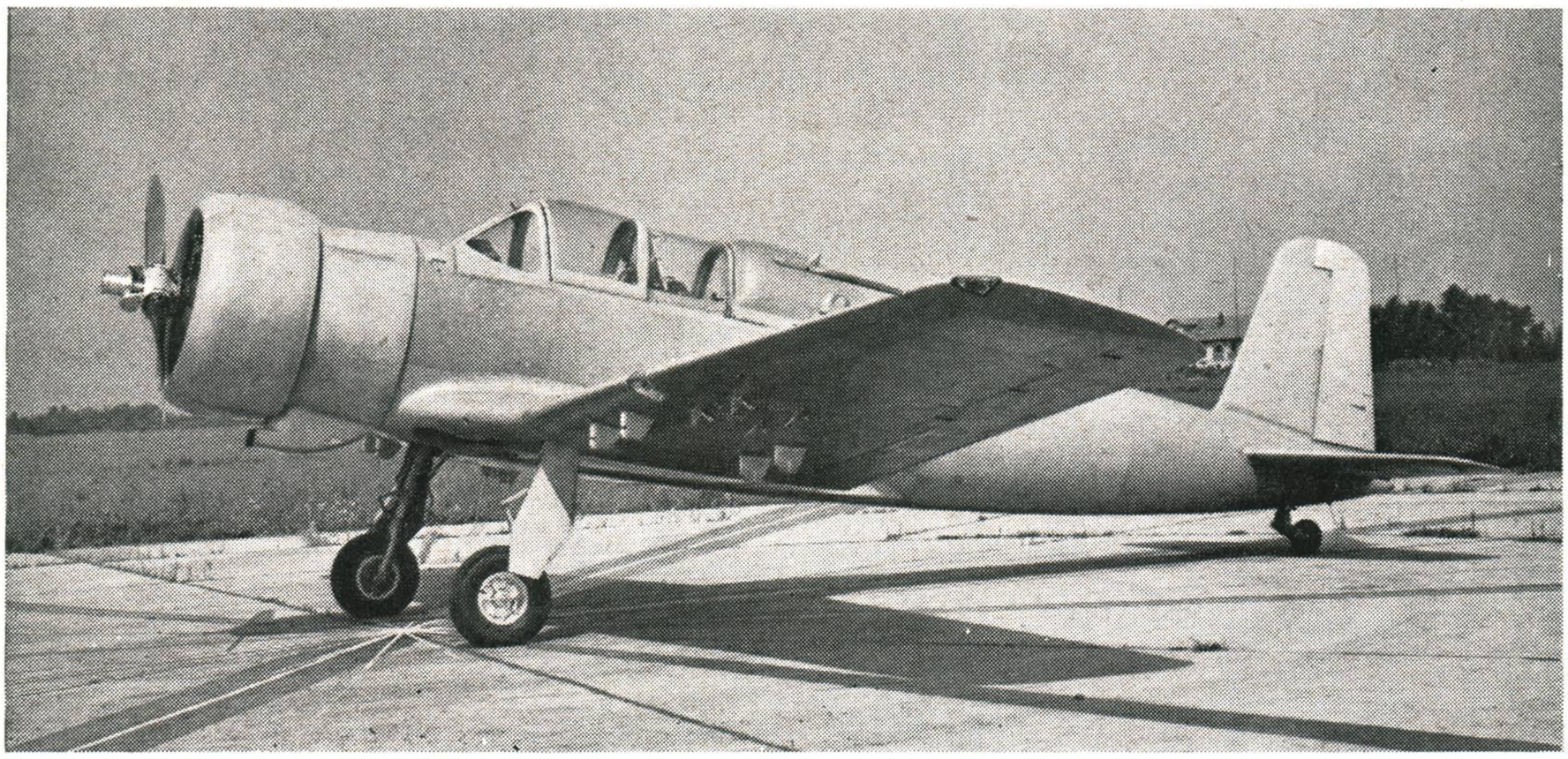
Construction of the G.49 is all-metal and the wing is of the two-spar box type. In order to assist in transportation, the two outboard sections of the wings are readily detachable by the removal of pins. The fuselage is a stressed-skin monocoque and features large inspection panels for servicing of the engine. In this respect the general layout of the entire aircraft has been designed to facilitate ready access during maintenance and overhaul.

Shock absorption for the undercarriage is oleo-pneumatic, whilst the wheel brakes are operated hydraulically, being controlled from the rudder pedals. Only the main wheels are retractable. The tailwheel is controllable by the rudder pedals through 6 degrees either side or, alternatively, by pushing the control column forward the wheel is released and becomes fully castoring.

All three control surfaces are sheet-metal covered and incorporate trim tabs, adjustable on the ground. The elevator control transmission is via rigid duralumin tubes and that for the rudder and ailerons is by means of cables.

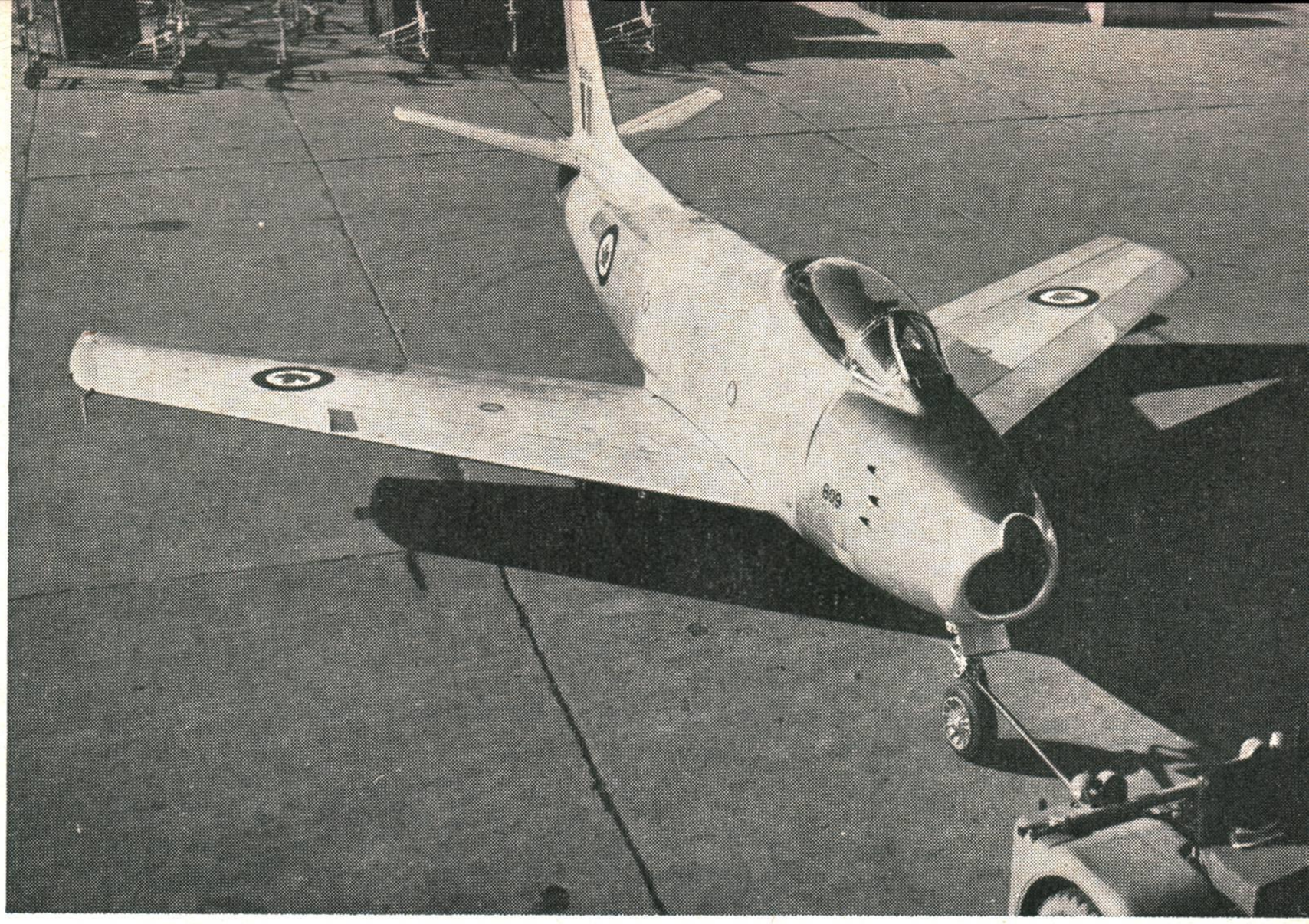
As shown in the general arrangement drawing, flaps are





Distinguishing features of the G.49 include slight anhedral at the wing roots, provision for rocket rails and bomb racks beneath the wings and a characteristically Fiat fin and rudder.

Sabre 5s from Canada



IN JULY, 1950, the Canadair company completed the first of an initial order of 100 F-86 Sabres for the R.C.A.F. When it was decided to send an Air Division to Europe the order was greatly increased, and further Sabres were supplied by Canadair to the U.S.A.F., which bought 60 for use in Korea, and to the R.A.F., which was allocated about 375 under the Millitary Aid Programme.

Production of the F-86E Sabre has now been completed by Canadair, nearly 800 having been built, and the company is now turning out the new Sabre Mk. 5, fitted with the Avro-Canada Orenda 14. Canadair designations for prototype and production Sabres are broken down as follows: Mk. 1, the first prototype, which was an F-86A; Mks. 2 and 4, production models of the F-86E—the Mk. 4 is the Sabre in general use, the R.A.F. having only three Mk. 2s; and the Mk. 3, which was the first Orenda prototype, and the aircraft in which Jacqueline Cochran broke the Women's Speed Record.

The planned output of Sabres at Canadair's Montreal factory was to be nearly 50 aircraft per month. The first Sabre 5s are due to reach the R.C.A.F. squadrons in Europe early in the New Year. It is probable that the present Sabre 4s will be taken out of service and returned to Canadair for modification to Sabre 5 standard.

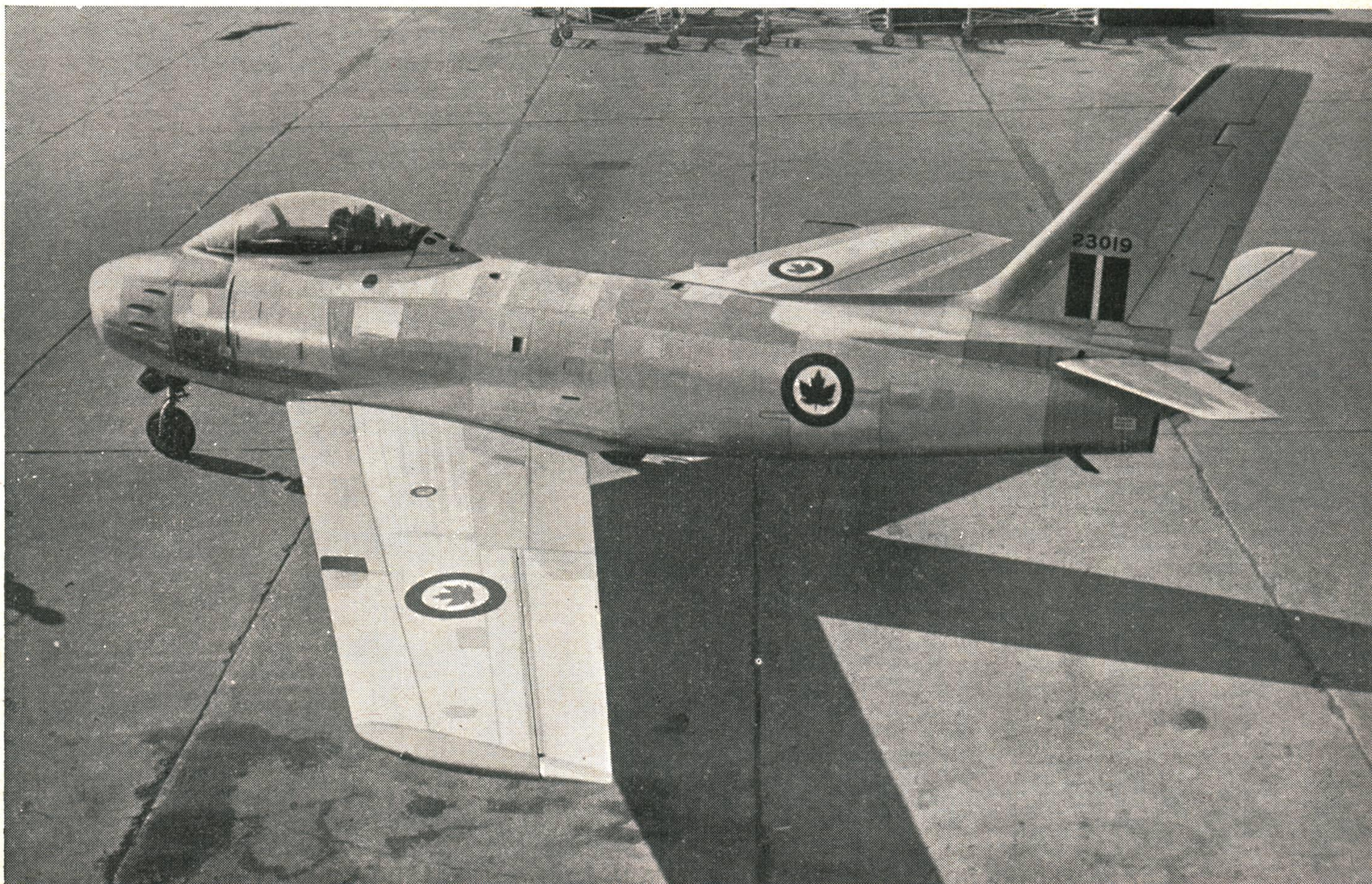
Externally, the Sabre 5 differs little in appearance from the F-86E. Also, the Orenda has been tailored neatly into the fuselage with apparently little modification. The standard Sabre armament of six 12.7-mm. machine-guns has been retained. Despite the Orenda's greater thrust of 6,500 lb., compared with the J-47's 5,200 lb., it is nearly 2 ft. shorter, measuring 10 ft. in length.

The main external feature of the Sabre 5 is found in the leading-edge of the wing. The slats fitted to earlier Sabres have been removed and the leading-edge extended by several inches. This not only allows space for additional fuel, but also greatly improves manœuvrability at high altitudes.

With the removal of its slats, the latest Sabre now wears small boundary-layer fences on the leading-edge of each wing. Without slats, the Sabre's low-speed handling becomes only slightly less docile, and the increase in landing speed is negligible.

In tight turns at low speed, however, care has to be taken to avoid flicking out. It is probable that the extended leading edge of the Sabre may cure what is perhaps the only vice of the F-86E—the tendency towards instability at high speeds and g loads, when turns have a habit of tightening up, with a resultant increase in g, possibly beyond the limit.

With the extra power of the Avro Orenda and the advantages conferred by the longer-chord wing, this remarkable aeroplane is given a further lease of life and should provide the R.C.A.F. Air Division with the most effective fighter in squadron service in any air force.



AIR TRANSPORT

Keeping Up the Standard

By R. E. Gillman

ALTHOUGH at first sight it may seem superfluous, in a profession where all newcomers are qualified and to some extent experienced, a training unit is a very real necessity to a modern air line.

British European Airways have been operating a Training Flight for all the seven years of its existence and, although the intake of new recruits to the flying staff has recently dwindled to a mere trickle as the general rate of expansion has slowed down, the volume of "continuation training" has increased very considerably.

This is the result of a definite policy on the part of the Corporation to keep the general flying standard uniformly high. Periodic flight checks are undergone by every line captain, during which are simulated certain emergencies which he would not normally encounter on his daily round, but with which he must be able to cope in a practised manner.

Each captain is subjected to a check flight twice a year, while first and second officers must undergo an Instrument Rating renewal test once every year. These checks and tests are conducted by a staff of training captains who are all experienced line captains appointed to the task after having passed the Ministry of Civil Aviation's flying tests and been granted the status of Authorized Examiners.

An Instrument Rating renewal test is embodied in the captain's six-monthly check, so his Instrument Rating is renewed twice a year—which is in excess of the legal requirements. The other half of the check is devoted to contact work around the circuit, with simulated emergencies. The syllabus for the visual flying check varies slightly according to the type of aircraft on which the check is being taken. But in all cases the accent is on engine failure and at various times during the flight engines are cut and feathered suddenly and without warning while the pilot's reactions and subsequent engine-out flying ability are marked accordingly on the check sheet.

This marking sheet is designed to make the assessment as quantitative as possible. Each operation is broken down into its obvious components and marked according to whether the performance is average, average plus, above average, or exceptional. Going down the scale, the lesser assessments are given as average minus, below average and unsatisfactory. If the latter assessment is given, then the training captain is empowered to ground the man from line flying and recommend that he be returned to the base training flight for a period of refresher flying until such a time that his performances are back to an acceptable standard.

It is considered that after two years at the job a training captain will have flown with a sufficiently large enough number of the Corporation's pilots to have gained a clear idea of an "average" performance for the Corporation. All assessments are balanced around this level, the check flight reports turned in by the 30-odd training captains showing a high degree of uniformity.

In order to carry the quantitative idea of assessment even further, the individual items on a check sheet are "weighted" according to the relative importance of the item within the exercise. For instance, an ILS let-down is broken into 14 items, with altimeter adjustment and maintenance of critical height having the highest "weight" factor of 7, while final alignment on the localizer merits a factor of 5 and accuracy in the use of the stop-watch only 2. As the qualitative assessments, mentioned earlier, have a value attached to them—"average" being worth 7 marks—it only remains to multiply the mark by the "weight" of the particular item to achieve the final figure.

It is thus possible to write down the entire check in terms of a percentage of the marks obtainable and, with the general remarks of the training captain, to obtain a fair assessment of the pilot's ability. The final marks of each item are then plotted in graph form, when the troughs and peaks show clearly any weaknesses that exist, and for which some corrective action may be considered necessary.

The paper work can, at times, be exacting, but it provides a continuous and fair record of a pilot's standard. The value of the system is beyond doubt, but the job of checking requires a certain type of mentality, for the check pilot is cutting engines on his victim during take-off with one hand, while studying the results and marking them with the other.

At Blackbushe, for instance, where most of the Elizabethan training is done, the Air Traffic Controllers are quite unmoved by the sight of an aircraft flying on one engine. Nor have they any compunction in sending it round again at a late stage in the landing approach should they consider that a scheduled flight could, by so doing, be spared some inconvenience.

An engine cut during an instrument take-off is considered to be a good test of a pilot's ability, and simulated instrument approaches are made with an engine out, these being followed by single-engined overshoots on instruments. It is only as a result of the bond of unquestioned confidence that exists between the pilots in the Corporation that this sort of thing is

Panels are used to cover the left-hand screens in the Elizabethan's control cabin when instrument-flying checks are in progress.

acceptable and that the "ulcer rate" among training captains is negligible.

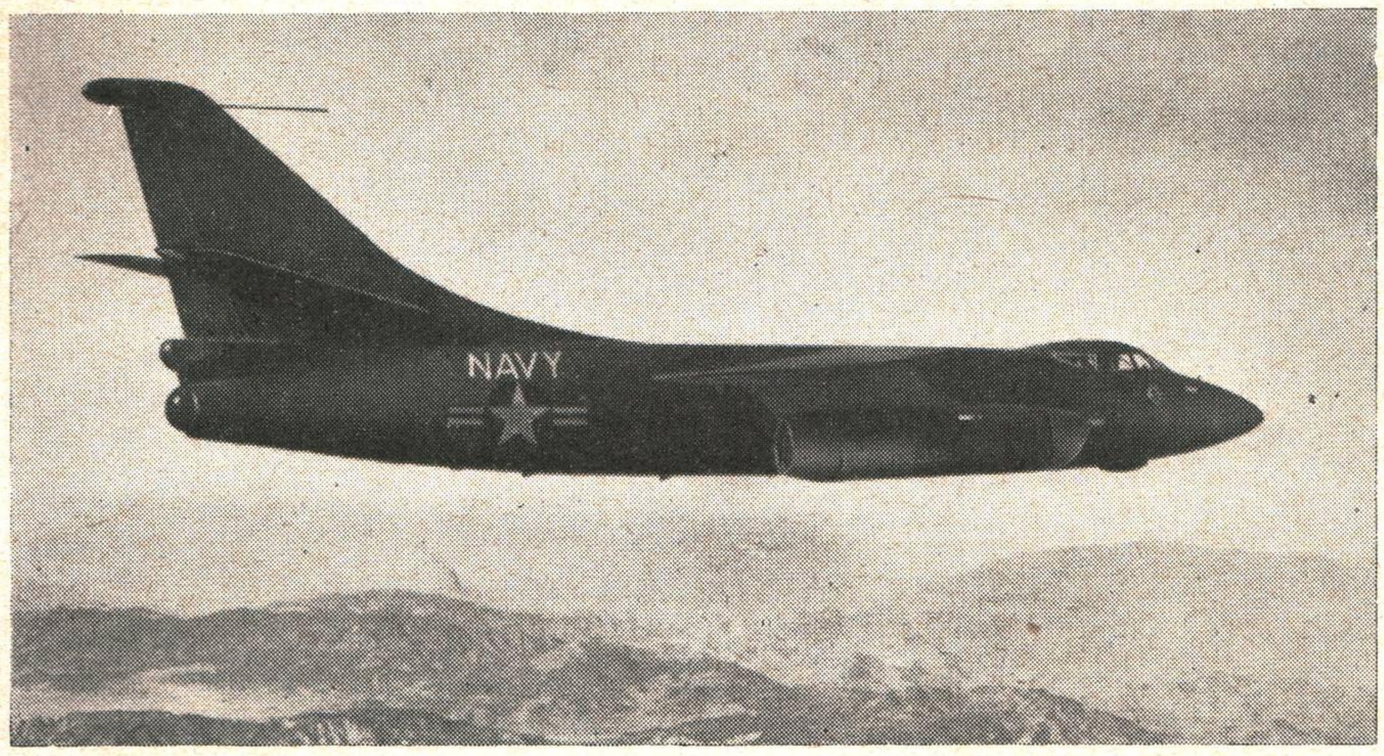
With pilots in the Corporation flying aircraft which each cost up to £100 an hour to operate, this system of check and re-check is an extremely costly business. But now that the standard of each pilot operating on the line is known beyond question, certain parts of the flight checks, and Instrument Rating renewal tests, are carried out during routine service flights. The cost involved in tying up aircraft at base, solely for training purposes, is thus reduced.

Normal all-engines-operating let-downs can be carried out on service flights with the training captain in the right-hand seat monitoring and checking. Airways flying procedures can be watched during a normal exit from, or entry into, the London Control Zone, and en-route instrument flying can be done without inconvenience to anyone. This leaves the contact flying and single-engined instrument work for the base check, while eventually, when the flight simulators for the Elizabethan and Viscount are operating, base flying may be reduced still further in the effort to cut down the training costs.

Even during periods of comparative stability of establishment a certain amount of "straight" flying instruction is going on all the time. New entrants, as second officers, are given conversion courses on the type of aircraft in which they are to fly, and are brought up to day and night solo standard, although it may be many years before they attain their command. Established pilots converting to the newer types spend some five weeks in the ground training school at Northolt, studying the airframe and engine design and ancillary equipment. before sitting for the Air Registration Board type-rating examination. This, incidentally, becomes more stringent each year with the increasing complexity of aircraft design, and will shortly include a section on I.C.A.O. Performance Standards. This course is followed by 20 to 30 hours' flying training before the pilot takes an independent check which may clear him to operate the type on service.

When a first officer is due for his captaincy, and a vacancy is imminent, he is rostered with a training captain on normal

AIRCRAFT INTELLIGENCE



AMERICAN SAILORS: The Lockheed R7V-1 Super Constellation (top) is the fastest Lockheed transport yet built; in the U.S. Navy it will be used for many types of strategic transport. The midnight-blue Douglas A3D (below) is now undergoing its flying trials. This prototype has two afterburning Westinghouse J-40s. The swept wings and tail fold for carrier stowage.

Great Britain

Short S.B./5. Since this Derwent-powered variable-sweep aircraft is to be used for low-speed work only, it is fitted with a fixed undercarriage. This permits use of the desired thin wing-section and also overcomes many c.g. travel problems. The wing sweep is adjustable from zero to 50 deg on the ground; in flight the wing is locked.

de Havilland Vampire. On January 21st, three Vampire 52s left Hatfield for the Finnish fighter base at Pori, 155 miles north of Helsinki. They are the first jet aircraft to enter service with the Finnish Air Force, and will supplement that country's Me109Gs. It is interesting to note that Finland has followed the example of Sweden and Norway in purchasing Vampires; they will benefit from the extensive cold-weather experience gained by the Vampire in Scandinavia and Canada.

U.S.A.

Temco T-35 Buckaroo. An order for a limited number of this Chipmunk-sized trainer has now been placed by the U.S.A.F. under the Mutual Defence Assistance Programme. Other orders may be forthcoming from Latin-America and the Far East.

France

Air France aircraft. The 37 new aircraft on order for Air France have now been registered. They will be: Comets, F-BGNX to Z; Viscount 708s, F-BGNK to V; Super Constellations, F-BGNA to J; and Breguet Deux Ponts, F-BASN to V and F-BASX to Z.

Nord 2501 Noratlas. Early this month the first civil version of this Packet-like transport was demonstrated at Le Bourget. It is not yet known whether civil operators will use the type, but this machine (F-WFRG) was due to leave today for Dakar, from whence it will set out on a South American sales tour.

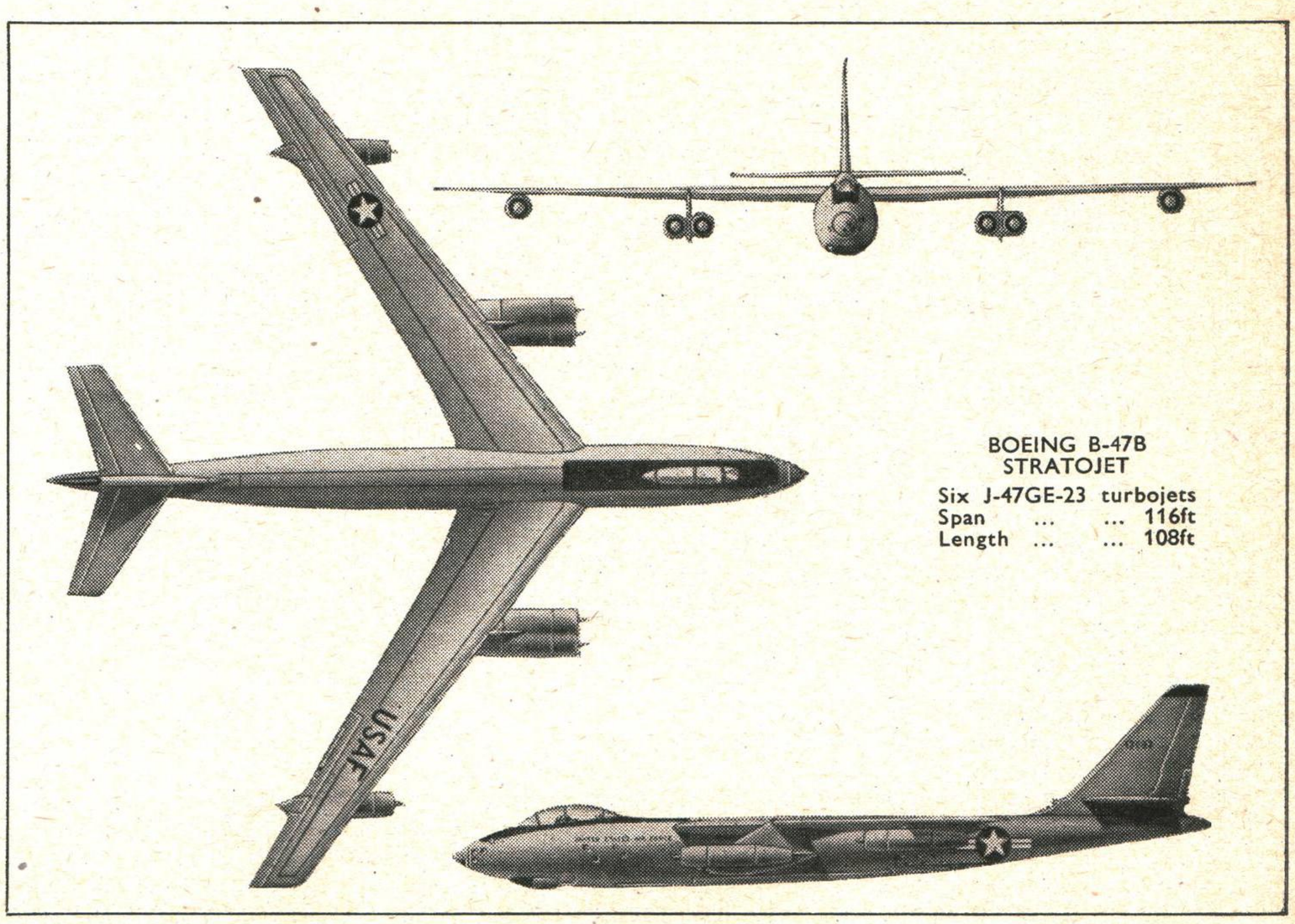
Bréguet 960 Vultur. The first prototype of this "push-me-pull-you" carrier strike aircraft was due to fly from its Toulouse home to Paris this week. From Paris it is expected to fly on to this country in order that its carrier trials may be undertaken "at an English test flight centre."

Matra Cantinieau development. Following the initial test reports on the MC.101 helicopter—which aircraft is to be quantity-produced—the decision has been taken to proceed with a twin-engined development capable of lifting a load of 880 lb (or four passengers) in addition to the pilot. The prototype, which will be shown at the Paris Salon in June, will have a single rotor driven by two SNECMA 41-02 engines of 170 h.p. each.

Bréguet 978. The French journal *Les Ailes* has recently published a description of this projected transport, which is designed to have three Atar turbojets (one in the tail) or, eventually, two Avons or Vulcains. Although the account credits the design with a "crescent wing" and suggests that it is analogous to the H.P.80, this is not correct. The Breguet project features a fuselage and fin of DC-4 shape mounted on an unswept wing whose roots are thickened by limited forward leading-edge sweep, in the manner of the Valiant. It is unlikely that the type will be built.

Jugoslavia

Jet Aircraft. The first turbine-powered aircraft of Jugoslavian design is reported to have made a successful first flight during the last week of 1952. It is a conventional low-wing monoplane with a retractable tail-wheel undercarriage. Two Turboméca Palas turbojets provide a total of some 660 lb thrust and it is suggested that the aircraft will be used as a purely experimental test bed for the development of more advanced types.



"Flight" photograph

Canadair-built North American F-86E Sabres of No. 410 (Cougar) Squadron, Royal Canadian Air Force, based at North Luffenham.

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SABRE

A Study of a Renowned Fighter

THIS review has been compiled by H. F. King, with the gratefully acknowledged co-operation of the Royal Canadian Air Force and Canadair, Ltd. The illustrations include special "Flight" copyright drawings by Arthur Bowbeer, and a new set of air-to-air copyright photographs by John Yoxall.

WHEN the last piloted fighter has made its final landing and the truly great military aeroplanes have taken up their ultimate niches in history, the North American Sabre will be seen to occupy a secure place. Whether it will have influenced the course of world events as did our own Hawker Hurricane and Supermarine Spitfire it is as yet too early to be sure; but one fact can never be refuted—that, at a time of world peril, the Sabre was the only available Allied fighter which could engage the enemy's best on equal terms. Certainly an American writer's assertion that the Sabre has saved his nation's face (if not its neck) in the Korean war is no exaggeration; nor is it an overstatement to attribute this timely success to the single factor of wing sweepback—a consideration which is the more gratifying because this feature was, as we shall see, wholly adventitious.

Our short introductory history of the Sabre must open in the last year of the war—1945—when the North American company was awarded a U.S. Navy contract for three XFJ-1 straight-wing fighters of the type later to achieve a limited distinction under the name Fury. For the consideration of the U.S.A.F. a similar design, stripped of naval impedimenta and designated XP-86, was then submitted, resulting in an order for three prototypes.

Had the original XP-86 project been realized (and detailed design was carried to an advanced stage) the performance of the aircraft would almost certainly have proved inferior to that of the contemporary Republic XP-84, later to achieve fame as the Thunderjet. Thus the jet fighter which was to succeed the brilliant piston-engined Mustang almost proved a mediocrity.

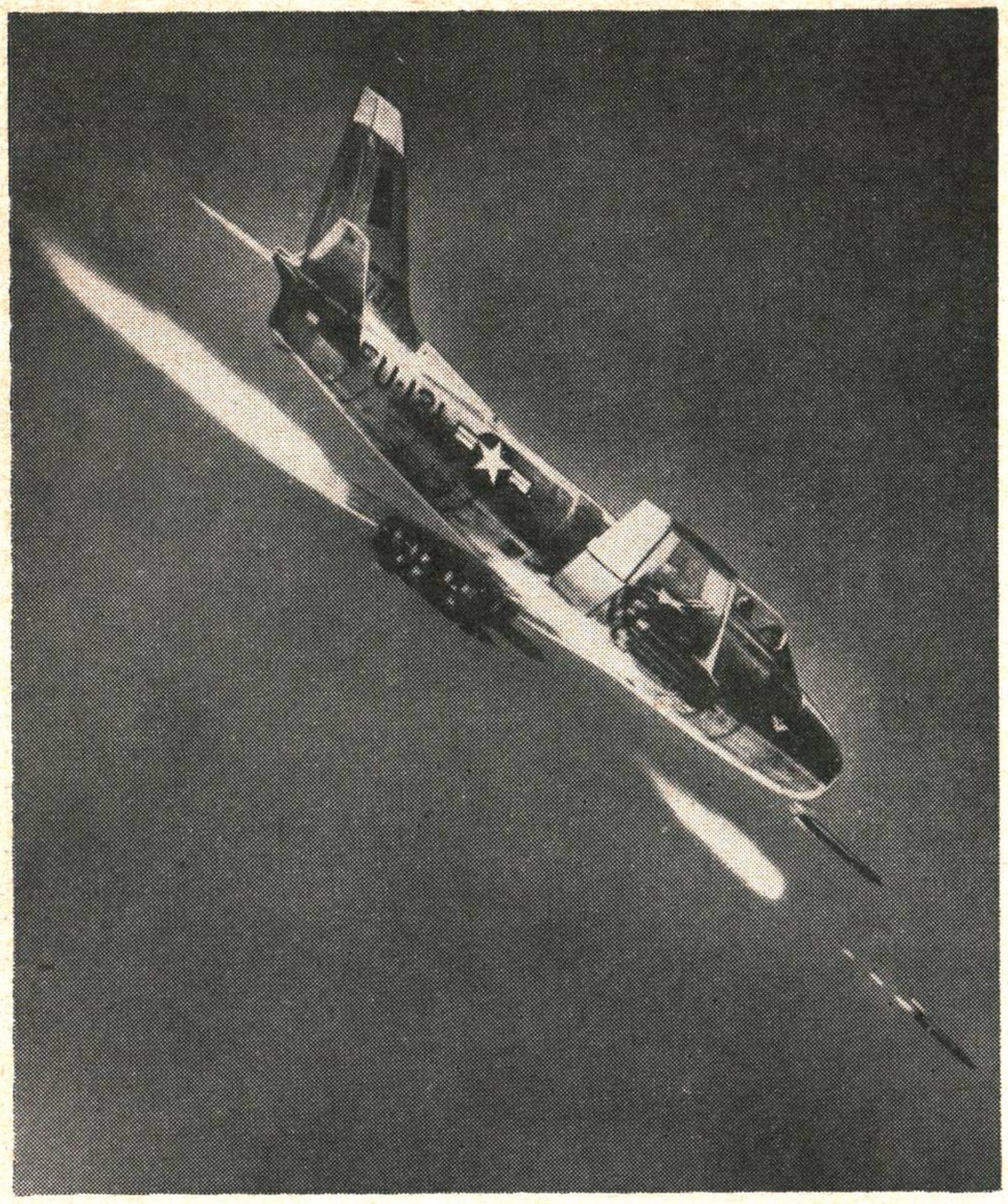
This near-calamity (for, in the light of events, it might have proved a calamity indeed) was averted only by the capture of German research data which disclosed the virtues of sweepback in delaying the onset of compressibility. In conjunction with a specimen Me 262 wing, this material encouraged the N.A. technicians to redesign the XP-86 to incorporate swept-back surfaces. Their drastic revision entailed a lengthening of the fuselage and various incidental modifications, so that when the new fighter appeared in the autumn of 1947 it differed very noticeably from the straight-wing naval Fury, construction of which had proceeded as originally planned.

The first of the two flying prototypes took the air on October 1st, 1947, and was powered with an Allison J-35 turbojet of only 4,000 lb thrust.

Clearly the F-86A, as the production version was designated, was something uncommonly good. Powered with the brand-new General Electric J-47, it demonstrated not only extremely high speed, but—all things considered—surprising tractability in handling. Moreover, it was remarkable for the ingenuity of its design and construction. Its wing, in particular, was quite extraordinary. It had 35 degrees of sweepback (measured on the 25 per cent chord line), was of 12 per cent thickness/chord ratio, and its construction was of "sandwich" type, whereby the structural material was laminated between inner and outer tapered skins. Another innovation was the "lipping" of the air intake to maintain air flow in a nose-up attitude.

Though the Sabre—as the F-86 came to be dubbed—was never designed for supersonic speed, the makers did proclaim that it had been built "to come nearer the speed of sound under actual combat conditions than any other American fighter." Beyond mentioning a range of over 1,000 miles and a service ceiling of over 40,000ft, however, they disclosed little more of importance.

By September, 1948, the world suddenly became aware of the Sabre's quite extraordinary speed, for on the 15th of that month a standard F-86A, carrying its full military load and flown by Major Richard L. Johnson, U.S.A.F., established a world record of 670.981 m.p.h. over Muroc Lake—a record which was to stand until Capt. J. Slade Nash attained 699.9 m.p.h. in an F-86D on November 19th, 1952.



A Sabre "ripples" its 5in rocket projectiles over a U.S.A.F. firing range.

SABRE . . .

Lest it should be imagined that the Sabre has always been a paragon, unblemished by affliction, it must be recorded that not only was it heir to the ills of most prototypes, but it soon showed symptoms of altogether new complaints. To some extent these troubles stemmed from the new axial power plant: thus, the rate of climb and altitude performance of early F-86As were, to say the least, suspect, while the short life of the turbojet—initially only 7½ hr between inspections—did nothing to enhance the new fighter's reputation.

In its ability to attain supersonic speed in the dive, however, the Sabre remained unique among military aircraft for a long period, though today the distinction is shared with several American, at least two British, one Canadian and one French fighter.

It was during 1948 that reports of supersonic dives over California, with their noisy and allegedly destructive consequences, began to circulate. Though the fact was kept secret for many months—and is still not widely known—it was W/C. R. P. Beamont, chief test pilot to the English Electric Company, who, flying a Sabre, became the first Englishman to achieve Mach 1 (or thereabouts). We have asked him to give us some impressions of this flight, which he made in May, 1948, at Muroc.

The aircraft was the second prototype XP-86. "As far as supersonics are concerned," W/C. Beamont writes, "I was able to obtain the necessary experience during some dives to indicated Mach numbers of well over 1. Subsequent research in this country has revealed the A.S.I. system of the production aircraft to be subject to quite considerable position error at high Mach numbers, and it is therefore by no means certain that the speed of sound was actually exceeded during that early flight of mine. It was, however, obviously transonic, if not actually supersonic, and did serve to demonstrate the remarkably docile control characteristics of the aircraft in compressibility. The marked changes in pitching moment hitherto associated with flight at Mach numbers above 0.8 were not present, and although small changes were detected—both in pitch and, as the speed of sound was approached, in roll—these involved only very small control forces to hold, or trim adjustments to trim out.

"I think that perhaps the most outstanding impression that the first flight made was that here was an aeroplane which had fighter manœuvrability up to well in excess of M=0.9, and that it was therefore a machine with a very considerable margin of manœuvrability and smooth controllability above any known fighters of the time, either in service or under development. That impression was formed in 1948, and my last flight in a Sabre, made last year, confirmed those first impressions, although it is now a relief to know that at last there are superior prototypes under development.

"Basically the Sabre is one of the most straightforward, pleasant, and obviously efficient fighter aeroplanes that has yet occurred, and is one of the few fast aeroplanes which I have come across with which it is possible to read the Pilot's Notes and then go flying without having to keep constantly in mind some particular, if only minor, vice."

The resounding success of the F-86 in Korea (notwithstanding its slight inferiority to the Mig-15 in high-altitude performance) is now everyday talk; but its genesis is still somewhat obscure, and our description may usefully be prefaced with a note on Sabre variants.

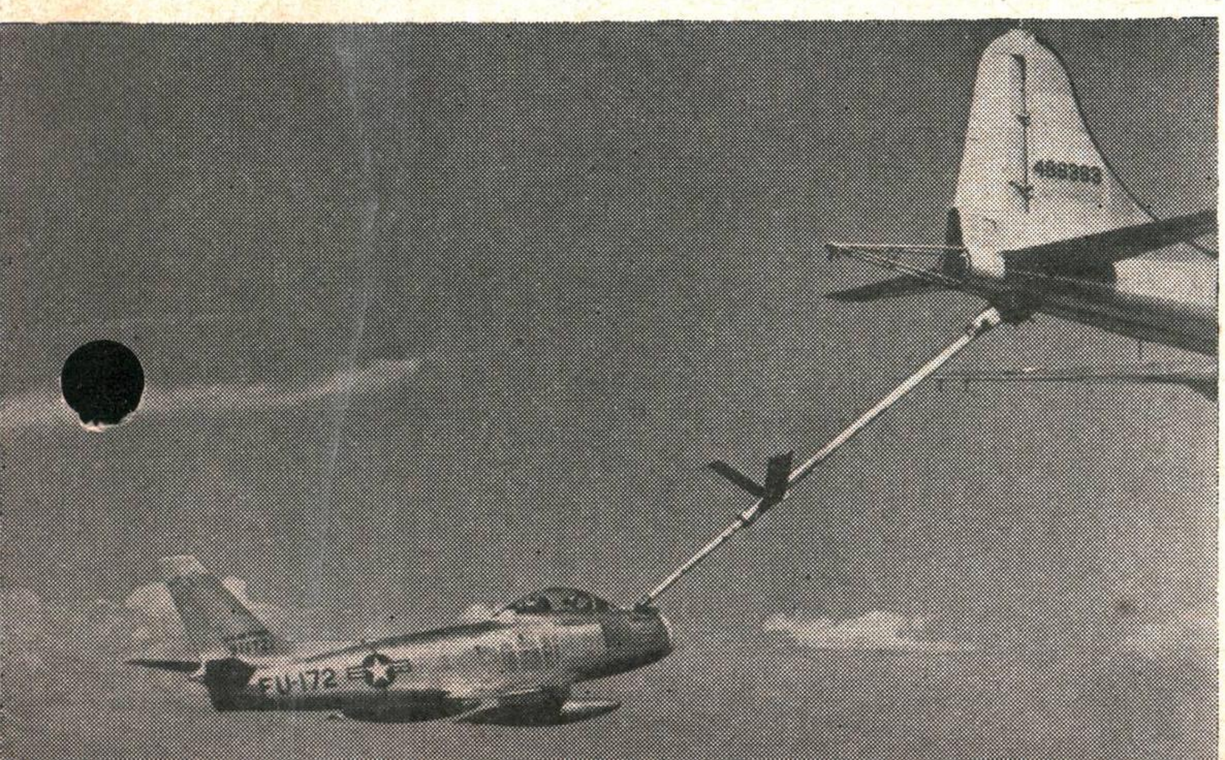
The Sabre Family.—The two flying prototypes, as we have said, were designated **XP-86,** and though at first they were powered with Allison J-35s, these were later changed for the General Electric J-47s. The initial production model was the **F-86A,** the first of which flew on May 20th, 1948, and the last of which came off the line in October, 1950. Two machines of this type were handed over to the Central Fighter Establishment of the Royal Air Force during 1950. One "A" airframe has been fitted with an Avro Canada *Orenda* turbojet, but the standard power plant is the J-47.

The **F-86D,** present holder of the world speed record, differs very considerably both in equipment and appearance. The most notable superficial change is the installation of a prominent bullet-shaped radar housing in the nose, and the repositioning of the air intake duct, shark's-mouth fashion, below. The turbojet is a General Electric J-47-GE-17, fitted with an afterburner, and the cockpit canopy is of "clamshell" type, hinged at its rear end. No guns are fitted, but there is a retractable rocket launcher in the belly of the fuselage for a battery of R.P.s.

The subject of our description, the **F-86E,** superficially resembles the "A," but is characterized by a new "all-flying" tail, in which the tailplane and elevators are linked for co-ordinated movement. This feature gives the Sabre better longitudinal control and eliminates the loss in effectiveness of the surfaces due to

(Above) XP-86 prototype. (Below) A YF-93A, powered by a Pratt and Whitney-built Rolls-Royce Tay development with afterburner.

A Sabre replenishes its tanks in the air by means of a Boeing "flying boom" lowered from a KB-29F Superfortress tanker.



SABRE . . .

the heavy loads at extreme speeds. Another innovation on the "E" is the irreversible power-control system for which (as none of the actual air loads act upon the pilot's control column) an artificial feel system has been introduced. Although the armament of the "E" is the same as that of the "A" (six 0.5in guns), the operational effectiveness of the type has been vastly increased by the installation of radar gun-laying equipment. Certain of the Canadair-built F-86Es are designated F-86E* and are distinguished from their stablemates in that the control-column break-out force (i.e., the force required to move the stick from neutral) has been reduced from 4 lb to 1 lb, and certain changes have been made in instrumentation.

The **F-86F** is a new Sabre variant, in production at the North American Columbus, Ohio, plant and having a more powerful J-47 turbojet. Slightly larger than the "E," the **F-86H** is made at Los Angeles; it has a J-73 (much developed J-47) turbojet, an improved suspension and release mechanism for carrying the wing tanks in conjunction with bombs or rockets, and although the entire horizontal tail surfaces are power-boost controlled, as in the "E," they are somewhat larger and have no dihedral. The undercarriage has been strengthened, and the canopy is of the new "clamshell" type. All H models have an improved ejection seat mechanism. The **YF-93A** sub-type differs primarily in having a Pratt and Whitney J-48 (Rolls-Royce Tay licence) centrifugal turbojet, aspirated through flush intakes and equipped with an afterburner. The main landing wheels are duplicated and airframe dimensions differ from those of other Sabres. The two prototypes of this aircraft are now being used by the N.A.C.A. Flight Test Laboratory for high-speed research. The **Avon-Sabre,** to be built in Australia by the Commonwealth Aircraft Corporation Pty., Ltd., is based on the standard F-86E, but will be armed with 30 mm guns and powered with a Rolls-Royce Avon RA.14. Mention may also be made of the new **Sabre F-100,** otherwise known as the "Sabre 45" (which figure gives a clue to the increased sweepback on the wing) and of the **FJ-2**—a deck-landing development of the F-86E, armed with four 20 mm guns.

Our immediate concern is the Canadair-built F-86E, now familiar in this country as the equipment of the Royal Canadian Air Force squadrons based at North Luffenham, and in process of being introduced into R.A.F. units of the 2nd Allied Tactical Air Force.

Structural Features.—The wing of the F-86E is notable for the heavy gauge of the materials—particularly the skin—and, though built as a centre section and two outer panels, is made continuous through the fuselage by connecting the three sections with bolts and lock-nuts round the perimeter of the joints. The torsion-box structure, which forms the centre section and houses one of the fuel tanks, is composed of the two spars and upper and lower double-skins. Within each double-skin are the stringers. From the centre section to a point slightly inboard of the aileron each main wing panel is likewise a two-spar double-skin torsion box with very few ribs, tapered heavy-gauge skin, and closely spaced spanwise stringers in the form of hat-section extrusions. These panels contain fuel tanks.

Outboard of the sections described, the structure has only a single, instead of a double, skin, and the extreme tip portions are formed of plastic. Unlike the main torsion box, the leading-edge structure, which is attached to the front spar, has many closely spaced ribs; the trailing-edge structure is essentially similar.

Each of the statically and aerodynamically balanced ailerons is attached by three hinges, and there is a fabric seal between the rear wing spar and the leading edge. The Handley Page automatic slats, which extend over almost the whole leading edge and are so characteristic of the Sabre, open or retract according to aircraft speed and attitude. To ensure their free working under any condition of wing distortion, each is in four loosely jointed sections which move forward and downward on tracks.

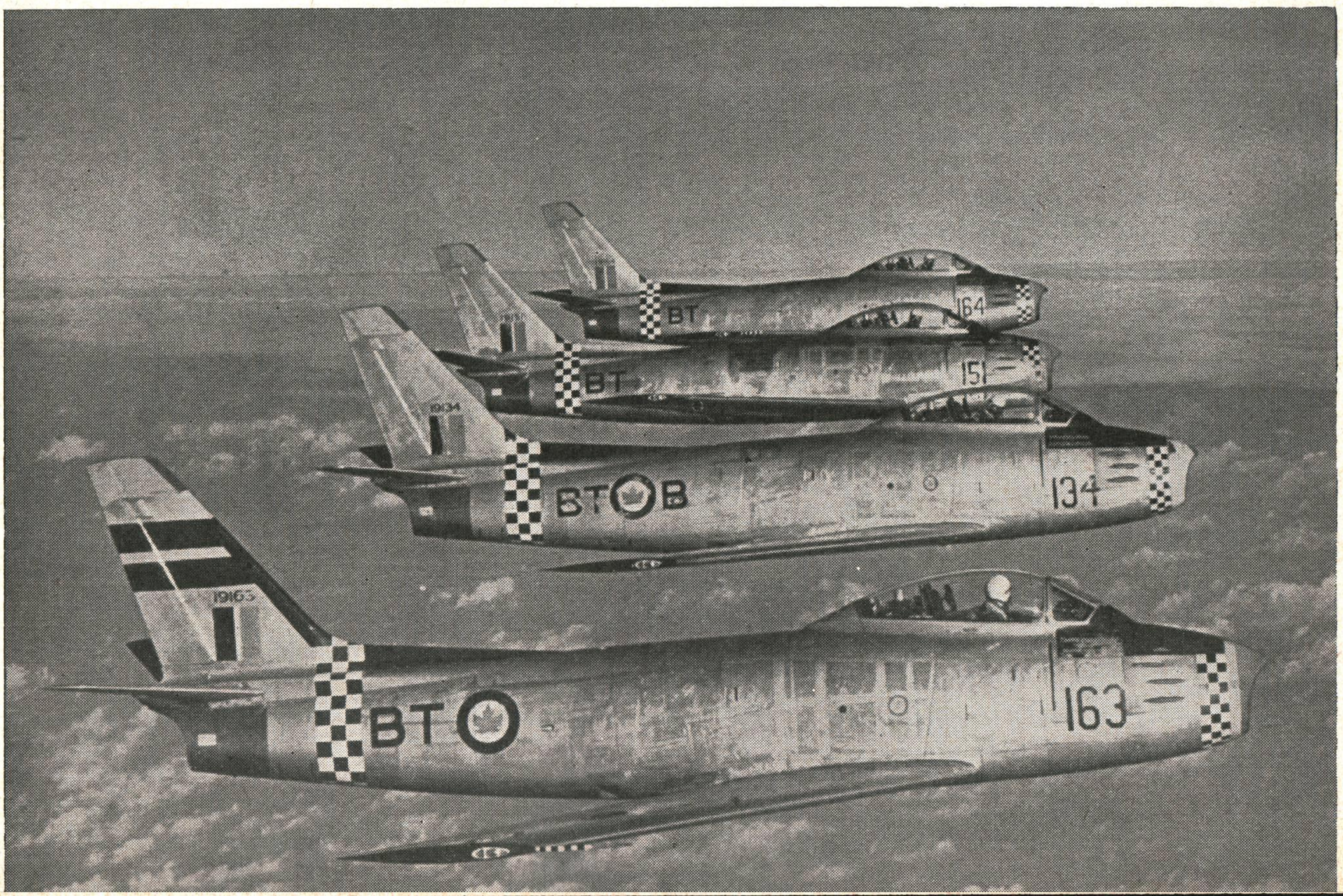
The slotted flaps are electrically operated over a range of 0-38 degrees and extend between the fuselage and each aileron. They are operated by a lever mounted beside the throttle and are interconnected by a flexible shaft to ensure unified movement under normal conditions and—in the event of one actuator failing—to permit both flap sections to be operated. The half-flap position is determined by aligning a painted stripe on the flap leading-edge with the trailing edge of the flap shroud.

Of conventional stressed-skin construction, the fuselage is built in two main sections to facilitate installation, inspection and removal of the turbojet. These two sections are joined by four bolts and there are quick-disconnectors for the wiring, control cables, and hydraulic and fuel pipes.

The rear fuselage is of simpler construction than the forward part and embodies one bay (in way of the tail) which is of stainless steel construction. On the first Canadair-built Sabres the fuselage nose-fairing was plastic, but on the later machines it is of metal, with a plastic "window" for the radar scanner.

On each side of the rear fuselage are the speed brakes (this R.C.A.F. terminology seems preferable to the more usual "dive brakes" or "air brakes"), each of which is in the form of a hinged panel which can be extended forward or downward into the air

441 Se



Overhaul and repair of North American F.86 Sabre

aircraft in this country has been entrusted to

The Bristol Aeroplane Company Limited

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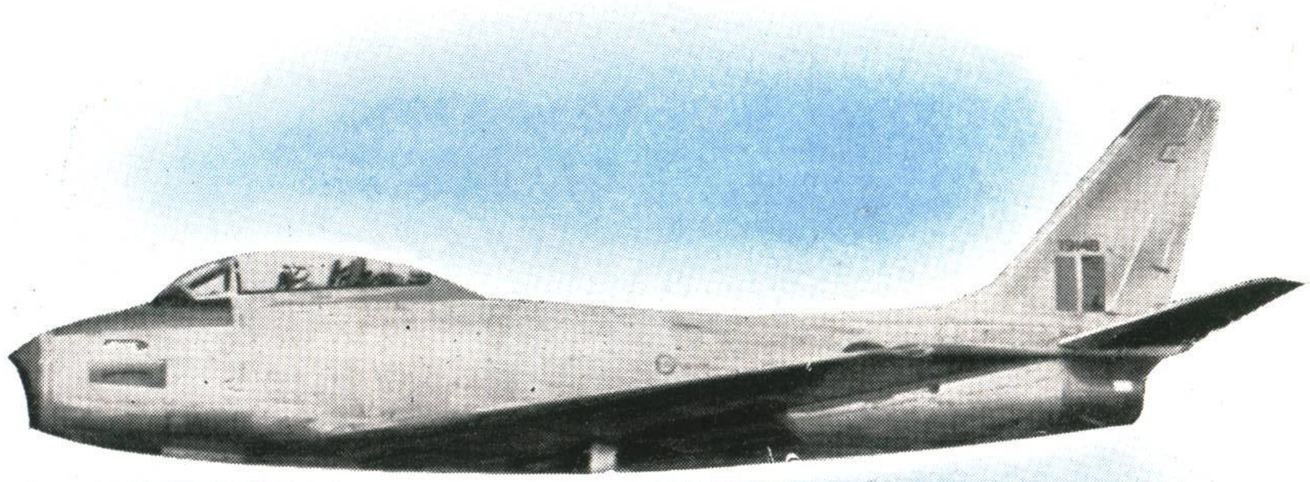

Dummying Hiduminium

Hand forging or dummying an undercarriage component under a 20 cwt. Massey hammer. This operation produces the rough form of the component and at the same time improves the grain structure of the metal thereby allowing its full mechanical properties to be developed. The component is finally formed by stamping between steel dies.

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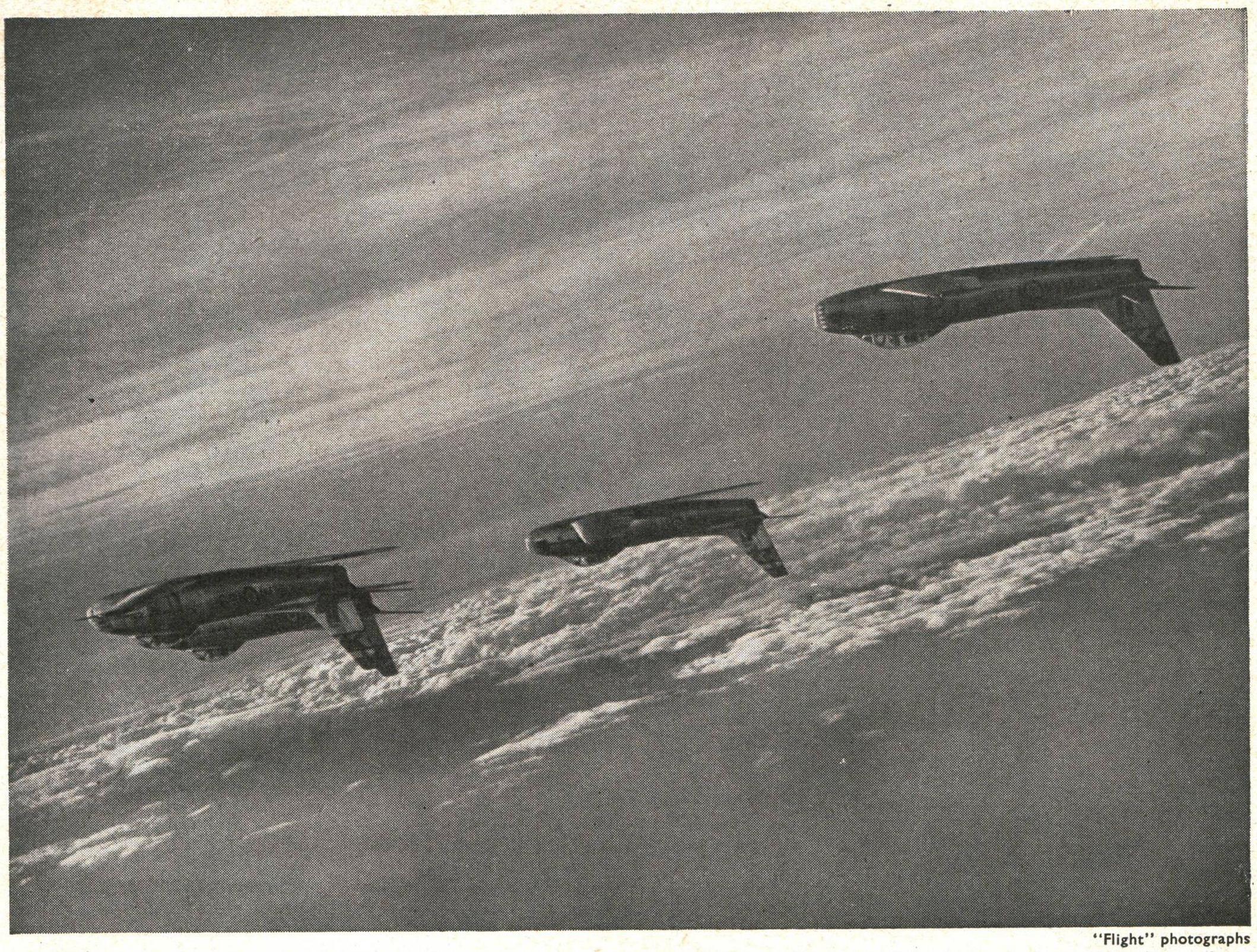

"Flight" photographs

Opposite, F-86E Sabres of No. 441 (Silver Fox) Squadron, R.C.A.F., are seen in a tidy echelon. Above, John Yoxall's camera has caught the aerobatic team of No. 410 (Cougar) Sqn. on the top of a loop, and below is a unique picture of a composite formation of North Luffenham Sabres. Nearest are four machines of No. 441 Sqn.: in the centre, four of No. 439 (Tiger) Sqn., and, beyond them, a similar representation from No. 410 Sqn.

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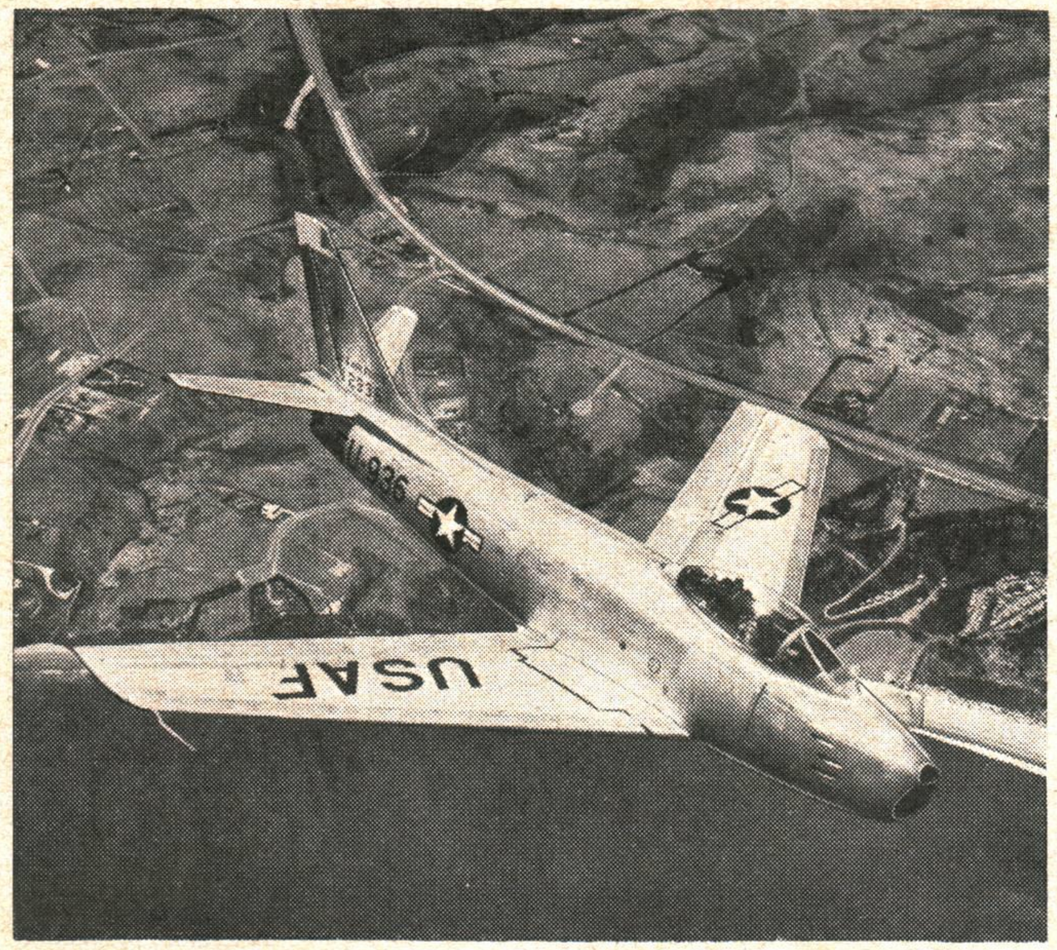
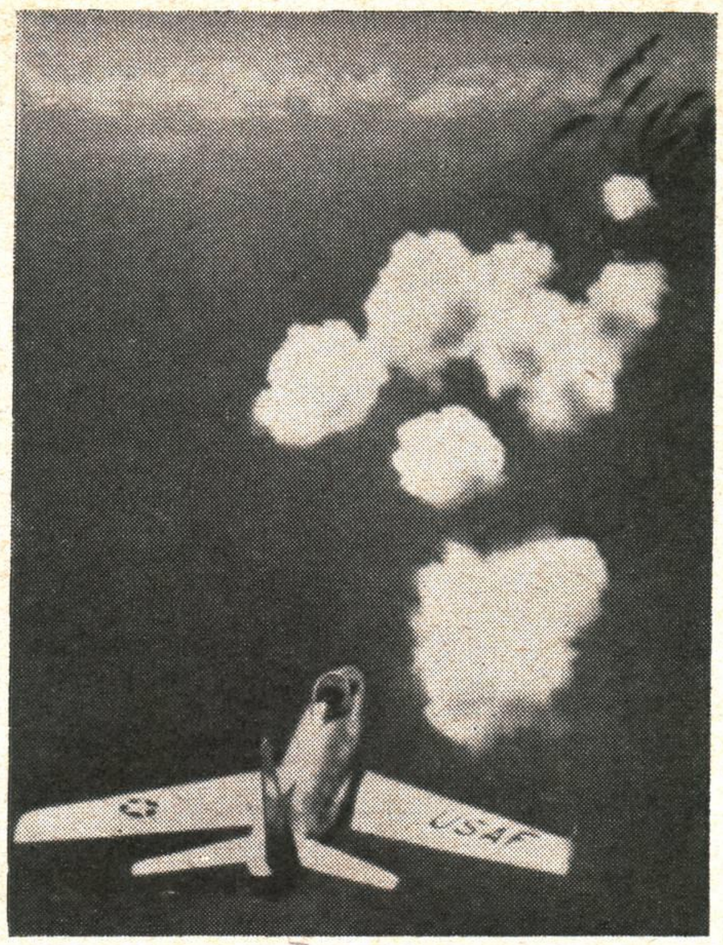
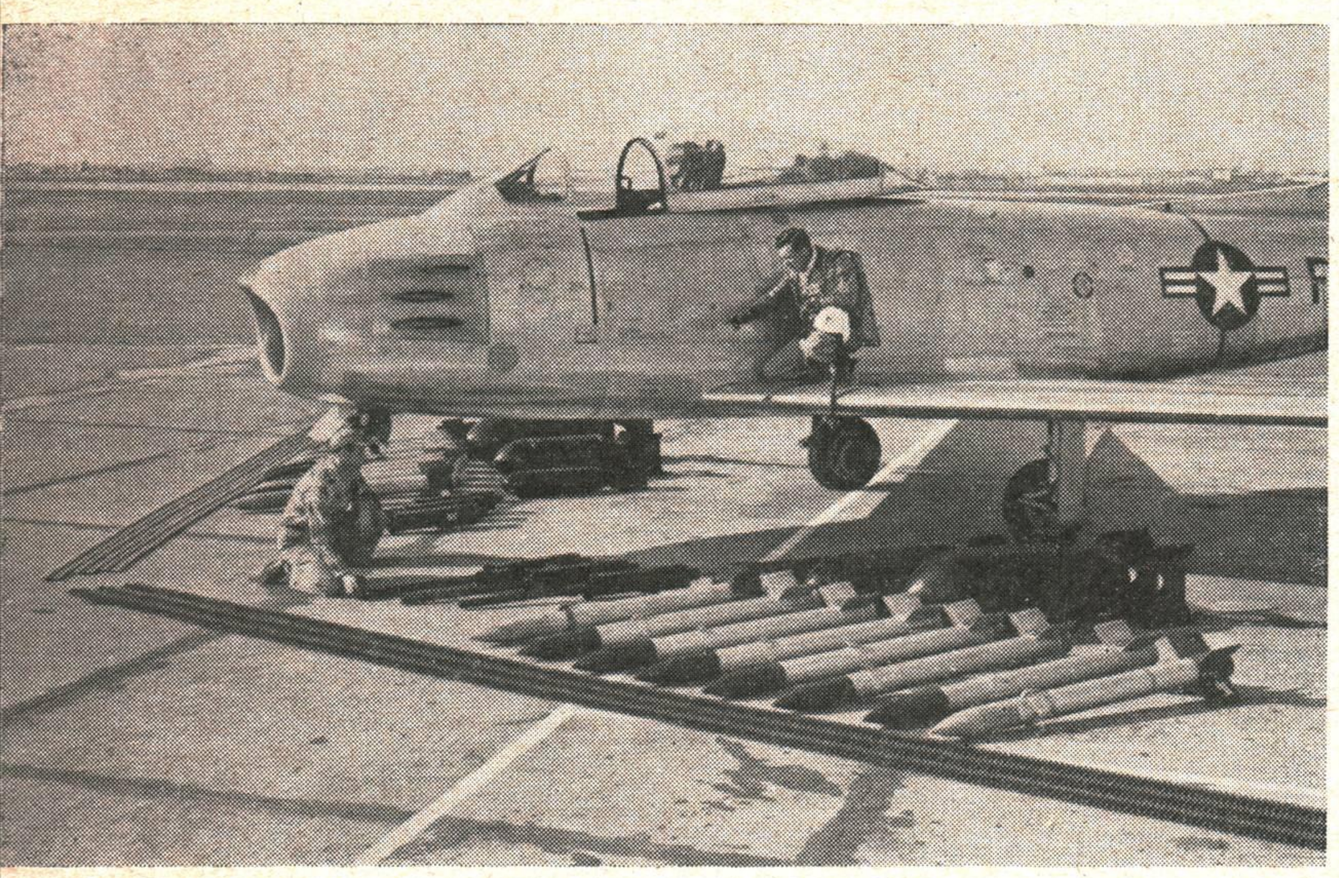


North American F-86F. Below, a range of Sabre armament stores, including six 0.5in guns and sixteen 5in R.P.s, which are alternatives to two 1,000 lb M-65 bombs or smaller bombs, such as the 500 lb M-64 or 100 lb practice bombs, all of which are shown in this photograph.



An F-86D catches up with the explosions of the special "flash-heads" of its Mighty Mouse rockets. These heads are used by the United States Air Force for photographic recordings.



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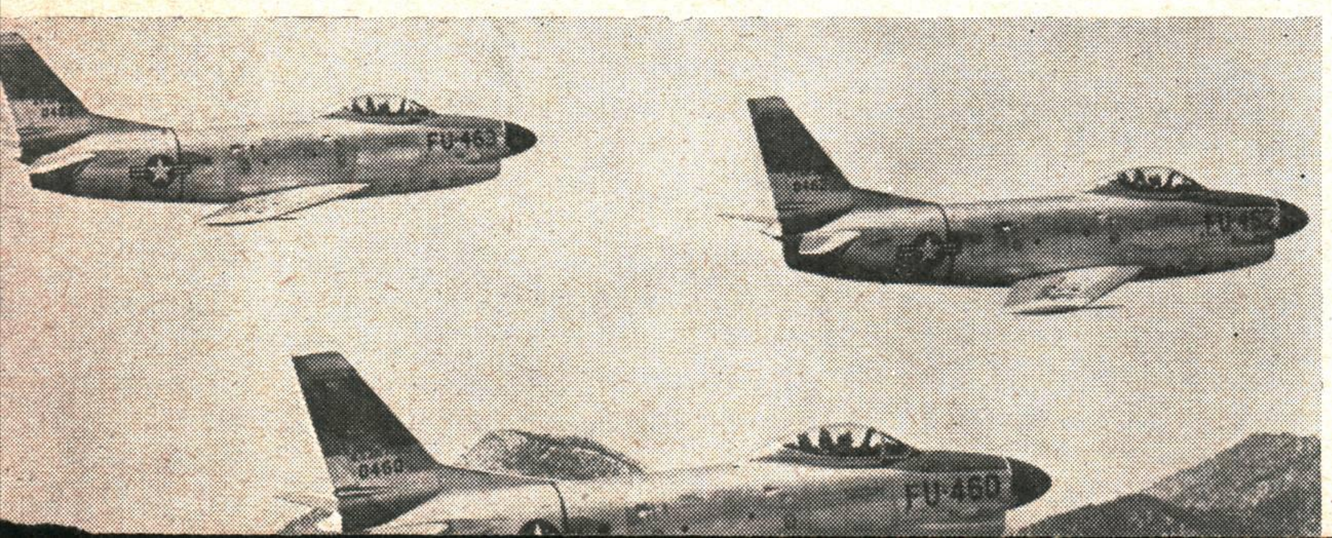
All-rocket armament and search radar characterize the "all-weather" F-86D, now entering service with squadrons of the United States Air Force.



stressed-skin construction. Longitudinal control is effected by *combined* tailplane/elevator movement, as described below.

The massive clear-vision cockpit canopy moves fore and aft on tracks and is normally electrically operated by a three-position switch, though there is a cable system for manual operation, in addition to the emergency ejection system. Fixed in the canopy are the loop aerial, cabin-pressure regulator and upward-identification light.

Each main undercarriage assembly is mounted on a cantilever trunnion on the rear main spar and incorporates a Cleveland shock-absorber strut, a 26in extra-high-pressure tyre and a Bendix multiple-disc hydraulic brake in a cast-magnesium wheel. Retraction (into the fuselage) is effected by a hydraulic jack, and each assembly is locked down by a pin in the aft face of the trunnion support, which engages a lug on the shock-absorber strut. The pin is actuated by a hydraulic jack and is spring-loaded in the locked position. Up-locking is achieved by a spring-loaded, hydraulically actuated hook engaging a roller on the shock-absorber leg. For combat the undercarriage control valves are in neutral and the wheel assemblies hang on their latches. A hand-pump allows emergency undercarriage operation.

The steerable nosewheel assembly has a thin-tyred 22in wheel, and the shock-absorber strut, which pivots on two trunnions, has a steering damping unit attached to its rear. It is retracted by two hydraulic jacks and during retraction the shock-absorber spindle rotates through 90 degrees so that the wheel lies flat in the fuselage. Steering is possible (by movement of the rudder pedals) through a range of 23 degrees each side of neutral. The wheel-well door remains closed except when the wheel is actually retracting or extending.

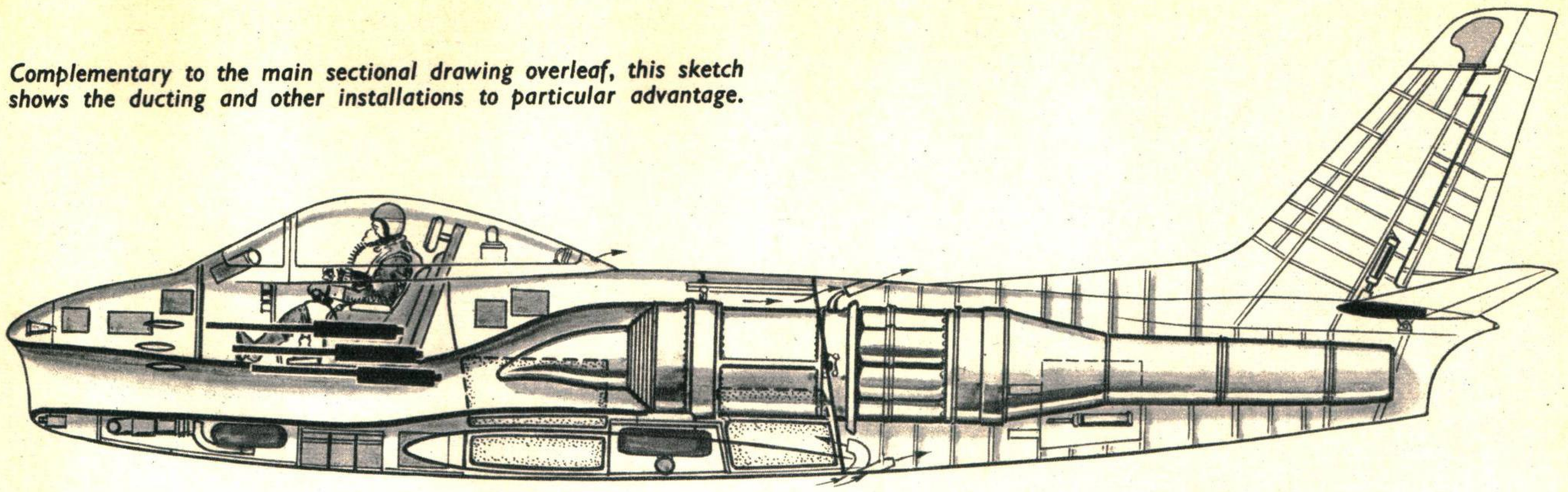
Control System.—Of all the Sabre's unusual features, one of the most interesting is surely the control system, incorporating the "flying-tail" principle and irreversible hydraulic operation. (In R.C.A.F. parlance the flying-tail is termed "controllable horizontal tail.") Though the rudder is cable-controlled, the ailerons and the all-moving tailplane-elevator assembly are worked solely by hydraulic power in response to control-column movements. The special aileron and flying-tail systems eliminate many of the undesirable effects of compressibility such as loss of control effectiveness at high Mach numbers.

The hydraulic power system, which is entirely separate from the system for the general services (speed brakes, undercarriage, nosewheel steering and wheel brakes) embodies reservoirs, an engine-driven pump, an electrically driven pump, a wobble pump and filling selector valve, accumulators, relief valves, pressurizing compensators, pressure transmitters, pressure switches, by-pass and shut-off valves, actuating jacks for the tailplane and ailerons, and associated valves, check valves and filters. For normal operation power is supplied by the engine-driven variable-displacement pump to the "normal" side of the control-surface valves and jacks. For emergency operation the electrically driven pump powers the "emergency" side of the valves and jacks. Check valves prevent excessive air loads from forcing the control surfaces from the selected setting. Pressure is maintained in the emergency accumulators by pressure switches which start the emergency pump when

stream. The brakes are normally operated by electrically controlled hydraulic jacks, served by an engine-driven pump, and may be extended to any position from closed to open. In emergency a manual control allows them to be closed by air loads. A hydraulic accumulator, capable of providing two brake-applications, is an additional emergency measure. At medium and high engine r.p.m. the brakes take 2 sec to open and about 1 sec to close, and at idling r.p.m. about 6 sec to open and 3 sec to close.

Both the fin and the tailplane have a 35-degree sweepback, and the tailplane is set at a 10-degree dihedral angle. The elevators are statically balanced and, like the tailplane, are of straightforward

Complementary to the main sectional drawing overleaf, this sketch shows the ducting and other installations to particular advantage.



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the accumulator pressure drops below 2,700 lb/sq in and stop the pump when pressure is restored to 3,000 lb/sq in. Changeover from normal to emergency operation is effected by pressure switches and two by-pass valves which are energized when normal pressure drops below 900 lb/sq in. Subsequent transfer from "emergency" back to "normal" occurs automatically if pressure is lost in the emergency system, or may be effected manually by operating a "reset" switch in the cockpit. The pilot is warned of emergency operation by a red light.

The pilot's control column serves merely to open the selector valves at the jacks, the actual control-surface movement being caused, as we have said, solely by hydraulic power. Thus it has been necessary to incorporate "artificial feel" systems to oppose pilot effort, transmit "feel" to the pilot, and impose neutralizing forces on the stick. Briefly, normal stick loads resulting from the application of g are provided through a bobweight in the tailplane and elevator linkage, and acting in conjunction with leaf springs on each side of the tailplane selector valve lever. Aileron air loads are simulated through spring-loaded struts which apply forces to the stick in proportion to the degree of stick deflection from neutral.

Lateral and fore-and-aft trim is adjusted by changing the neutral position of the control-stick and the rudder has an electrically actuated trim-tab. Alternative lateral and longitudinal trim controls are provided.

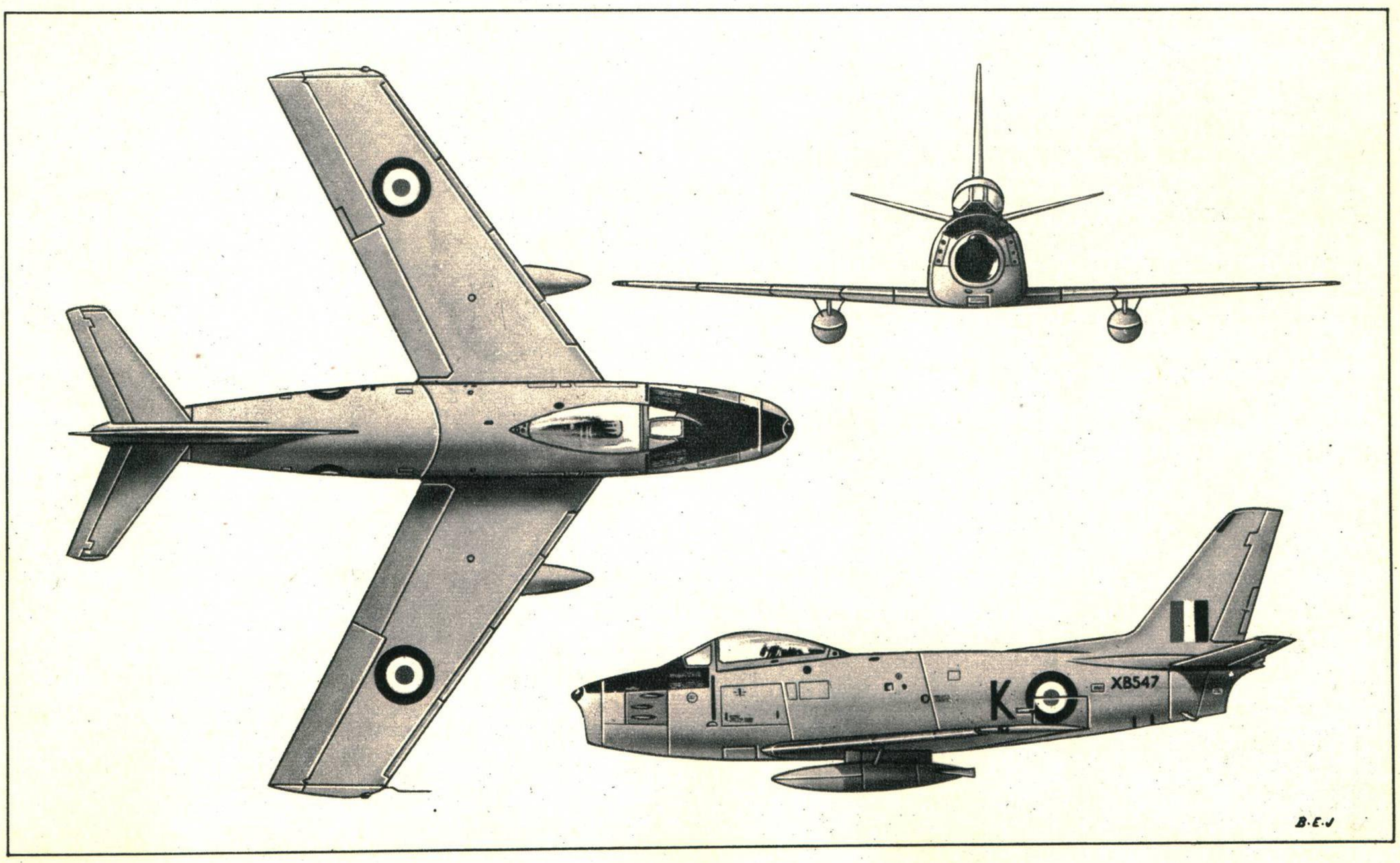
Mounted on the grip of the control column are the following controls: lateral and longitudinal trim switch; bomb release and rocket-firing switch; gun trigger; radar range-finder target selector switch; and nosewheel steering engaging switch—items which give a clue to the Sabre's elaborate equipment. Before describing the purely military items, however, it is desirable to examine the power plant, tankage and other installations.

Engine Installation.—The power-plant location and ducting arrangements will be best understood by referring to the drawings. The standard F-86E has a General Electric J-47 turbojet, characterized by a 12-stage axial compressor, eight combustion chambers and a single-stage turbine. As already noted, the power unit can be laid bare for inspection or removal by dividing the fuselage. There is a two-circuit, Edison-type fire-detector and indicating system which operates in either the forward or aft engine compart-

F-86E SABRE
General Electric J-47 turbojet

Span	37.1 ft
Length	37.5 ft
Height	14.7 ft
Sweepback (25 per cent chord line)	35 deg
Aspect ratio	4.785
Aerofoil section	N.A.C.A. 0012-64 Mod.
Gross wing area	287.9 sq ft
Area of speed brakes	8.6 sq ft
Total fuel	562 gal
Gross weight (with drop-tanks)	16,480 lb (approx.)
,, ,, (without drop-tanks)	14,640 lb (approx.)
Empty weight (equipped)	10,950 lb

General arrangement of F-86E Sabre, showing Royal Air Force insignia.



F86D-
'Flight' silouette

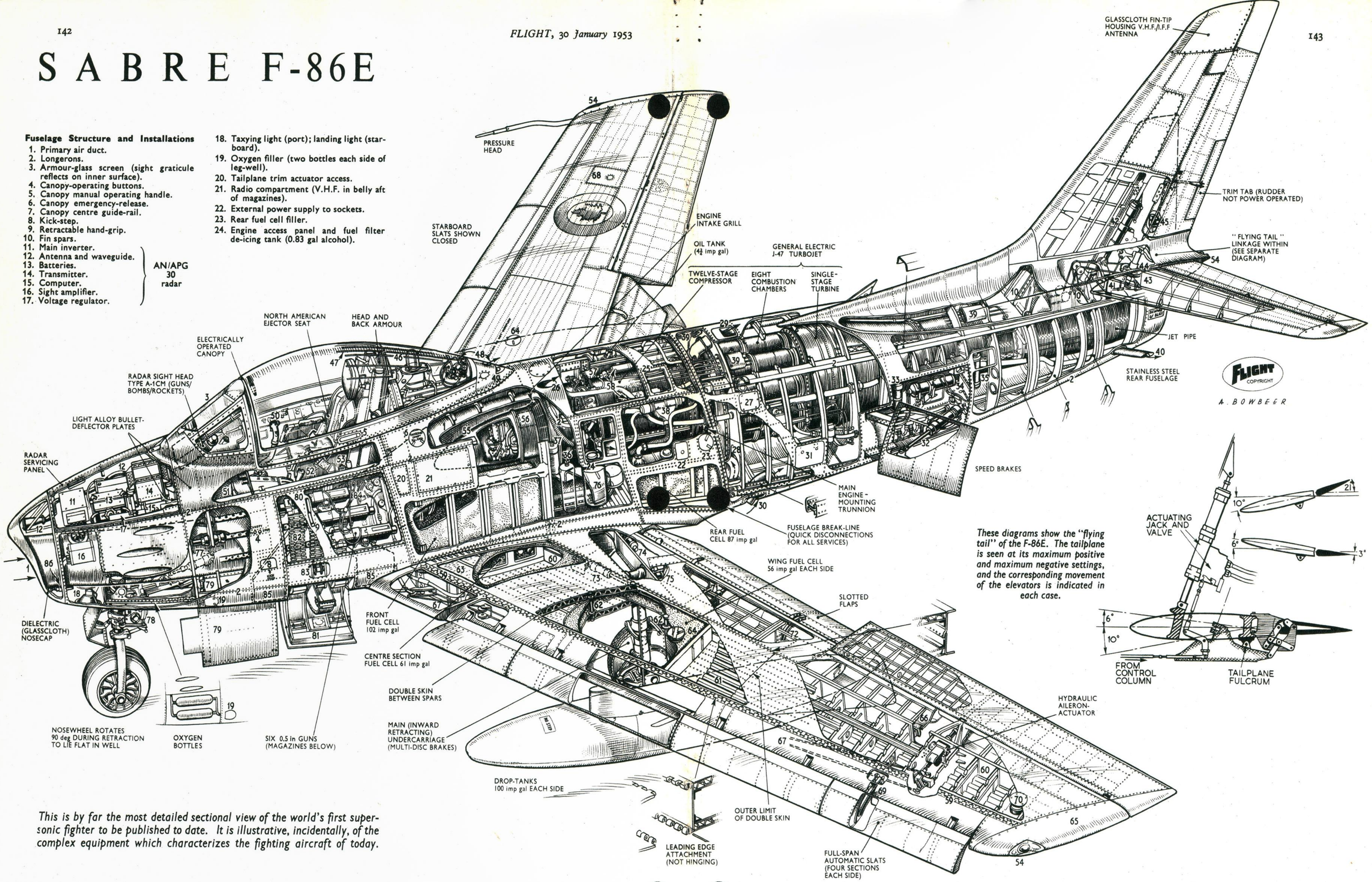
SABRE F-86E

Fuselage Structure and Installations

1. Primary air duct.
2. Longerons.
3. Armour-glass screen (sight graticule reflects on inner surface).
4. Canopy-operating buttons.
5. Canopy manual operating handle.
6. Canopy emergency-release.
7. Canopy centre guide-rail.
8. Kick-step.
9. Retractable hand-grip.
10. Fin spars.
11. Main inverter.
12. Antenna and waveguide.
13. Batteries.
14. Transmitter.
15. Computer.
16. Sight amplifier.
17. Voltage regulator.

AN/APG 30 radar

18. Taxying light (port); landing light (starboard).
19. Oxygen filler (two bottles each side of leg-well).
20. Tailplane trim actuator access.
21. Radio compartment (V.H.F. in belly aft of magazines).
22. External power supply to sockets.
23. Rear fuel cell filler.
24. Engine access panel and fuel filter de-icing tank (0.83 gal alcohol).



This is by far the most detailed sectional view of the world's first supersonic fighter to be published to date. It is illustrative, incidentally, of the complex equipment which characterizes the fighting aircraft of today.

These diagrams show the "flying tail" of the F-86E. The tailplane is seen at its maximum positive and maximum negative settings, and the corresponding movement of the elevators is indicated in each case.

25. Control-surface cable adjustment access.
26. Hot outlet from air-conditioning unit.
27. Igniter plug access.
28. Compressor section ventilation air intake.
29. Compressor section ventilation air outlet.
30. Rear fuselage ventilation air intake.
31. Ground fire-fighting access; data case; power control emergency hydraulic pump.
32. Speed-brake actuating jack.
33. Emergency control reservoir.
34. Emergency hydraulic accumulator.
35. Power control compensator.
36. Power control normal accumulator.
37. Power control normal reservoir.
38. Heat exchanger (cockpit air-conditioning system).
39. Control-surface cable-duct.
40. Fuel-tank vent.
41. Tailplane front spar moved by (42).
42. Tailplane actuator jack.
43. Tailplane rear spar (hinged).
44. Rudder control quadrant.
45. Tab-actuating motor.
46. Radio compass (type ARN-6) loop antenna.
47. Radio compass sense antenna.
48. Cockpit pressure regulator and outlet.
49. Upward identification light.
50. Control column.
51. Port rudder-pedal.
52. Engine-power control.
53. Anti-g [illegible].
54. Navigation [illegible]ghts.

Engine

55. Nose cone (engine auxiliaries within).
56. Starter/generator.
57. Engine steady and guide-rail.
58. Ignition units.

Wing Structure and Installations

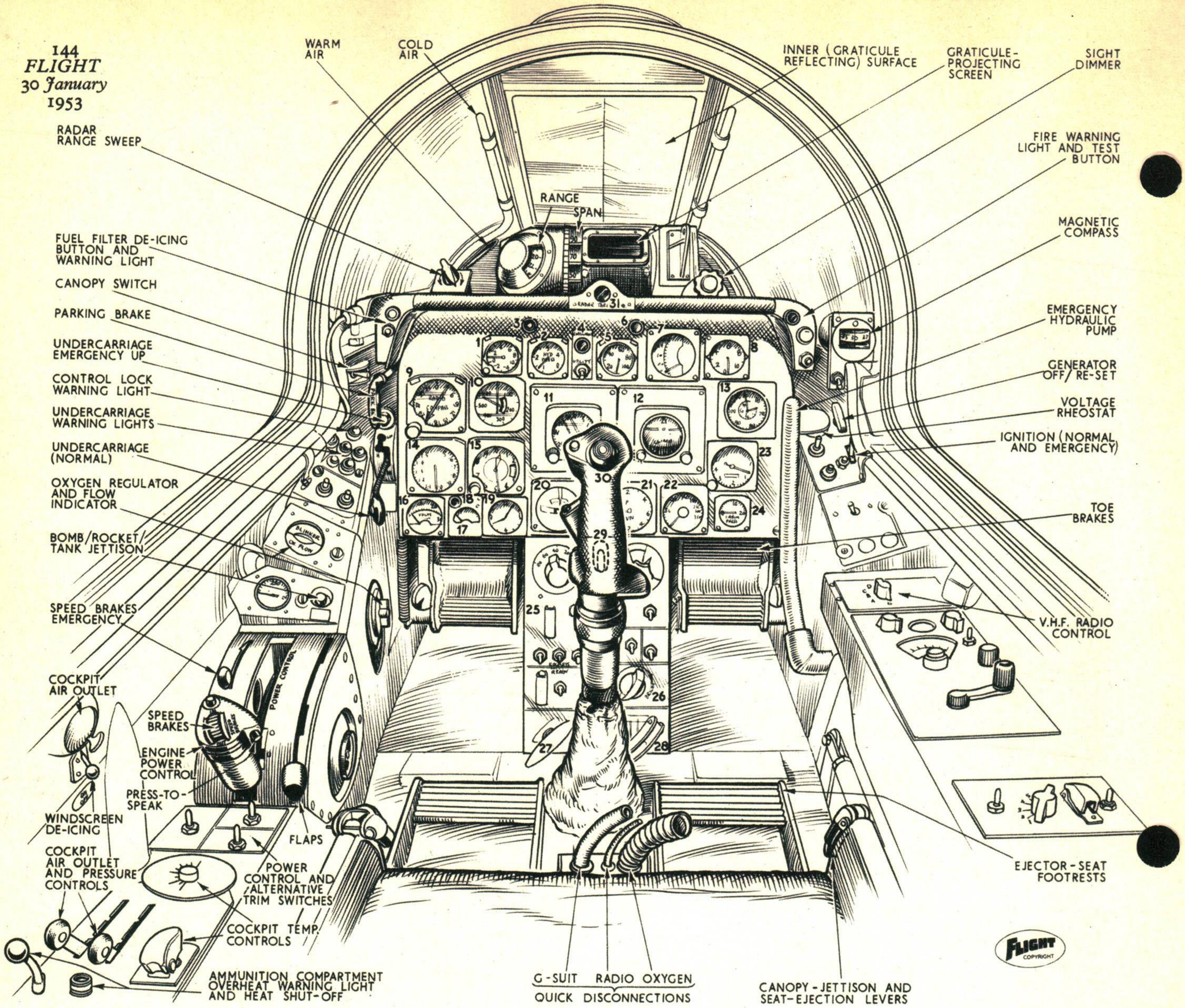
59. Front spar.
60. Rear spar.
61. Corrugations between double skin.
62. Constructional posts bolted through fuel cell.
63. Glasscloth liner (anti-chafe and bullet deflector).
64. Fuel fillers.
65. Moulded wing-tip.
66. Irving balanced ailerons.
67. Aileron control cables.
68. Aileron actuator access.
69. Slat roller and guide-rail assemblies.
70. Gyrosyn compass flux unit.
71. Flap actuating motor and flexible co-ordinating shaft.
72. Flap roller-and-guide-rail assemblies.

Undercarriage Units

73. Mainwheel operating jack.
74. Uplock cylinder.
75. Downlock cylinder.
76. Wheel-well with raised portion for brake drum.
77. Nosewheel operating jack (under air-duct).
78. Steer/damp unit (nosewheel steers 23 deg each side).
79. Nosewheel door and jack.

Armament

80. Gun access panel.
81. Magazine door/entry step.
82. Flexible belt-guides.
83. Feed boosters.
84. Gun-heating cables.
85. Spent case and link compartments.
86. Camera gun.



1. Accelerometer.
2. Hydraulic pressure.
3. Instrument power selector.
4. Emergency hydraulic warning light and selector switch.
5. Oil pressure.
6. Neutral-trim indicator light.
7. Jet-pipe temperature.
8. Fuel pressure.
9. Radio compass.
10. Air speed.
11. Gyrosyn compass.
12. Attitude.
13. Tachometer.
14. Machmeter.
15. Height.
16. Volts.
17. Amperes.
18. Generator warning light.
19. Clock.
20. Turn and slip.
21. Rate of climb.
22. Fuel contents.
23. Fuel flow.
24. Cockpit pressure.
25. Armament selector panel.
26. Panel lights.
27. Canopy de-clutch.
28. Emergency hydraulic selector.
29. Control lock (on panel).
30. Control column, carrying:—
    Fore/aft/lateral trim;
    Gun-firing trigger;
    Bomb/rocket firing button;
    Nosewheel-steering engagement.
31. Radar target-indicator.

The F-86E cockpit and its equipment and instrumentation. This diagram is of particular interest in relation to F/O. Seitz's flying-notes (p. 146):

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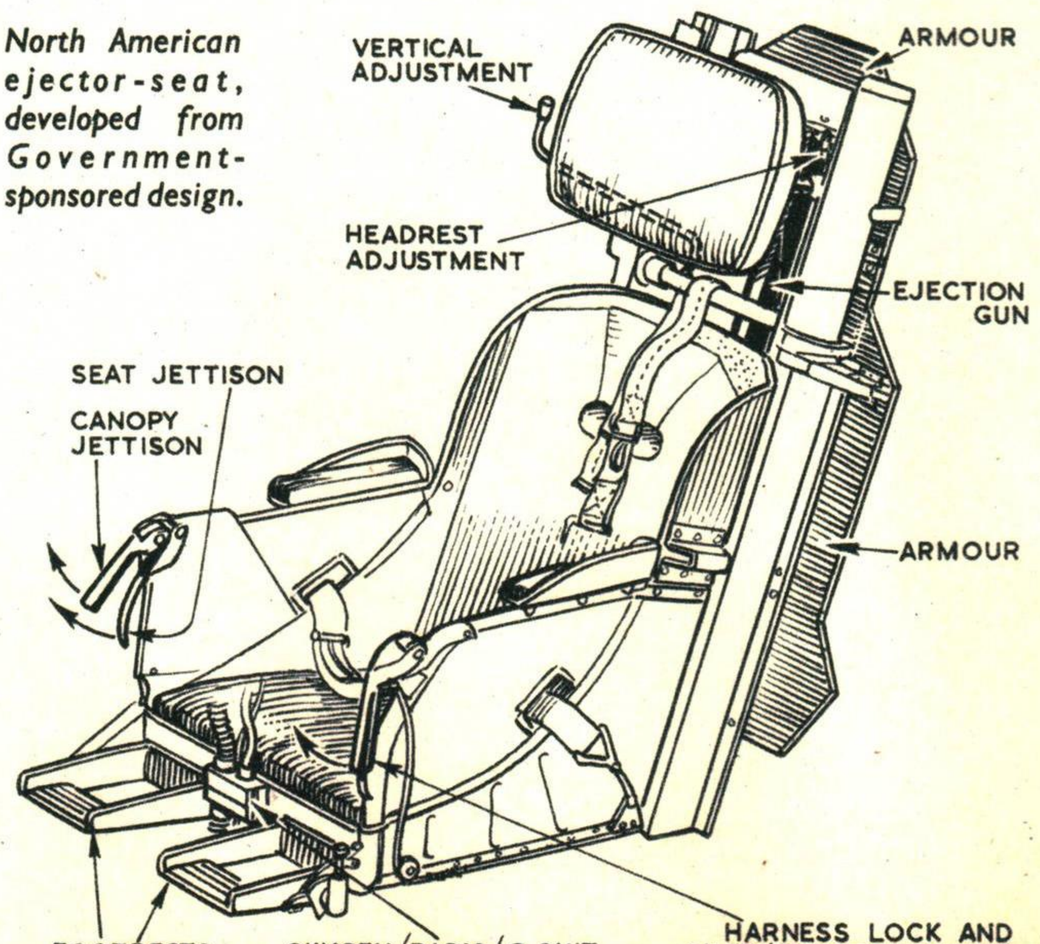
ment or in both. Nineteen thermocouple detector units are distributed throughout the engine and its compartment.

Fuel is contained in five self-sealing tanks, one in each wing, one in the centre-section, and two above it, one behind the other. The tank bays are lined with glass-cloth backing boards to protect the tanks from chafing and improve resistance to gunfire. Fuel is delivered to the turbojet from the centre-section tank, which in turn is fed from all the other internal tanks by gravity. To supplement the gravity flow from the rear tank there is a transfer pump which automatically functions when the fuel level in the centre-section tank drops below approximately 46 gallons.

Supplementary fuel is carried in two jettisonable under-wing tanks, each of 100 gallons capacity, from which the fuel is forced by compressed air to the forward fuselage tank when the quantity of fuel in that tank drops by four gallons. Experimentally, the under-wing tanks have been fitted with probes for the probe-and-drogue system developed by Flight Refuelling, Ltd.

On the later Canadair-built Sabres the "liquidometer" type of fuel-content system is replaced by a "liquidensitometer" type, in which the fuel-quantity gauge indicates the total internal fuel supply in pounds, as against gallons. This system has the merit of automatically compensating for changes in fuel density, so that a

North American ejector-seat, developed from Government-sponsored design.



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true reading is given regardless of the type of fuel used, or fuel expansion or contraction.

Other Services and Equipment.—The heating, ventilating and pressurizing systems utilize air tapped from the final stage of the turbojet compressor and provide cockpit air-conditioning, pressurizing, windscreen anti-icing and ammunition-bay heating. Below 12,000ft the cockpit is not pressurized, but at greater heights pressurizing air is delivered from the compressor through conditioning valves and circulates and increases in pressure until the differential reaches 2.75 lb/sq in or 5 lb/sq in, depending on the setting chosen by the pilot and the altitude of the aircraft. Pressure in excess of these differentials is relieved through a regulator. If additional heat is required this is automatically supplied by an electric cockpit heater. Warming of the ammunition bay is thermostatically controlled and a cockpit light gives warning of unsafe heat. The oxygen system is of low-pressure type, capable of supplying oxygen for about 4 hr at a height of 25,000ft.

The windscreen is defrosted by heated cockpit air which is led through three outlets. Perforated tubes along the windscreen and canopy tracks direct engine-compressor air for supplementary canopy defrosting. De-icing of the windscreen is achieved by circulating engine-compressor air between the outer screen and the armour glass. There is an air heater which provides additional warmth automatically when necessary.

A 28-volt system, powered by a 400 amp hr generator, provides electric current, and a 24 volt, 34 amp hr storage battery serves as a standby.

The Sabre is the first fighter fully described in this journal in which anti-g-suit equipment is standard. This equipment consists of a pressure-regulating valve, a suit-attachment fitting, connecting hose, a quick-disconnector block on the pilot's seat (a safety measure in the event of emergency ejection), and tubing to the turbojet compressor. Compressed air is delivered to the anti-g bladders through the pressure-regulating valve, which starts to function at a predetermined g loading, depending on the setting of a special valve marked "Hi" and "Lo." At accelerations above 1.75g (with the valve set to Hi or Lo) this valve opens, causing inflation of the suit. For every increment of g a corresponding pressure of 1 lb/sq in (Lo) or 1.5 lb/sq in (Hi) is exerted in the suit. Momentary inflation—which can lessen fatigue on a long flight—is possible by means of a button on the valve.

The cockpit instruments are classified in three groups—"flight," "engine" and "miscellaneous"—and their dispositions are seen in one of our drawings.

The pilot's ejection seat has fixed armrests and footrests, and an adjustable headrest. Just forward of the armrests are two handgrips which are hinged to pull up to a vertical position prior to ejection. The trigger lever is located beneath the right handgrip and is normally protected by a guard and safety wire. When the grip is pulled up preparatory to ejection, the safety wire is broken and the trigger projects from its guard. On ejection the anti-g-suit connection, oxygen hose, microphone and headset leads are automatically disconnected at a junction box fixed to the seat beneath the footrests. When the trigger is operated the shoulder harness locks, the canopy seal deflates, the canopy ejector fires, and, finally, the ejection-seat catapult fires.

On the back of the seat is an "inertia-reel" for the shoulder harness, which automatically locks the harness at accelerations of over 2.2g.

Armament.—The standard built-in armament of the F-86E is six guns of 0.5in calibre, disposed in two banks of three guns each in the sides of the forward fuselage, with the ammunition magazines below. The belts are assisted from the magazines by booster motors. As is well known, the remarkable success of the Sabre in Korea is largely attributable to the fire-control system which, although details are still secret, is known to embody an automatic range-determining device which tells the pilot when he is "on target" and is used in conjunction with an "all-purpose" sight, developed for use with guns, bombs and rockets.

Built in to the under-surfaces of each wing are fittings for carriers suitable for bombs ranging from 100 lb to 1,000 lb in weight or anti-personnel bomb clusters. Alternatively, eight zero-length rocket attachments, providing mounting for sixteen 5in projectiles, can be installed.

The electronic equipment consists of a V.H.F. transmitter/receiver, radio compass, I.F.F., and the fire-control gear.

So much for the Sabre in detail.

Canadair's Part.—We have already acknowledged the design and constructional skill of North American Aviation, Inc., the parent company responsible, and it remains to place on record the part played by Canadian and British companies in the vast Sabre programme. Finally—and we take special pleasure in this—we print some flying impressions from the pen of one of the North Luffenham Sabre pilots. We begin with the Canadair story.

Having decided in 1949 that the Sabre was the logical choice for its first-line fighter force, the R.C.A.F. called upon Canadair, Ltd., of Montreal, as the one Canadian manufacturer capable of turning out these machines in a hurry. The original contract—for a hundred F-86s—was signed in August, 1949, and specified that the first aircraft should be delivered twelve months later. Canadair's history of meeting contract dates merely repeated itself when the first F-86 rolled off the assembly line on schedule.

A leader in civil-aircraft construction at that time, Canadair took readily to its new and vital task of building the swept-wing supersonic fighters, and the original order of 100 was soon increased substantially.

The first Canadair-built F-86 was of the A series as specified in the contract; but almost as soon as this model went into production the R.C.A.F. decided to adopt the later series E. Thus, only one F-86A was completed in Canada.

Soon after the Sabre had gone into production, a call came from the United States Air Force for sixty machines to bolster its fighter strength for the Korean war. These have all been delivered and it is known that a number of them have seen action in Korea. Then, when Canada decided to equip and send a 12-squadron air division to Europe as one of its contributions to NATO, the F-86 was chosen as the standard fighter.

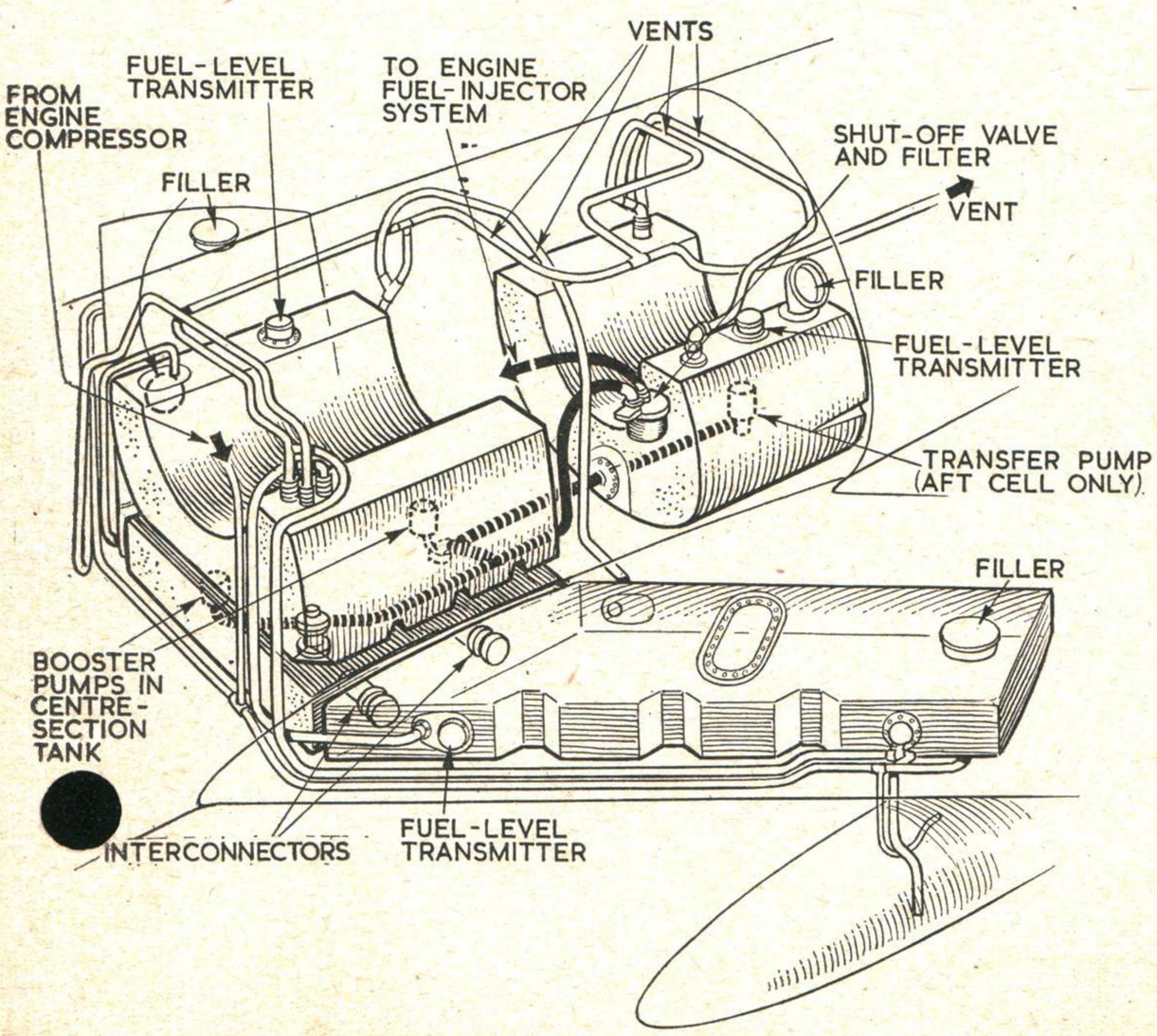
The six R.C.A.F. squadrons overseas—three at North Luffenham and three at Gros Tenquin, France—are, with the exception of a few American units, the only NATO forces equipped with fighters of this calibre. This situation will soon be rectified, however, for the Royal Air Force is receiving between 300 and 400 Canadair-built Sabres, the engines and other equipment for which are supplied by America under Mutual Aid arrangements.

All Sabres manufactured by Canadair have conformed to the North American design and have been kept up to date on all modifications. At a particular point in the programme the airframe will be adapted to take the Orenda turbojet, soon to be delivered in quantity by A. V. Roe Canada, Ltd. Canadair engineers are still busy making the necessary adaptations to fit the Orenda into the production airframe, for the Canadian engine is considerably larger than the General Electric J-47, and production of Orenda-Sabres will not be under way for some months.

By Spring, the Canadair plant at Cartierville, outside Montreal, will contain more than 2,500,000 sq ft of covered factory space—almost 60 acres—and surrounding it there will remain approximately 40 acres available for expansion. In addition, there is a three-strip airfield operated by the Department of Transport.

The main portion of the present Plant No. 1 was built in 1942 after a survey of the latest production layouts in North America. Since that time, Canadair has added considerably to the original space and is today augmenting it with another 200,000 sq ft. Plant No. 2 was operated during the war by the Noorduyn Company for the manufacture of Harvards, and is leased from the Crown by Canadair. Plant No. 3 is a repair depot at nearby Dorval Airport, while Plant No. 4 is the recently acquired space (165,000 sq ft) formerly occupied by the aircraft division of Canadian Car and Foundry. Additions to the already immense

The fuel tanks of the Sabre are "tailor-made," filling every available cubic inch. The cut-outs in the wing tanks are for the slat guides.



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floor space are the two warehouses covering a total of 274,000 sq ft. In addition, there are a number of hangars and other buildings which can be described as small only in a relative sense.

At present, Plant No. 1 handles production of the Sabre and houses the machine tools, presses and other equipment necessary to its manufacture.

All assembly operations on the Sabre—minor, major and final—are performed at Plant No. 2, which has been described as one of the most efficient aircraft assembly plants in the world. In all, almost 1,250,000 sq ft of space are now devoted to the F-86.

Additional to the 2½ million-odd sq ft of space soon to be occupied, approximately a quarter as much is being utilized by sub-contractors to carry on their portion of the work.

In Plant No. 1 is the machine shop and the sheet-metal and tooling departments. Milling machines, lathes and grinders of every type and size necessary for aircraft production are housed here. There are more than sixty milling machines of various types—universal, horizontal and vertical—ranging from three to 60 h.p. The machine shop includes 35 engine lathes and 24 turret lathes, as well as grinders of every description.

While many processes at Canadair are standard for large industrial concerns, others are of special interest. Two impressive machines in the sheet-metal working department are the 5,000-ton and 4,000-ton hydraulic presses.

One large machine which never fails to catch the eye of the visitor is the Hufford stretch former of 150-ton capacity which grips a sheet of aluminium up to 66×144in at either end, stretches it slightly to remove all resiliency, then wraps it over a die. This department also contains smaller stretch formers as well as 21 punch presses, providing a complete range.

Then there are such specialized departments as that for heat-treatment, with furnace capacity for all types of dural and steel and copper furnace-brazing; the plastic shop, with all facilities for die-making in rezolin, plaster and kirksite; and the welding department—with a complete range of flash, spot, seam and tack welding.

Many machines—i.e., the stretch-former and skin-millers—were purchased expressly for F-86 production, while others were acquired to duplicate similar machines already in the shops in order to ensure the proposed production rate.

To keep these and the many other machines in operation requires a large labour force, and at present more than 11,000 are employed. Of these, about 3,500 work directly on the F-86.

Thus, a great company is playing its part in Canada.

Sabres in Britain.—Here, too, famous names are linked with the Sabre programme, notably that of the Bristol Aeroplane Co., Ltd. In recent years this company has followed a policy of progressive expansion of its Canadian interests and it is a particularly happy arrangement, therefore, that it should be responsible for the repair and overhaul of all Canadair Sabres now in Gt. Britain.

Negotiations between Bristols and Canadair, Ltd., regarding overhaul arrangements had begun some months before the first R.C.A.F. Sabres arrived in England—in November, 1951. The first approach had been made in August of that year by, appropriately, an old friend of Bristols, Mr. Tim Sims, who piloted a Bristol Freighter on its 41,000-mile demonstration tour through North and South America in 1946. To acquire the necessary technical background, a team of Bristol engineers and technicians was sent to the Canadair plant towards the end of 1951. They were joined by Mr. R. Ellison, the company's assistant chief test pilot, who happened to be in Canada at that time.

From the first moment of contact between personnel of the two organizations, it was clear that there was an admirable spirit of co-operation on both sides—a cordial relationship which has been maintained ever since and has greatly facilitated progress.

In North Luffenham's early days as an R.C.A.F. base, the volume of work was comparatively light, but it was clear that as further squadrons arrived and the wing approached its complete establishment, the demands on the Bristol service organization would be considerably increased. Work was divided into two categories—repairs which could be handled on site, and extensive overhauls which, it was decided, would be handled at Filton. As the first preparatory step, a Sabre was sent to Filton for examination by servicing personnel, shortly after the first squadron's arrival at North Luffenham. A little later, two Bristol test pilots went to North Luffenham to take a conversion course.

The first Sabre to be serviced was accepted on March 10th, 1952, by the team of Bristol technicians at the North Luffenham base, and within 15 days was once again airworthy. Since then, work on site and at Filton has increased steadily, ranging from minor to extensive repairs.

The major overhaul period for Sabre aircraft in this country has yet to be decided. When it is settled, a regular flow of work may be expected. The Bristol company is well equipped for the task. The supply of spares from the material base at Langar is prompt and comprehensive, and a large stock, ranging from small parts to major components, has been established near Bristol, under the supervision of an R.C.A.F. Supplies Officer. In addition, a Canadair representative is stationed permanently at Filton.

The company is also responsible for the overhaul of the Sabres' J-47 turbojets. Planning and shop layout is proceeding in the Engine Division and deliveries of engines for overhaul are expected to begin in the spring of 1953.

The task being undertaken by Airwork, Ltd., at Speke entails the storage, rapid servicing and modification of Sabres on behalf of Canadair, Ltd., and to the instructions of the various Wings of the R.C.A.F. stationed in Europe. Technical liaison is controlled from the R.C.A.F. Station at Langar, which unit is also responsible for Nos. 2, 3 and 4 Wings in Europe.

The wide experience of the Airwork organization has enabled it to undertake tasks of this nature without much inconvenience, and it is hoped that early this year the whole organization at Liverpool will be working smoothly. Most of the staff to be employed at Liverpool will be engaged from local sources, with the exception of a few key personnel transferred to Speke from other of the company's branches. A large number of Airwork personnel have been to Canada for training during the past year and the experience they gained there is proving invaluable.

Airwork will also have working parties positioned with the various Wings in Europe—an arrangement which is unique in entailing the employment of large numbers of British personnel in European countries, working in close collaboration with the Fighting Services. An R.C.A.F. ferry service for aircraft spares is being organized from this country and will eventually be flown daily. The inconvenience of working in Europe will be considerably lessened by the regularity of this air lift.

The arrival of Sabres at Speke has roused considerable interest in the Liverpool area; these are, in fact, the first jet fighters seen at close quarters in that district. Whether the local residents will continue to put up with their noise without comment remains to be seen, but most of them look upon the development as a useful one for the neighbourhood.

The Ministry of Civil Aviation has been most helpful in getting this scheme under way at Speke and without its help such rapid progress could not have been made. Airwork hopes that in building up this useful unit as a contribution to NATO it will be able to extend these activities to many of a similar nature now being contemplated by the United Nations Forces in Europe.

Care and maintenance of the electronic equipment of R.C.A.F. Sabres in Europe has been entrusted to Vicom and Co., Ltd., of Bourn, Cambs, and Redifon Ltd. is producing a special F-86E flight simulator to R.C.A.F. specifications.

FLYING THE SABRE

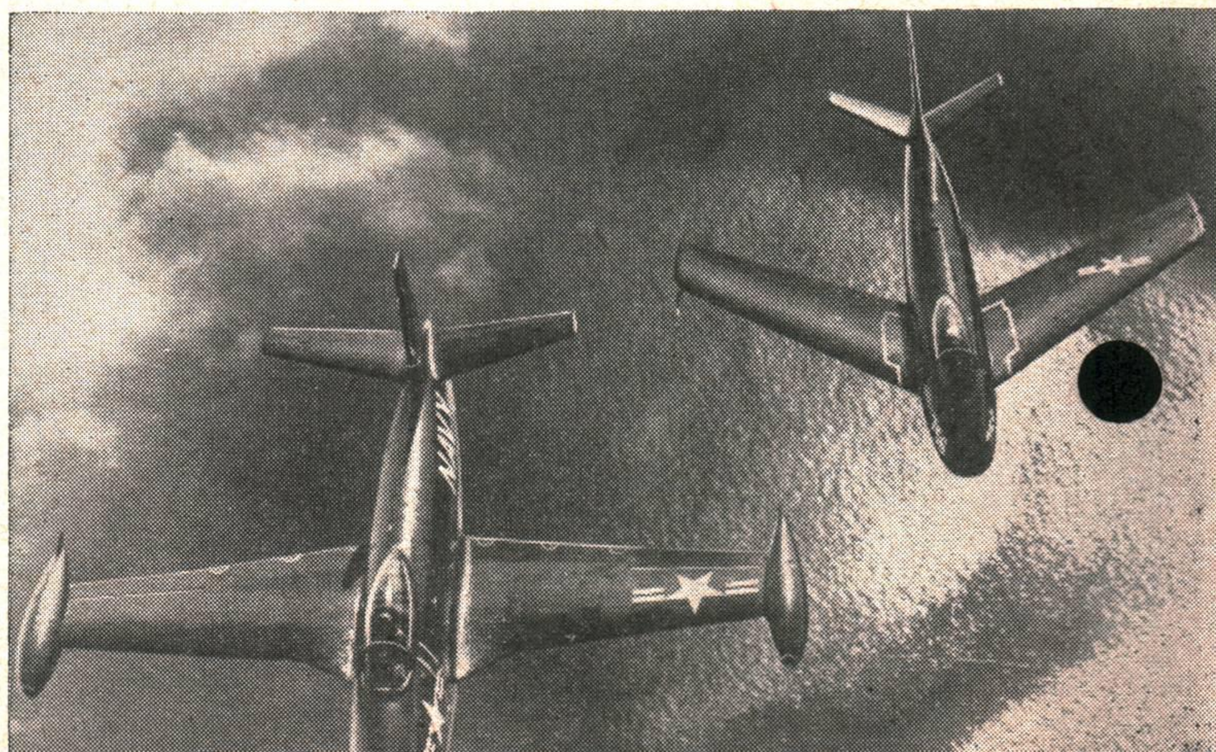
By F/O E. A. Seitz, 439 Fighter Squadron, R.C.A.F.

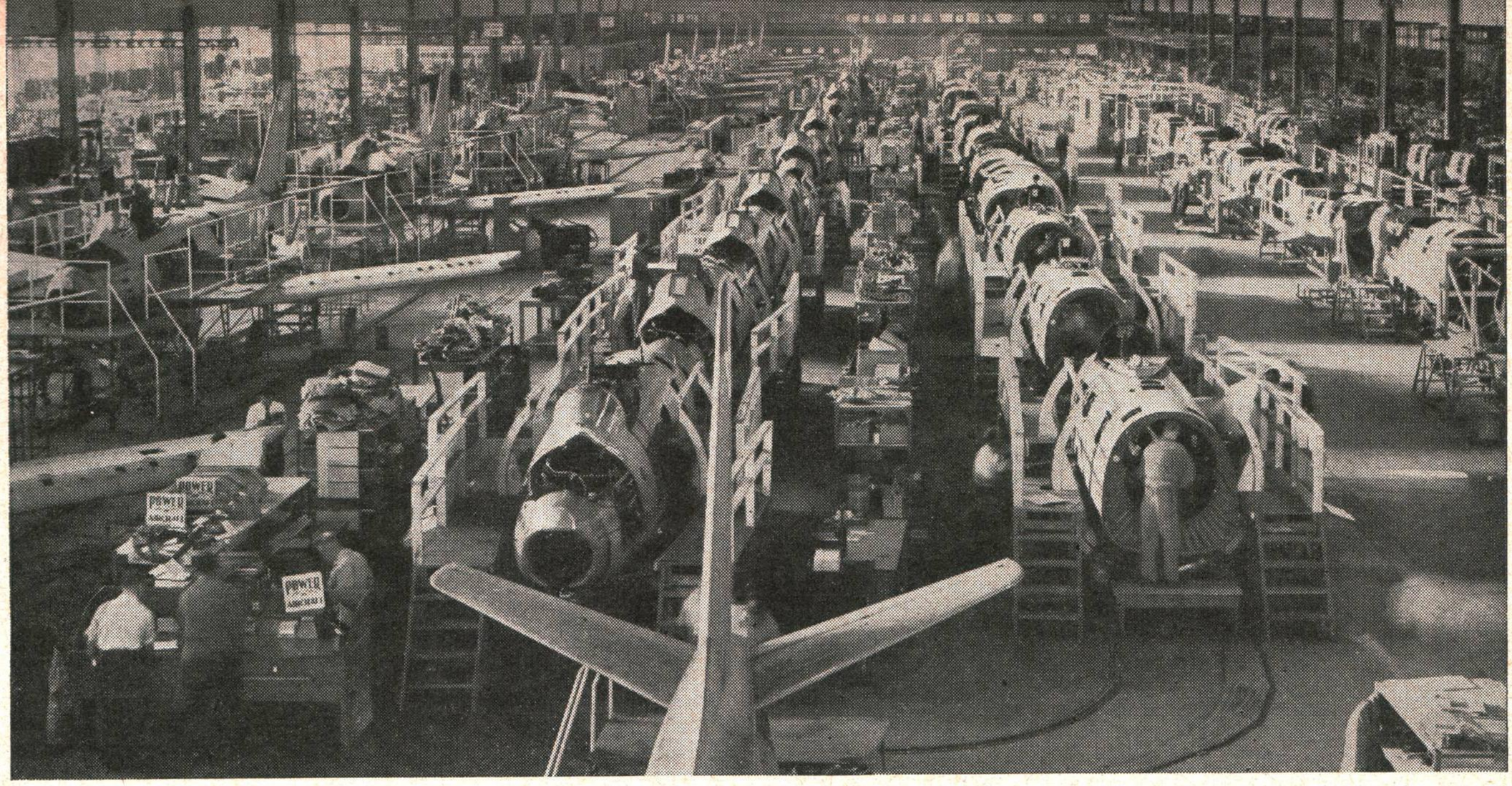
ON first sight the Sabre appears to be a rather large aircraft for a fighter, but its dimensions are actually slightly less than those of a Meteor. Its undercarriage is long and is largely responsible for the impression of hugeness.

Entering the cockpit and strapping into the safety harness is probably the most awkward operation of an entire flight. Being strapped, one finds that the cockpit is quite roomy lengthwise but rather cramped for a pilot with broad shoulders.

Just behind either elbow is an impressive array of circuit breakers, as practically every electrical circuit is represented. The console on the right side of the cockpit carries the controls for navigation lights, emergency ignition switch, generator reset switch, master switch, and the battery starter switch. On the left console are the drop-tank on/off handle, cabin pressure and heat controls, flap lever, and throttle. Incorporated on the throttle are,

A straight-wing deck-landing FJ-1 Fury (left) with an FJ-2 (also known as Fury). The FJ-2 is a "navalized" version of the Sabre which, as related on an earlier page, was itself descended from the FJ-1.





Assembly of North American F-86E Sabres in the No. 2 Plant of Canadair, Ltd., which has been leased from the Crown.

SABRE . . .

among other things, the speed brake selector switch and the microphone button.

The instrument panel is set well forward and although the blind-flying group is not standardized, as is the case with the majority of British aircraft, all dials are easy to see. Not so the armament controls, however, which are on a pedestal below the main panel and are directly in front of the control column. They can be reached only with the safety harness unlocked.

The adjustable rudder-pedals, with brakes incorporated, are set in tunnels on either side of the armament pedestal. On the upper extremity of the stick, which is of the pistol-grip type, one finds five buttons, or switches, the lowest of which actuates the nosewheel steering. Above this is the gun trigger, operated by the index finger. On top of the stick is the bomb-release and rocket-firing button, as well as the elevator and aileron trim button, both of which are operated by the thumb.

The flight controls of the Sabre, with the exception of the rudder, are completely hydraulically operated. This means that they are irreversible, and therefore cannot flutter at high speeds. As a result it was necessary to install an artificial feel system, and it is therefore obvious that the controls feel exactly the same regardless of air speed. Pilots soon become accustomed to this idiosyncrasy and generally prefer this type of control to any other. With it the normal type of trim tab cannot be used, of course, so the use of trim merely moves the centralization of the "feel system". This is accomplished simply by pressing the trim button in the desired direction with the thumb. The rudder, which is manual, has a normal electric trim tab, is actuated by a spring-loaded switch on the left console.

Once started, the Sabre is one of the pleasantest and easiest machines of its class to handle, both on the ground and in the air. Very little power and practically no brake are required in taxying. For take-off the airplane is held on its brakes and the throttle is opened to 80 per cent r.p.m. Upon release of brakes the throttle is advanced to fully-open position and the machine accelerates—rather slowly as compared to a Meteor—to its unsticking speed of about 125 kt. It does not unstick cleanly, but rather wallows into the air with an extremely high angle of attack. However, it picks up speed rapidly after wheels and flaps are raised. Roughly 30 deg of flap is used to take off, as the run would be considerably increased without flap.

If held down until its ideal climbing speed, in the region of 400 kt, is reached, the Sabre has a rate of climb of better than 7,000 ft/min. Although this is less than that of some other contemporary fighters, the zoom climb is very impressive.

In its element at high speeds this swept-back fighter easily cruises at Mach numbers appreciably higher than those at which a straight-wing machine would become uncontrollable. At 30,000ft and above, a clean F-86 can comfortably reach Mach 0.9 or better at high cruising power. At this height a certain degree of compressibility can be reached in a shallow dive at an indicated Mach reading of 0.96; however, since the pilot has complete elevator control at all speeds, the slight buffeting encountered causes no concern. In a vertical dive, and at near-sonic speed, either wing will tend to drop until it can no longer be corrected by aileron. At this point, if the pilot has sufficient altitude, he may continue the dive until he breaks through the sound barrier, or pull out normally with or without the use of speed brakes. If supersonic speed is reached it becomes noticeable by a decrease in buffeting and better control. However, most pilots will admit that at this point Mother Earth is rushing up at a somewhat disconcerting speed and one must give full attention to recovering from the dive. As velocity decreases, the buffeting increases and then stops completely at about Mach 0.97.

There is no indication in the cockpit of the controversial "boom" which is associated with supersonic flight, although it is known that this sound—very like an explosion—is heard only in the immediate vicinity of the spot at which the aircraft was pointed in its dive.

Elevator control with the "all-flying tailplane" is completely normal at all speeds. With this type of control the tailplane moves with the elevator in a ratio of roughly 4:1. For example, when the stick is pulled back the tailplane will change its angle of incidence 12 deg., to a 3 deg movement of the elevator, in a combined motion. The majority of aircraft capable of supersonic flight are equipped with this type of control.

The ailerons are extremely sensitive: as an example, it is practically impossible to do one maximum-rate roll, for the machine is almost completely round its roll by the time the stick is moved through its full travel. At very low speeds the lateral control is not so sensitive, although it is satisfactory right up to the stall.

Naturally, with such ease of control the Sabre is a very fine aerobatic airplane. Rolls require no effort other than use of ailerons. Like all fast aircraft, it must be flown around a loop, starting with a $2\frac{1}{2}$-4g pull. In a loop one notices the artificial feel of the controls more than in any other manoeuvre. In other aircraft one generally eases off on stick pressure on top of a loop, but in the Sabre it is necessary to increase stick pressure at the lower speed on top to give the tailplane a greater angle of incidence.

A factor which gives pilots confidence in the machine and banishes a natural reluctance to get into unusual positions in the Sabre is the ejection seat. It is the type found in many other American aircraft in that it does not have the protecting curtain which is pulled over the face, as in the Martin-Baker type. The seat is fired by a trigger on the right side of the seat.

Another feature thoroughly approved of by the pilots is the anti-g suit. This is nothing more than an inflatable girdle, inflated by air drawn from the compressor. It cuts in at approximately 2gs and increases the pilot's tolerance anywhere from 1 to $2\frac{1}{2}$gs. One of its greatest advantages is that it cuts down fatigue. The suit has an inflatable bladder on the stomach, one on either thigh, and one on either calf, and when wearing it the pilot does not have to tense his muscles when pulling g. Indeed, the benefits of the suit are nullified if one's muscles are bunched up.

On rejoining the pattern, speed brakes are generally used to slow down the machine to circuit speed. The pattern and approach are similar to those of most other jet fighters, and the final turn is completed at about 140 kt. It should be brought over the fence at 125 kt and it will touch down smoothly with a very nose-high attitude. The nose can be kept up for deceleration, but, of course, brakes are much more effective if a short run is necessary. The Sabre could be landed in 1,200 yd, but for comfortable operation 2,000 yd are required. Full flap is always used for landing as the float period would otherwise be quite long.

All in all, the F-86 Sabre is a very pleasant and easy airplane to fly and fulfils its operational rôle well. It is admitted, though, that more power is required to increase its effectiveness at high altitudes.

WIT AND WISDOM

—at Boscombe Down's Dinner to the Industry

THE annual "Contractors Dinner" given at Boscombe Down by the Aeroplane and Armament Experimental Establishment was, as briefly mentioned last week, the enjoyable affair which we have come to expect in each of many years. Some of those present—A. and A.E.E. officers, Government officials, manufacturers, test pilots and so forth —are portrayed, gaily if a little unkindly, by cartoonist Fred May on the opposite page.

A. Cdre. A. H. Wheeler, O.B.E. (Air Commodore Commanding), proposing "The Guests," extended a welcome and regretted that accommodation prevented more friends from being invited. He went on to remark that aviation, like other industries, had its worries (to this Sir Frederick Handley Page added a loud "hear hear!"). Fifty years ago manufacturers worried first of all about whether their aircraft would fly, and secondly if they would sell. Now it was a moral certainty that they would fly, and they were usually sold in advance—in spite of what the A. and A.E.E. said. This led him to question the value of Boscombe.

A. Cdre. Wheeler then went on to refer to Boscombe's "new management" and also to the arrival of Colonel Stark of the United States Air Force. The work of the Establishment was pleasant and interesting, but the staff were called upon to be critics, and he recalled Disraeli's dictum that critics were "the men who had failed" in the arts they criticized. At Boscombe there were few who had tried to design and build aircraft. The staff did, however, try to stick to the Air Ministry terms of reference and confine their criticisms to those things which concerned them. The air commodore did not believe that even "the illustrious heads of the industry" could really criticize their own products. If the Boscombe pilots were clumsy and inept, well, it was probable that the aircraft would later get that sort of treatment anyway. There was no doubt that Boscombe had a real duty to do : it represented at least the average of Air Force users. A. Cdre. Wheeler added that the Controllers of Supplies (Air) did not like the wrong answers, and he went on to talk of a certain Captain Bousicault who, being the most stupid officer on Napoleon's staff, was nevertheless most useful in having all orders tried out on him before they were issued.

Sir Frederick Handley Page, C.B.E., began his response by quoting the well-known hymn "The strife is o'er, the battle done, now is the Victor's triumph won." He then went on to refer to the sonic barrier and the shapes of aircraft wings—"some people have gone back to childhood days and imitated the paper dart." More thought should be given to the other end of the speed scale —to going slower at take-off and when landing. Here Sir Frederick recalled the remarkable record of the H.P. Hannibal of pre-war days. He concluded his speech with some entertaining speculations on what might happen were the aircraft industry to be nationalized.

An additional speaker was Sir Harry Garner, K.B.E., C.B., M.A., who is to retire from the post of Chief Scientist, Ministry of Supply, on February 23rd next. He referred to his associations with Air Ministry, Ministry of Aircraft Production and Ministry of Supply, and remarked that he was the only one to have been the head of all three establishments, M.A.E.E., Felixstowe; A.F.E.E., Ringway; and A. and A.E.E., Boscombe. He recalled memories of the first trials of the Mosquito bomber and of a first attempt at a rocket-assisted take-off with a Stirling. He thought that aircraft today were "more exciting." There were "nearly as many shapes as designers of aircraft," and no one could say what the ultimate shape would be. Sir Harry did not agree that piloted aircraft would go out in the next few years : it would be many years before that happened.

Air Marshal Sir John Boothman K.B.E., C.B., D.F.C., Controller of Supplies (Air), M.o.S, proposed "The Aircraft Industry." "What," he asked "is the industry? The two thousand or so firms having A.I.D. approval, or the main aircraft and engine manufacturers?" He would love to see a nationalized aircraft industry if it meant Sir Frederick Handley Page and Sir Roy Dobson sitting as Civil Servants in the same office. He did not think that flying was getting more exciting, and he defined the modern gas turbine as "an infinitely expensive and infinitely complicated blow-lamp." He also described it as having "a point at one end and a hole at the other," surrounded with a mass of bought-out equipment to the cost of which the manufacturers added their 400 per cent. In a more serious vein, Sir John said that the nation owed a debt to the aircraft industry and one that would become increasingly important in the future. Finally, he paid a tribute to Mr. George Edwards, who was to reply to the toast.

Mr. Hugh Burroughes, F.R.Ae.S. (director, Hawker Siddeley Group) told in a brief speech of the great admiration for the way in which Air Marshal Boothman was doing his job—a tough assignment. He recalled the C.S.(A)'s Schneider Cup success, and concluded by adding a further tribute to the work of Mr. George Edwards, Vickers-Armstrong aircraft chief designer.

The final speech, in reply to the toast of "The Aircraft Industry," drew from Mr. Edwards the remark that chief designers were shy, retiring and, by and large, inarticulate. During the last few months the aviation business had taken on a new look. In his opinion, "neither the utmost curvature in place of straight lines nor a job in which you cannot tell the body from the wing is the best"—he believed in the good old British compromise. It might be wondered if some people were building aircraft to fill space in the national Press rather than for the Air Force. Would it not be cheaper just to provide the handouts and save the price of the aircraft—in fact, to replace P.R.U. by P.R.O.?

Turning to the subject of exports, he said that production alone did not sell aircraft; a most intensive and determined sales effort was necessary, and it had to be made clear to potential buyers that what the manufacturer would in fact undertake to do was very different from what his foreign competitors said he would do. The British aircraft industry could make aircraft; some companies could match American production, and in some circumstances, with the right size of order, could do much better.

Mr. Edwards went on to say that designers could get nowhere without test pilots to prove the machinery and to do work which was a vital link in the whole process. To get the right answer meant taking risks, and he wished to pay the highest and most sincere tribute to the test pilots. Mr. Edwards also spoke of the work Sir John Boothman was doing, and added that a company must never cut down on development and research. So far as testing was concerned, companies in the industry were growing up and doing more and more to accept responsibility for the testing of their aircraft. They had to fight the temptation to think things were better than they really were. Finally, Mr. Edwards said that British designers hung together, and he was personally proud to take part in this sort of co-operation. It was as it should be.

FORTHCOMING EVENTS

Jan.	30.	Junior Institution of Engineers: "Metal Spinning," by R. R. Baskerville.
Jan.	31.	S.L.A.E. (London): Lecture.
Jan.	31.	Closing date for England-Christchurch (N.Z.) Race Entries.
Feb.	7.	Helicopter Association: Discussion on Standards of Maintenance, and Requirements for Helicopter Engineers' Licences. Papers by Members of the A.R.B. and S.L.A.E.
Feb.	7.	British Interplanetary Society: "Limiting Performance of Rocket Motors," by W. N. Neat, B.A., A.F.R.Ae.S.
Feb.	9.	Institute of Transport: Brancker Memorial Lecture: "The Influence of Military Aviation on Civil Air Transport," by Sir Frederick Handley Page, C.B.E.
Feb.	11.	British Institution of Radio Engineers: "Modern Trends in Communication Materials," by L. A. Thomas, B.Sc., F.Inst.P.
Feb.	11.	R.Ae.S. Graduates' and Students' Section: "Production of Prototype Aircraft," by W. Thorn.
Feb.	12.	R.Ae.S. Section Lecture: "Integral Construction and its Effect on Production Methods," by E. Dixie Keen, B.Sc. (Eng.).
Feb.	14.	British Interplanetary Society (Birmingham): "Rocket Test-bed Instrumentation," by J. Venn, B.Sc.
Feb.	17.	Birmingham and District Aviation Club: Film Show.
Feb.	17.	R.Ae.S. Section Lecture: "Recent Developments in Gliding," by A. H. Yates, B.Sc.(Hons.), A.F.R.Ae.S.
Feb.	18.	Aircraft Recognition Society: Meeting: Guest Speaker, Peter G. Masefield, M.A.(Eng.), F.R.Ae.S.
Feb.	20.	Institute of Navigation: "Navigation and the Operation of Jet Aircraft," by Capt. R. C. Alabaster, D.S.O., D.F.C.
Feb.	21.	British Interplanetary Society (Manchester): "Structural Problems of the Lunar Base," by P. L. Sowerby.
Feb.	24.	R.Ae.S. Graduates' and Students' Section: "Viscount Operations," by Capt. R. Rymer.
Feb.	25.	R.Ae.C.: Britannia Trophy Dinner.
Feb.	26.	Aerodrome Owners' Association: A.G.M. and Annual Dinner.
Feb.	26.	R.Ae.S.: "New Materials and Methods for Aircraft Structure," by H. J. Pollard, Wh. Ex., F.R.Ae.S.
Feb.	27.	A.T.A. Association: Annual Reunion Dinner.
Feb.	28.	S.L.A.E.: "Aircraft Fire-protection Equipment," by R. W. J. Cockram, A.M.I.E.E., A.I.Mech.E.
Mar.	6.	Helicopter Association: Discussion on Flight-testing Experiences: contribution by C. T. D. Hosegood, S/L. W. R. Gellatly and Capt. J. A. Cameron.
Mar.	7.	British Gliding Association: International Contest Victory Ball.

J. Bellay (82)

1953, that Canadair President J. G. Notman announced the delivery of the 500th Sabre, and the 1,000th machine was turned over to the RCAF on April 20, 1954.

•During the production run so far, a number of major modifications have been incorporated in the aircraft without noticeably retarding output. This includes the switch-over from the J-47 version to the Orenda-powered model, which took place during the past year.

Appropriate recognition of Canadair's achievement was taken April 20 at a ceremony held at the company's Cartierville plant, and attended by Minister of National Defence Brooke Claxton, Minister of Defence Production C. D. Howe, and Air Marshal C. R. Slemon, Chief of the Air Staff. The 1,000th Sabre was turned over to Defence Minister Claxton by Canadair

Canadair's 1000th Sabre

CANADA'S Aircraft Industry has been knocking out production aircraft and engines with such regularity during the past year that it came as no surprise recently when Canadair Limited announced the completion of its 1,000th Sabre. This figure represents a commendable production record, especially when one considers that when the Canadian Government placed the first order in August 1949, only 100 aircraft were involved.

And here are some other factors that should be considered when making note of Canadair's Sabre production record:

•The first production aircraft made its initial flight on August 9, 1950, just a year after the placing of the original order, and less than four years ago.

•Of the 1,000 Sabres now completed, 500 were constructed in the last twelve months. It was on April 8, 1953, that Canadair President J. G. Notman announced the delivery of the 500th Sabre, and the 1,000th machine was turned over to the RCAF on April 20, 1954.

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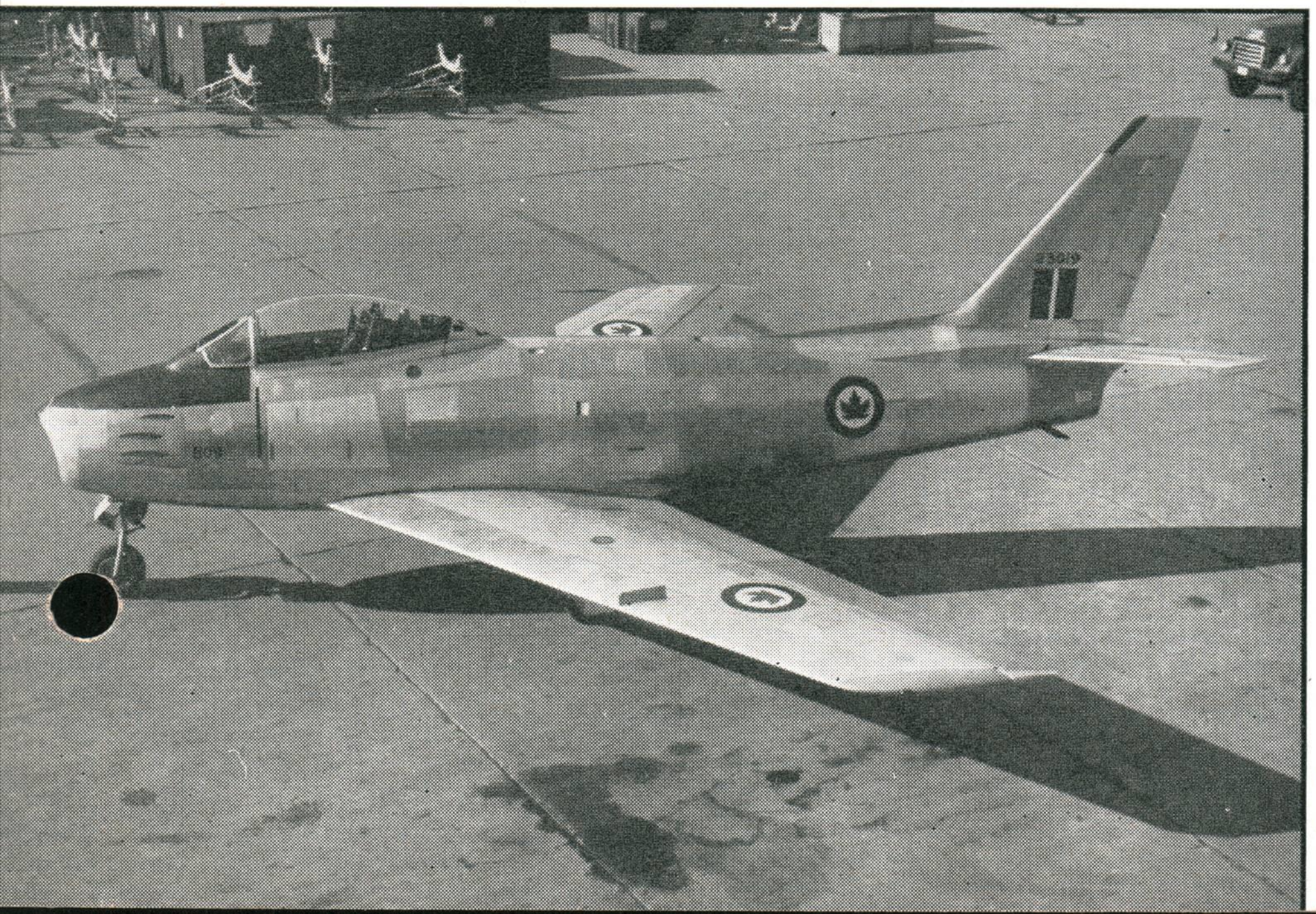
In Mr. Notman's comments prior to the presentation of the Sabre to Mr. Claxton, he warned: "It is an established fact that no airplane designed after 1939 saw service in the last war.



Top, L to R are: J. G. Notman, C. D. Howe, Brooke Claxton, A/M C. R. Slemon, F/L Fred Moore, and Canadair's A. J. Lilly. At left is one of first Sabre 5's, model now in production. Below, A/V/M A. L. James signs the 1000th Sabre. With him is Admiral L. B. Richardson, USN (Rtd), Canadair vice-chairman.

in the over-all effectiveness of the F-86."

commercial complexity

IN the commercial aircraft field increased speeds and operating heights are increasing complexity, just as they did to the military. A few years ago, pressurized cabins were a commercial rarity. Now all major airlines think nothing of fitting pressurization equipment, with its extra costs, weight, maintenance, systems, complications, and structural penalty. They fit it because it nets more dollars for the airline, in added altitude performance that paying passengers prefer.

Autopilots are another airline necessity that has been proven in practice. Yet today's automatic pilot is a weird maze of complexity compared to the simple gyros that Lawrence Sperry experimented with many years ago. That they pay off, however, was confirmed by Mr. Little of American Airlines when he said, "Speaking with reference to domestic air carrier DC-6's, I am of the opinion that a modern electronic pilot, with properly operating altitude control, will, under average weather conditions, keep the aircraft on the 'step'. Our experience has shown that you wind up with about a 10 mph speed advantage if you have a properly operating autopilot at a 300 mph speed."

The Right Combination: BOAC also confirmed the importance of keeping a transport aircraft at the right altitude, attitude and speed. On one particular route they estimated that flying 10 mph from the optimum meant a payload penalty of 700 to 800 lbs.—or several paying passengers.

This operational-effectiveness yardstick often gets forgotten during the early test flight stage of any new device. When the first test results are logged, and difficulty piles on difficulty, the device is promptly branded "complex" and unfit for use. This dogmatic approach fogs the picture and blinds the observer against a true appraisal of its future value.

Looking back, there is no doubt Dr. Alexander Graham Bell's "Aerial Experiment Association", had similar difficulties. When J. A. D. McCurdy, and others, were conducting their 1909 flights over the ice at Baddeck, Nova Scotia, they probably considered their 50 hp Glen Curtiss engine a complex and balky mechanism. According to the aviation history books, they had only one, and they transferred it from one airplane to another. Telegrams went back and forth between Baddeck and the Curtiss factory at Hammondsport, N.Y. on all manner of difficulties from overheating to effective oil distribution.

Yet from these early engines grew the modern aero-engine, which is far more complicated than its ancestors, though no one would have believed it possible in 1909. When viewed in the spotlight of history it is apparent that complexity has been marching forward in the footsteps of every new aeronautical development.

reliability the criterion

IT IS DURING this early era that complexity is forced to the forefront, and it immediately gets confused with reliability, or the lack of it. R. J. Norlund of Wright Air Development Centre Armament Laboratories struck the keynote when he said recently: "Complexity (of electronic equipment) is not important if we have reliability. If a black box performs day after day, never requiring disassembly or attention, it is a simple gadget (to the user), regardless of the wondrous jumble of tubes, capacitors, resistors, and what-not which may be inside."

In the first days of development, reliability is hard to come by. Every design is based on the previous knowledge of the designer. And as developments progress and do not stagnate, the designer just never has enough knowledge of the precise environmental operating conditions that his mechanism must live in, to be sure that it will be trouble-free.

For example, a particular aircraft designed for low altitude and slow speeds will have an infinitely varying pattern of forces from wing tip to wing tip and from nose to tail. These forces result in mixed patterns of vibration and pressure on the structure, and the engines and equipment in it. For example, a radio stowed adjacent to the engine will suffer one set of forces, while the same equipment placed in the rear of the fuselage will have an entirely different set. In another aircraft to the same specification the complex of forces may be entirely different. And when a high speed, high altitude aircraft is considered, a further maze of varying forces is applied.

Storehouse of Knowledge: In the Piper Cub type of aircraft today, the pressure and vibration patterns have been reduced to simple design rules established from previous environmental tests on a wide variety of similar aircraft. Thus the designer of the airframe and equipment already has a full storehouse of knowledge. He can design a reliable mechanism. The development era is short. The design is classed as simple.

On the extreme other end of the design scale is the supersonic, high altitude fighter. Compared to the Cub, a reading on true environmental conditions over a wide variety of similar aircraft is non-existent. The design must be schemed out using the best of lower altitude and speed data. In most cases this will prove inadequate. The actual environmental conditions throughout the aircraft will be different. One trouble follows another. Lacking adequate test data the designer reinforces here, duplicates there, with each change effecting something else. This is the cut-and-try of practical engineering. The development period may run into years. The design is branded as complex.

Missiles are probably the most complex piece of modern air machinery that is suffering from this lack of design data. One case occurred recently where a missile continually misfired. Initially the cause was unknown. By gradually piecing together the evidence the ignitor plug came under suspicion. A check of the precise environmental conditions that the ignitor had to work in was proposed. In four test firings, the ignitor suffered through a variety of accelerations ranging from 15 to 180 "g". Once these exact conditions were filtered out, then a shock-proof ignitor was developed. It reduced the acceleration to less than 2 "g" and promptly cured the trouble.

Governing Principle: Over the broad front of mechanical history this has been the general trend. The great British historian, Arnold J. Toynbee, in his monumental "Study of History", was examining the development of technique through the ages. In so doing he stumbled across the fact that there is, ". . . a principle by which technical progress is governed, which

(Continued on page 51)

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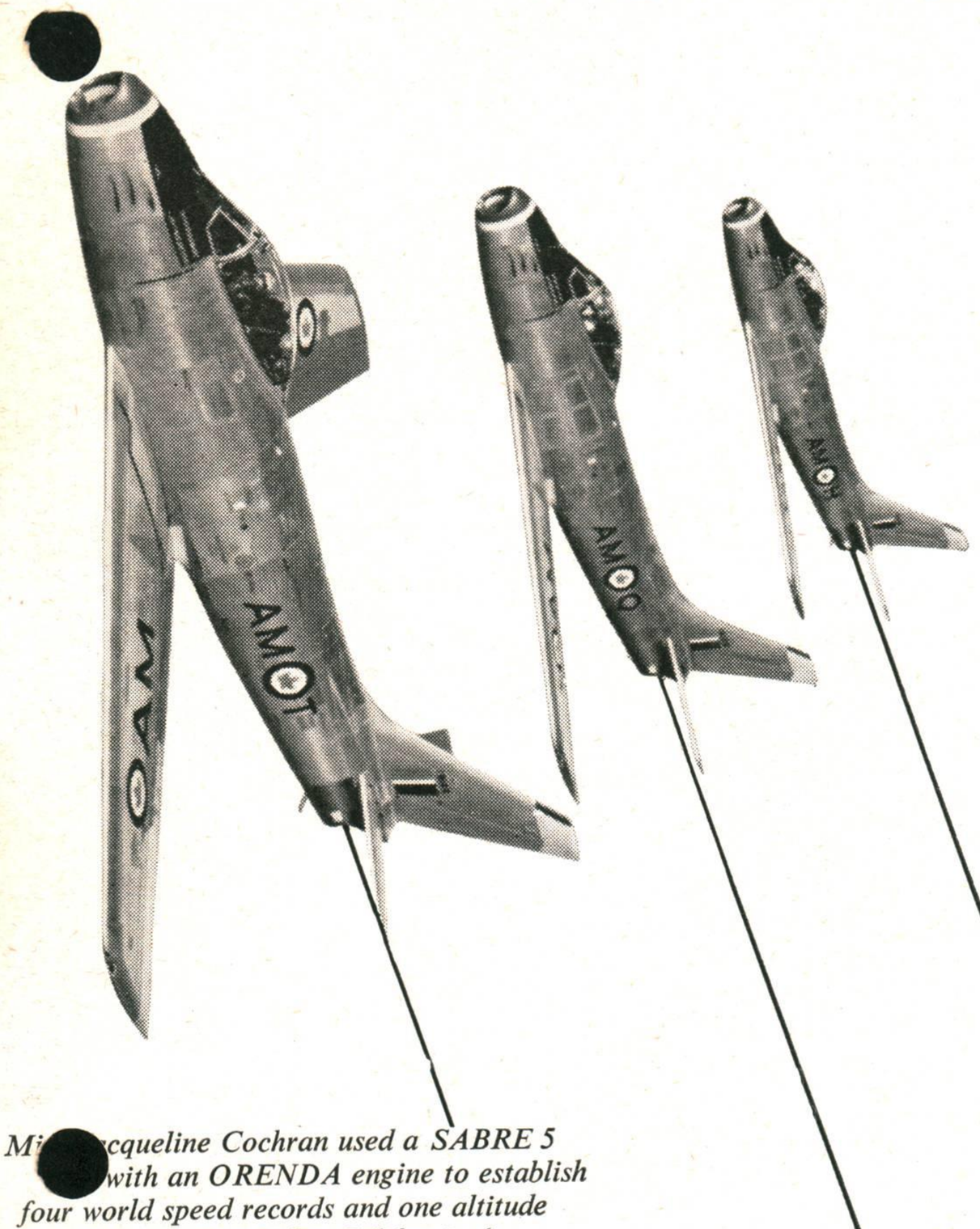
More **Power** *for the Sabre*

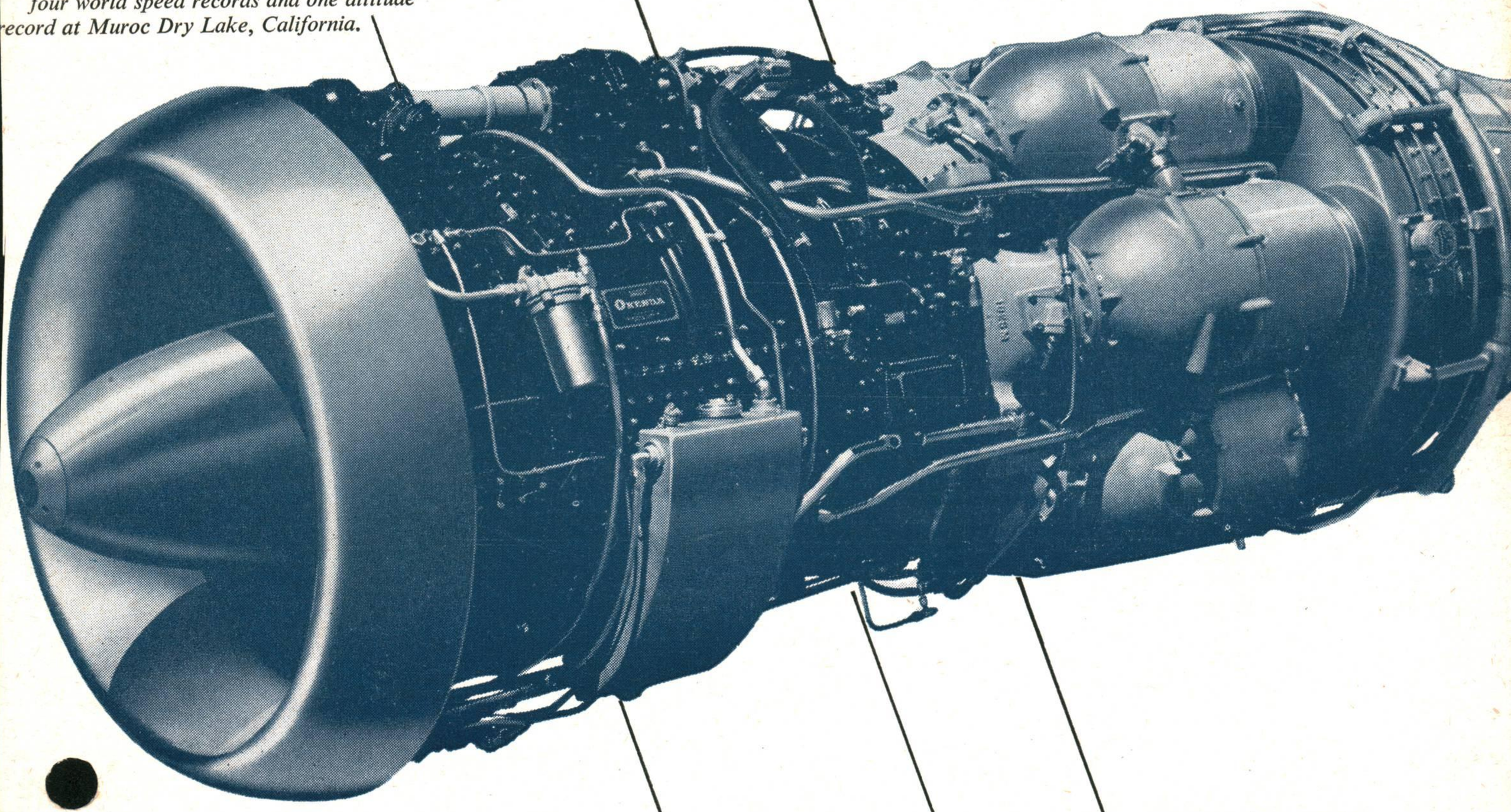


ORENDA jet engines built by AVRO Canada power all F-86-SABRE 5's for service with the R.C.A.F. The first squadron of these new higher-performance SABRES, destined for the fighter defence of Europe, will soon fly the Atlantic.

The ORENDA, which began with a basic power output of 6,500 lbs. thrust (equal to 12,000 h.p. at sea level at 600 M.P.H.), is being developed to deliver 7,500 lbs. and is capable of still further development. *The current production ORENDA makes the Canadair-built SABRE and AVRO Canada's own CF-100 the two most powerful fighters in service anywhere today.*

Twin ORENDAS recently powered an R.C.A.F. CF-100 to a new world's non-stop record for operational fighters—2,100 miles from Vancouver to North Bay in 3 hours, 50 minutes at 550 M.P.H.

Miss Jacqueline Cochran used a SABRE 5 with an ORENDA engine to establish four world speed records and one altitude record at Muroc Dry Lake, California.



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J. Bzilby 154

J. Beilby 155

1958—

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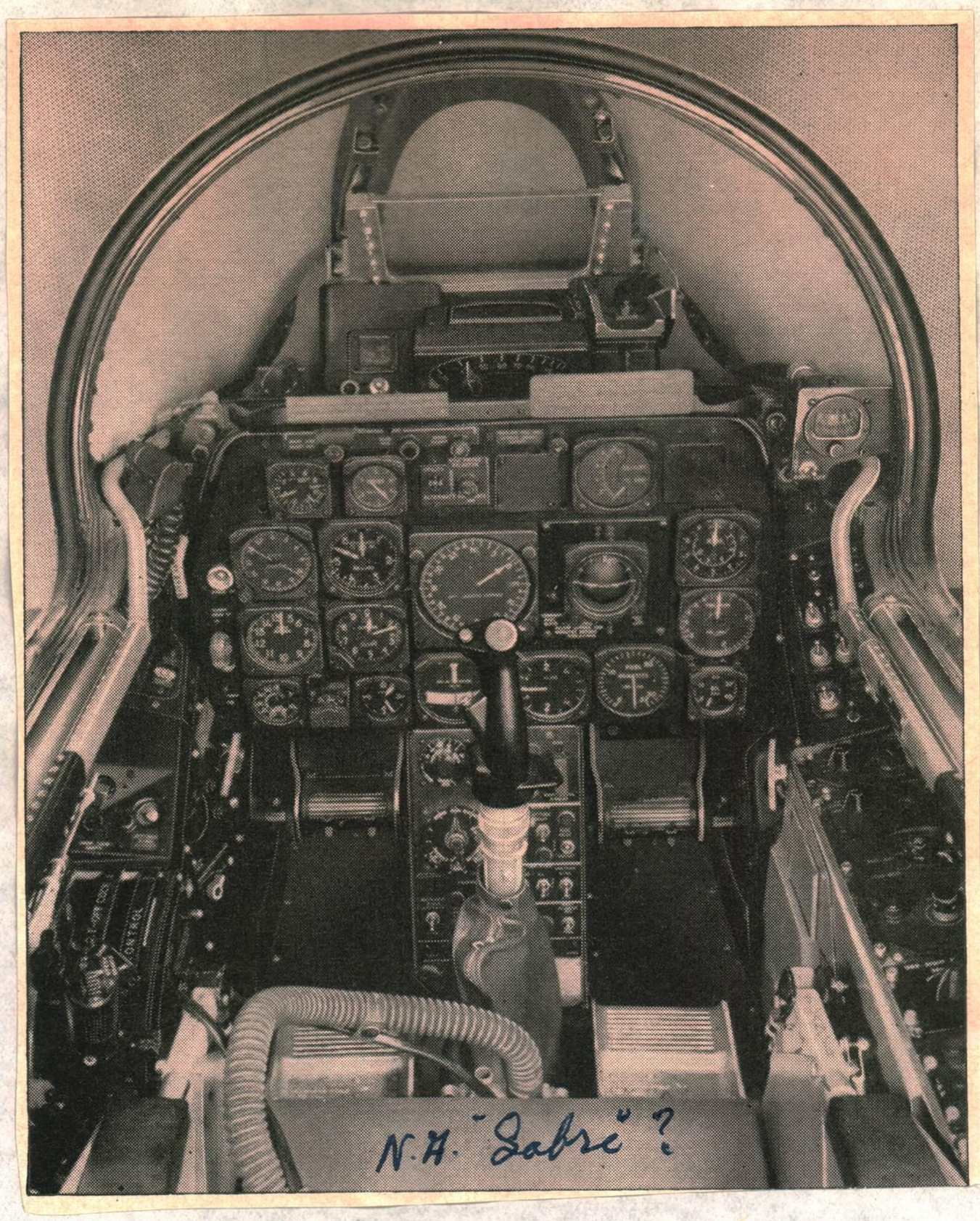
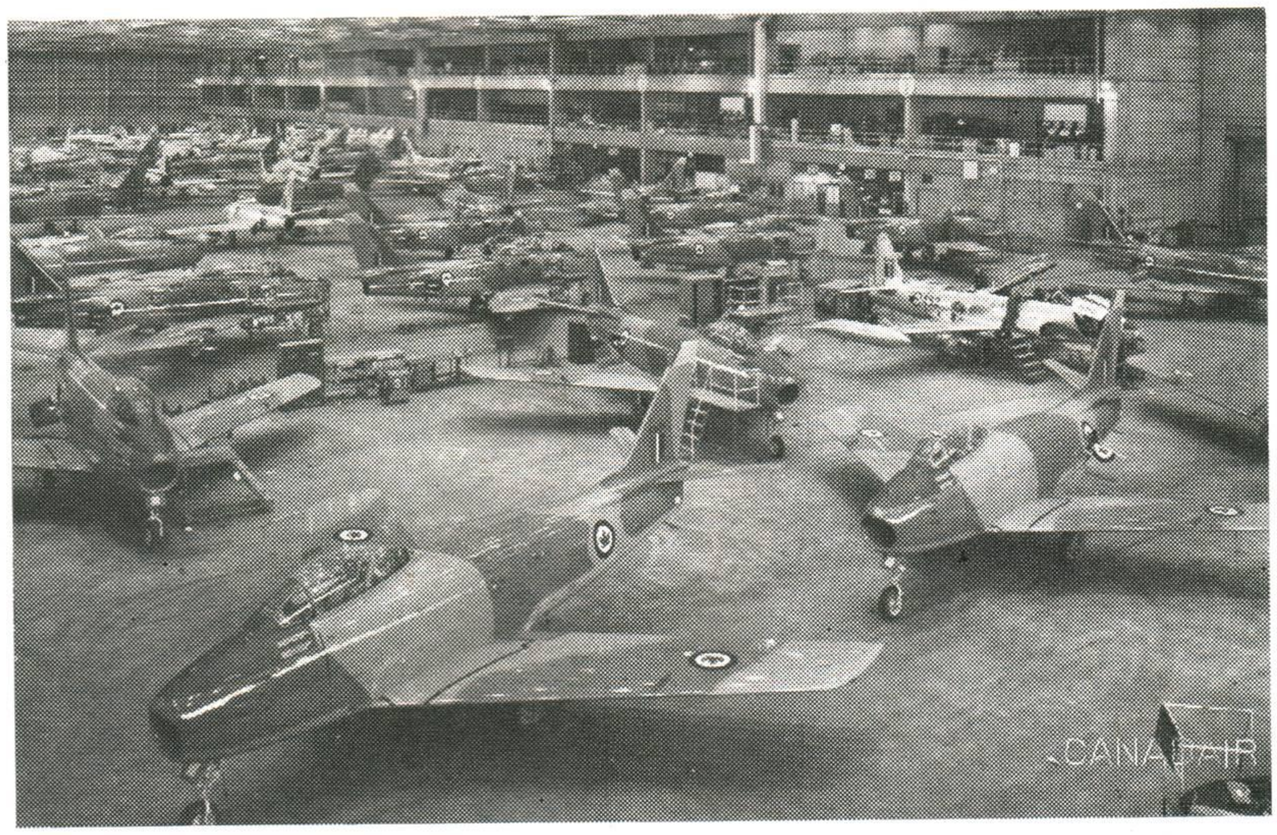


N.A. "Sabre"?

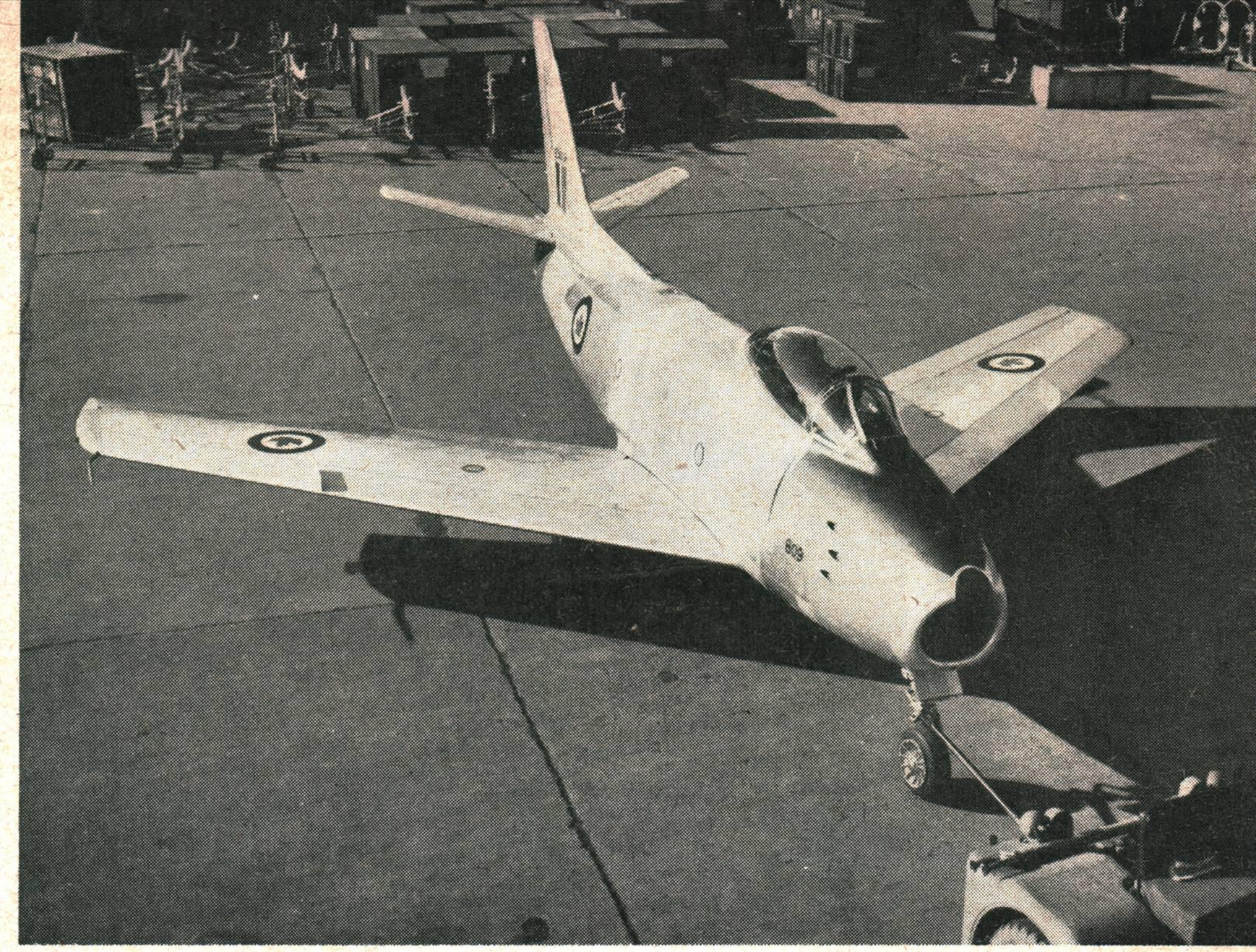
J. Beilby 158



COLORFUL SABRES: Crowded with Sabre 6's and T-33's is Canadair's big flight test hangar. Sabres wear the new camouflage scheme in which all aircraft of this type are now being finished. Scheme utilizes two shades of green on upper surfaces, and light blue underwing and belly. RCAF Sabres in Europe have flatter finish than evident above and also have Canadian ensign in place of the tri-color bar on the vertical fin. No squadron insignia are being permitted.

F. Bailey (74)

Sabre 5s from Canada



IN JULY, 1950, the Canadair company completed the first of an initial order of 100 F-86 Sabres for the R.C.A.F. When it was decided to send an Air Division to Europe the order was greatly increased, and further Sabres were supplied by Canadair to the U.S.A.F., which bought 60 for use in Korea, and to the R.A.F., which was allocated about 375 under the Millitary Aid Programme.

Production of the F-86E Sabre has now been completed by Canadair, nearly 800 having been built, and the company is now turning out the new Sabre Mk. 5, fitted with the Avro-Canada Orenda 14. Canadair designations for prototype and production Sabres are broken down as follows: Mk. 1, the first prototype, which was an F-86A; Mks. 2 and 4, production models of the F-86E—the Mk. 4 is the Sabre in general use, the R.A.F. having only three Mk. 2s: and the Mk. 3, which was the first Orenda prototype, and the aircraft in which Jacqueline Cochran broke the Women's Speed Record.

The planned output of Sabres at Canadair's Montreal factory was to be nearly 50 aircraft per month. The first Sabre 5s are due to reach the R.C.A.F. squadrons in Europe early in the New Year. It is probable that the present Sabre 4s will be taken out of service and returned to Canadair for modification to Sabre 5 standard.

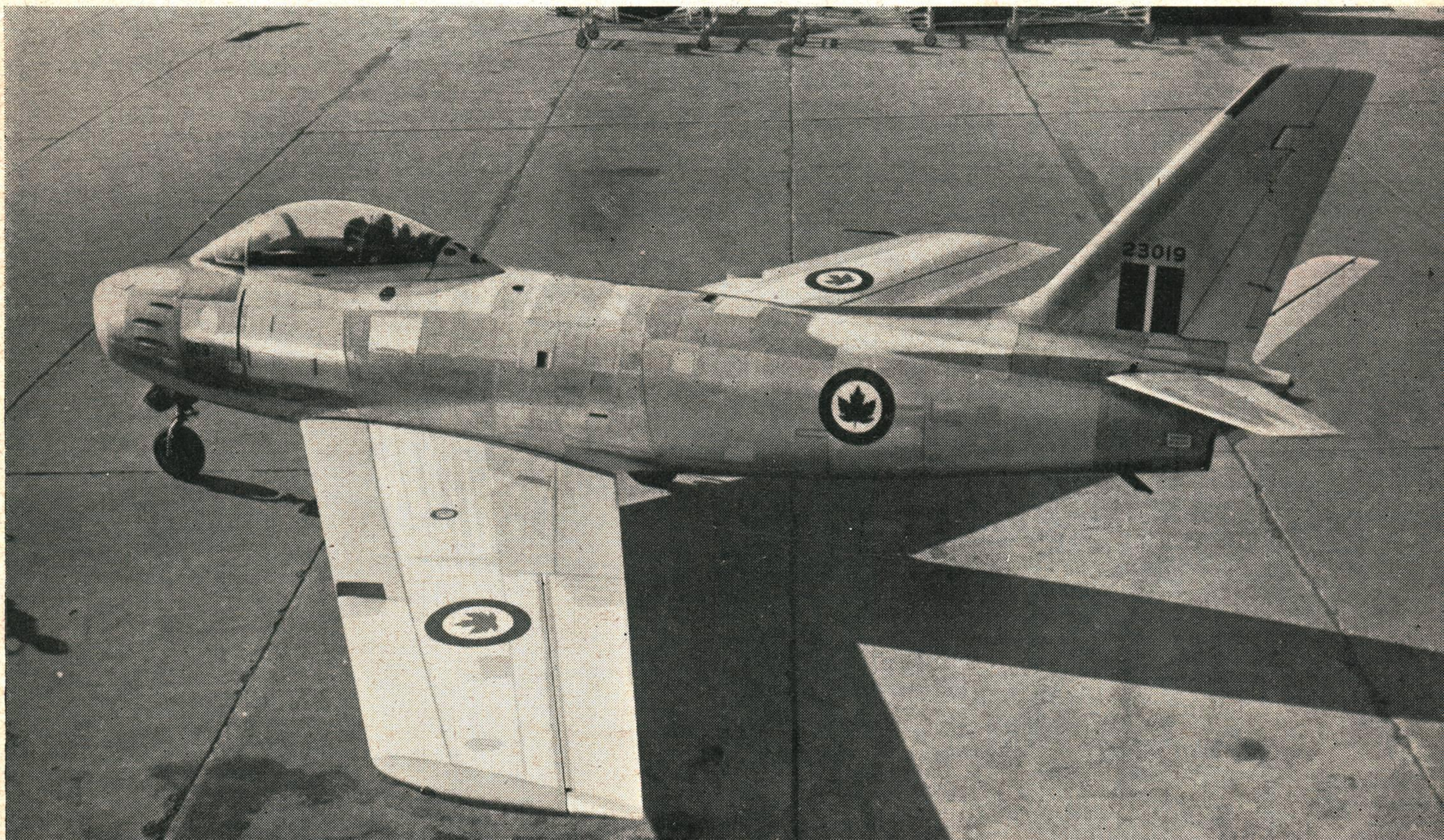
Externally, the Sabre 5 differs little in appearance from the F-86E. Also, the Orenda has been tailored neatly into the fuselage with apparently little modification. The standard Sabre armament of six 12.7-mm. machine-guns has been retained. Despite the Orenda's greater thrust of 6,500 lb., compared with the J-47's 5,200 lb., it is nearly 2 ft. shorter, measuring 10 ft. in length.

The main external feature of the Sabre 5 is found in the leading-edge of the wing. The slats fitted to earlier Sabres have been removed and the leading-edge extended by several inches. This not only allows space for additional fuel, but also greatly improves manœuvrability at high altitudes.

With the removal of its slats, the latest Sabre now wears small boundary-layer fences on the leading-edge of each wing. Without slats, the Sabre's low-speed handling becomes only slightly less docile, and the increase in landing speed is negligible.

In tight turns at low speed, however, care has to be taken to avoid flicking out. It is probable that the extended leading edge of the Sabre may cure what is perhaps the only vice of the F-86E—the tendency towards instability at high speeds and g loads, when turns have a habit of tightening up, with a resultant increase in g, possibly beyond the limit.

With the extra power of the Avro Orenda and the advantages conferred by the longer-chord wing, this remarkable aeroplane is given a further lease of life and should provide the R.C.A.F. Air Division with the most effective fighter in squadron service in any air force.



AIR TRANSPORT

Keeping Up the Standard

By R. E. Gillman

ALTHOUGH at first sight it may seem superfluous, in a profession where all newcomers are qualified and to some extent experienced, a training unit is a very real necessity to a modern air line.

British European Airways have been operating a Training Flight for all the seven years of its existence and, although the intake of new recruits to the flying staff has recently dwindled to a mere trickle as the general rate of expansion has slowed down, the volume of "continuation training" has increased very considerably.

This is the result of a definite policy on the part of the Corporation to keep the general flying standard uniformly high. Periodic flight checks are undergone by every line captain, during which are simulated certain emergencies which he would not normally encounter on his daily round, but with which he must be able to cope in a practised manner.

Each captain is subjected to a check flight twice a year, while first and second officers must undergo an Instrument Rating renewal test once every year. These checks and tests are conducted by a staff of training captains who are all experienced line captains appointed to the task after having passed the Ministry of Civil Aviation's flying tests and been granted the status of Authorized Examiners.

An Instrument Rating renewal test is embodied in the captain's six-monthly check, so his Instrument Rating is renewed twice a year—which is in excess of the legal requirements. The other half of the check is devoted to contact work around the circuit, with simulated emergencies. The syllabus for the visual flying check varies slightly according to the type of aircraft on which the check is being taken. But in all cases the accent is on engine failure and at various times during the flight engines are cut and feathered suddenly and without warning while the pilot's reactions and subsequent engine-out flying ability are marked accordingly on the check sheet.

This marking sheet is designed to make the assessment as quantitative as possible. Each operation is broken down into its obvious components and marked according to whether the performance is average, average plus, above average, or exceptional. Going down the scale, the lesser assessments are given as average minus, below average and unsatisfactory. If the latter assessment is given, then the training captain is empowered to ground the man from line flying and recommend that he be returned to the base training flight for a period of refresher flying until such a time that his performances are back to an acceptable standard.

It is considered that after two years at the job a training captain will have flown with a sufficiently large enough number of the Corporation's pilots to have gained a clear idea of an "average" performance for the Corporation. All assessments are balanced around this level, the check flight reports turned in by the 30-odd training captains showing a high degree of uniformity.

In order to carry the quantitative idea of assessment even further, the individual items on a check sheet are "weighted" according to the relative importance of the item within the exercise. For instance, an ILS let-down is broken into 14 items, with altimeter adjustment and maintenance of critical height having the highest "weight" factor of 7, while final alignment on the localizer merits a factor of 5 and accuracy in the use of the stop-watch only 2. As the qualitative assessments, mentioned earlier, have a value attached to them—"average" being worth 7 marks—it only remains to multiply the mark by the "weight" of the particular item to achieve the final figure.

It is thus possible to write down the entire check in terms of a percentage of the marks obtainable and, with the general remarks of the training captain, to obtain a fair assessment of the pilot's ability. The final marks of each item are then plotted in graph form, when the troughs and peaks show clearly any weaknesses that exist, and for which some corrective action may be considered necessary.

The paper work can, at times, be exacting, but it provides a continuous and fair record of a pilot's standard. The value of the system is beyond doubt, but the job of checking requires a certain type of mentality, for the check pilot is cutting engines on his victim during take-off with one hand, while studying the results and marking them with the other.

At Blackbushe for instance, where most of the Elizabethan training is done, the Air Traffic Controllers are quite unmoved by the sight of an aircraft flying on one engine. Nor have they any compunction in sending it round again at a late stage in the landing approach should they consider that a scheduled flight could, by so doing, be spared some inconvenience.

An engine cut during an instrument take-off is considered to be a good test of a pilot's ability, and simulated instrument approaches are made with an engine out, these being followed by single-engined overshoots on instruments. It is only as a result of the bond of unquestioned confidence that exists between the pilots in the Corporation that this sort of thing is

Panels are used to cover the left-hand screens in the Elizabethan's control cabin when instrument-flying checks are in progress.

acceptable and that the "ulcer rate" among training captains is negligible.

With pilots in the Corporation flying aircraft which each cost up to £100 an hour to operate, this system of check and re-check is an extremely costly business. But now that the standard of each pilot operating on the line is known beyond question, certain parts of the flight checks, and Instrument Rating renewal tests, are carried out during routine service flights. The cost involved in tying up aircraft at base, solely for training purposes, is thus reduced.

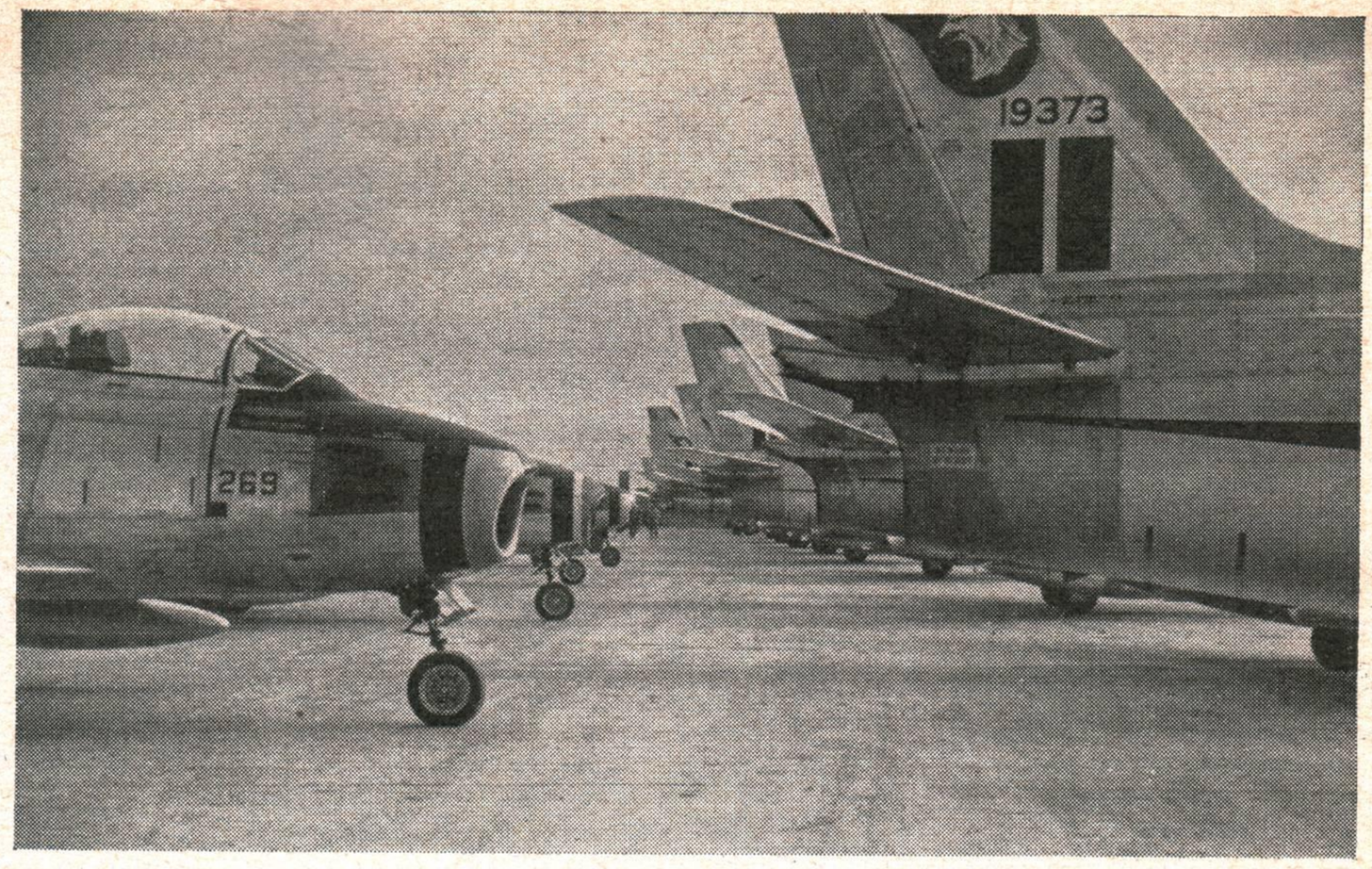
Normal all-engines-operating let-downs can be carried out on service flights with the training captain in the right-hand seat monitoring and checking. Airways flying procedures can be watched during a normal exit from, or entry into, the London Control Zone, and en-route instrument flying can be done without inconvenience to anyone. This leaves the contact flying and single-engined instrument work for the base check, while eventually, when the flight simulators for the Elizabethan and Viscount are operating, base flying may be reduced still further in the effort to cut down the training costs.

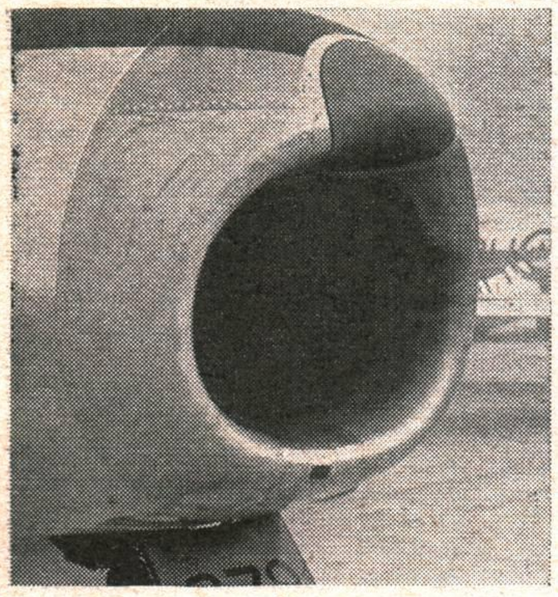
Even during periods of comparative stability of establishment a certain amount of "straight" flying instruction is going on all the time. New entrants, as second officers, are given conversion courses on the type of aircraft in which they are to fly, and are brought up to day and night solo standard, although it may be many years before they attain their command. Established pilots converting to the newer types spend some five weeks in the ground training school at Northolt, studying the airframe and engine design and ancillary equipment, before sitting for the Air Registration Board type-rating examination. This, incidentally, becomes more stringent each year with the increasing complexity of aircraft design, and will shortly include a section on I.C.A.O. Performance Standards. This course is followed by 20 to 30 hours' flying training before the pilot takes an independent check which may clear him to operate the type on service.

When a first officer is due for his captaincy, and a vacancy is imminent, he is rostered with a training captain on normal

J. Beilby (76)

(Right) Heads and tails: The sleek noses of Nos. 416 and 421 Squadrons set off the angular tails of No. 430.





The new Sabre intake. A smaller plastic area now covers the radar.

The older-type nose, with nearly the whole circumference in plastics.

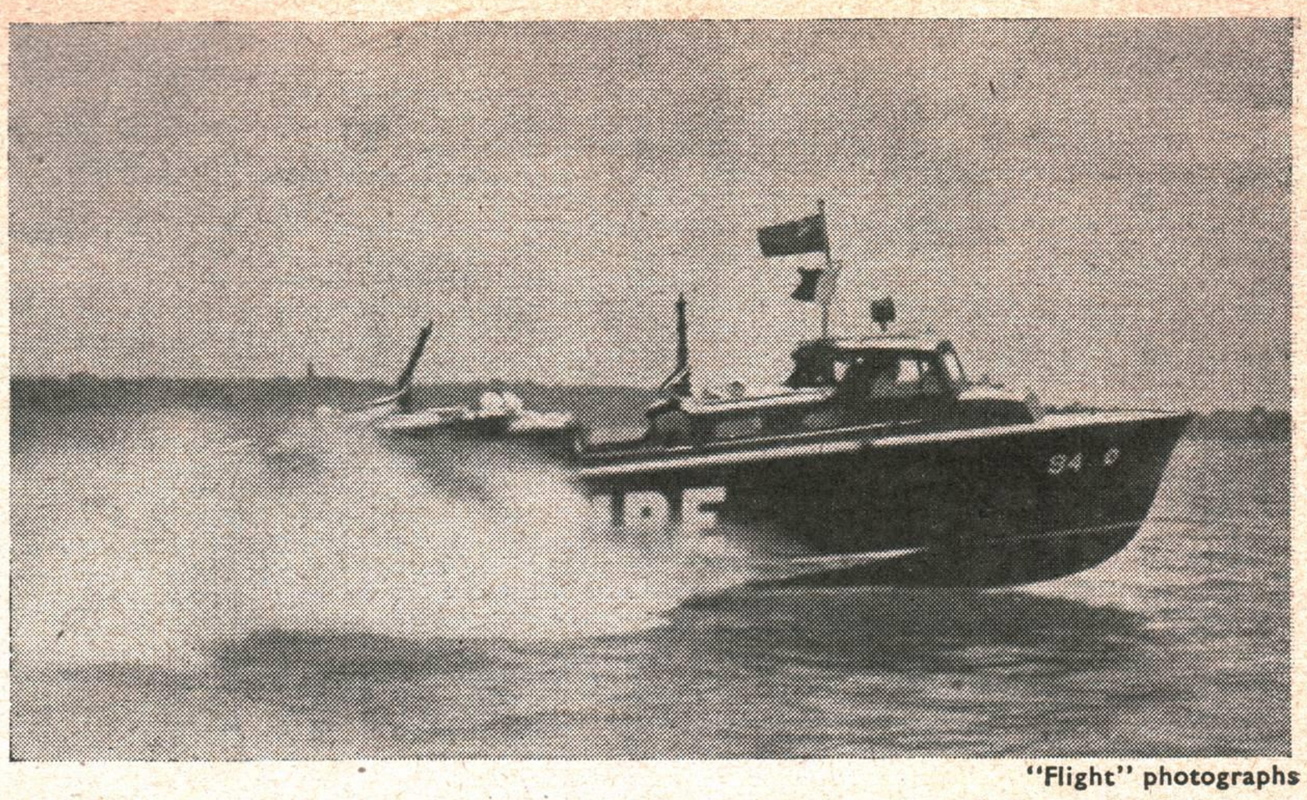
(Right) In a self-made heat-haze a section of No. 416 Squadron taxies in from the runway.

With the exception of the three portraits on the opposite page, all these illustrations are "Flight" photographs.

(Left) Crated stores made an excellent grandstand. (Right) Lined up for Europe's defence: In the front rank is No. 430, with 416 and part of 421 Squadron in the rear.

RESCUE TENDER

The New 30-kt Vosper Fire-fighting and Salvage Craft for the R.A.F.



"Flight" photographs

At full speed off the Isle of Wight, as seen from a similar craft.

AT first sight, it might appear oddly contradictory that an all-metal, kerosine-burning flying-boat might be aided by a fire tender made of wood, and using petrol as fuel; but the following details should show that the new 46-ft craft from the Portsmouth yard of Vosper, Ltd., is excellently fitted for its purpose.

Compared with previous such equipment, this launch—known as the 46ft crash rescue tender—shows a significant increase in speed; its continuous rating is almost 29 kt, and well over 30 kt can be reached for limited periods. Power is provided by two Rover Meteorite engines, each of which is essentially an eight-cylinder development of the Rolls-Royce Merlin by way of the Sea Merlin and the Meteor tank engine. The Meteorite is normally rated at 375 b.h.p. at 2,400 r.p.m.; and the drive is effected through a Mathway hydraulically operated gearbox. An unusual feature for marine work is the adoption of cartridge starting—obviously an asset in emergencies—a magazine-fed Plessey unit having been chosen. The engines are cooled by sea water and drive individual screws at crankshaft speed. Twin rudders are fitted.

The hull is of the high-chine type with double diagonal planking; it is fully fireproofed and has been designed to traverse extensive areas covered with burning fuel or debris.

The tender has been designed for rescuing survivors from crashed or burning flying-boats, or from marine craft, or directly from the water; it is also equipped for isolating and extinguishing fires and for the salvage of water-logged hulls. General towing operations also fall within the tender's compass, a sprung hook being provided with an overload release at 10,000 lb.

Clearly visible in the photographs are the two main 3½in monitors which are equipped for the discharge of foam or water. These monitors are hand-operable through 360 deg in traverse and up to 90 deg in elevation. They are served by a rotary-vane pump, chain-driven by a Ford V-8 engine at either of two speeds; at 500 r.p.m. the pump delivers some 550 gallons of water per minute, while at 1,800 r.p.m. the foam delivery is about 2,400 gallons/minute. Very full equipment is carried for crash rescue operations, and, in addition, the craft is fully capable of looking after survivors for limited periods. A crew of five is normally specified—coxswain, fitter, two firemen and a sick-bay attendant—and up to 12 survivors can also be dealt with at one time.

The handling of these craft, as we saw it recently in the Solent, leaves little to be desired, a typical figure being the stopping time of eight seconds from almost full speed. Two of these tenders —one of which has attended the Saunders-Roe Princess—have completed their trails at Felixstowe, and are about to go into service. No doubt they will be followed by many others and will prove of inestimable value at R.A.F. flying-boat bases at home and overseas. NATO countries have also shown interest.

Extinguishing a simulated aircraft fire by means of foam.

THE PRACTICAL APPROACH TO ASTRONAUTICS . . . (Continued from page 528)

the *Journal of the British Interplanetary Society*. At Stuttgart he presented *Inter-orbital Transfer with Minimum Propellant Expenditure*, which dealt with the transfer of a rocket between two coplanar elliptic orbits (these might be two satellite orbits) about a central body, along a trajectory using a minimum quantity of propellant. It was shown that a number of impulsive thrusts was the best method and equations were derived from which the magnitudes and directions of these thrusts could be calculated in particular cases.

Even when an artificial satellite has been established all will not be plane sailing, as was shown by Dr. H. G. L. Krause of the G.f.W. in his paper *Perturbations of a Satellite Orbit*. He developed a method of investigating the perturbations for satellite orbits with any inclination to the equatorial plane and any eccentricity. In general the inclination was the more important factor. In a detailed investigation of an orbit at about 1,700 km altitude and 45 deg to the equatorial plane, it was found that the oblateness of the earth had the effect of causing the orbital plane to rotate at the rate of about once every five years. Both the sun's and moon's influence was negligible.

The medical aspects of space-flight have been receiving a great deal of attention during the past two or three years, especially in relation to the effects of weightlessness and cosmic rays on the human organism. Both topics were dealt with in Stuttgart. Dr. H. J. Schaefer of the American Rocket Society, in his paper *Exposure Hazards from Cosmic Radiation at Extreme Altitude and in Free Space*, said that the heavy nuclei component of primary cosmic radiation, discovered in recent years, had placed on a new basis the problem of exposure hazard for living organisms. The total ionisation due to both primary and secondary cosmic radiation reached a maximum at about ten miles' altitude. This level was perfectly safe for human organisms. The heavy primaries, however, were characterised by an extremely high specific ionisation and a large radial spread of the ionisation dosage around the particle tracks. Both these properties may endow them with a greatly increased biological effectiveness—but this still has to be proved experimentally. Again, the distribution of these heavy primaries has still to be determined in the upper atmosphere and in space. The earth's magnetic field is sufficiently strong to deflect large numbers of these heavy particles, so that it is possible that their density in space is much higher than it is close to the earth.

The technical proceedings were brought to a close with a highly mathematical paper by a young German physicist, B. Heim. Its title, *Die dynamische Kontrabarie als Losung des astronautischen Problems*, is not susceptible of translation, since "Kontrabarie" is a new concept put forward by Heim. If Heim's theory is correct then it should be possible to control certain nuclear reactions to produce a direct thrust from released electrical energy, with a mass consumption which is only a small percentage of that of a conventional chemical rocket. Another result is that it should be possible to control the gravitational field within a given space! This conjures up pictures of space-ships accelerating at several hundred g and cruising at a speed approaching that of light. However, whether Heim is just playing with mathematics, or whether he really has stumbled on something revolutionary, remains to be seen.

All of the technical papers are to be published in full, in duplicated form, by the Gesellschaft für Weltraumforschung in the near future at cost of D.M.20 and can be ordered direct from the society at Stuttgart-Zuffenhausen, Postfach 9, Germany, or through the British Interplanetary Society, 12 Bessborough Gardens, London, W.C.1.

CANADIANS at ZWEIBRÜCKEN

A Fine New Base Handed Over by the French

"Flight" photograph

Sabres from Zweibrücken and Gros Tenquin fly across the new base. In the foreground are the impressively emblazoned fin and rudder of one of the machines of 427 "Lion" Squadron.

THE Canadian intention, expressed last August, to have four wings of fighters flying in Europe by 1954 is fast becoming reality. Already No. 1 Wing at North Luffenham and No. 2 at Gros Tenquin have made their Sabres and maple-leaf roundels no unfamiliar sight in the skies above Europe; and on April 26th attention was focused on yet another of the R.C.A.F.'s N.A.T.O. units—Fighter Wing No. 3, now based at Zweibrücken, in the French Zone of Germany.

The occasion was the official handing-over of the airfield at Zweibrücken by the French to the R.C.A.F., and the placing of the unit at the disposal of Allied Air Forces, Central Europe. The occupying wing of F-86Es comprises Squadrons 413 (from Bagotville, Quebec), 427 (from St. Hubert, Quebec), and 434 (from Uplands, near Ottawa), which flew over from Goose Bay by way of Keflavik and Prestwick, arriving at the new Saar base early in April. Squadron commanders are, respectively, S/L. W. I. Gordon, S/L. C. L. V. Gervais, and F/L. H. S. Tetlock.

During the delivery flight, two Canadian North Stars of 42[illegible] Thunderbird Squadron had flown squadron ground personnel and equipment to the *en route* bases and Zweibrücken, in the long-stage hops which gave the flight its code name, "Leapfrog 3."

Many distinguished NATO representatives, including Lord Ismay (Secretary-General of the North Atlantic Council), were present for the handing-over ceremony, which began with a fly-past by Sabres from Zweibrücken and Gros Tenquin, and by F-84s of Squadrons 1 and 11 of the French Air Force. On parade in front of the large hangar were several hundred Canadian airmen and French troops, while on the raised platform, flanked by the French tricolour and the Canadian flag, were representative guests from many countries.

The base was officially handed over by M. François-Poncet, the French High Commissioner in Germany. After the Franco-Canadian agreement had been signed by Gen. R. Noiret, C.-in-C. French Forces in Germany, and A. Cdre. W. R. MacBrian, A.D.C. No. 1 Air Division (and endorsed by M. François-Poncet and Mr. T. C. Davis, Canadian Ambassador to the Federal German Republic) a reply on behalf of the Canadian Government was made by the Hon. Brooke Claxton, Canadian Minister of National Defence.

He began by re-emphasizing the close ties between France and Canada, mentioned by the High Commissioner, and congratulated the C.O. of No. 3 Wing, G/C. A. C. Hull, and his squadrons on successfully completing Operation Leapfrog 3. "The fourth Wing," he continued, "is now being organized and is receiving its final training so that it will be able to take its place at Solingen, not far from here, and this will be accomplished by the planned date, later this year. We have also established the Air Division Headquarters at Mercy-les-Metz, some four miles out of that historic military centre."

Mr. Claxton went on to mention the Canadian Sabres being built for Britain, and the flying training given by Canada to the aircrews of NATO countries. "Altogether, we have so far trained over 1,600 pilots and navigators from other countries, and today there are another 1,300 undergoing training."

The Minister concluded: "For the Government of Canada and the Royal Canadian Air Force, in accordance with the North Atlantic Treaty provisions, I now commit this Wing to the Supreme Command of the North Atlantic Nations in Europe, with the strong belief and confidence that this will be another step in the path of progress and in the guarding of peace, to build firmly the foundation of our stand together for freedom, for the maintenance of security, and for the welfare and happiness everywhere of free peoples."

In a short closing speech, G/C. A. C. Hull, commanding officer of the Zweibrücken Wing, thanked all who had co-operated to make the inauguration of the new activity a success.

A tour of the station following the ceremony enabled visitors to see for themselves how excellently the station had been built, and how comprehensively equipped. Constructed in less than two years by German labour to the instructions of French engineers, the airfield and station buildings had been equipped and furnished by the R.C.A.F., using Canadian, British and Continental European material—truly a joint achievement. The buildings (which include a 55-bed hospital, a gymnasium and a theatre) are modern and spacious, and must make the base one of the best equipped of the newly built NATO airfields. Speaking

The Hon. Brooke Claxton speaking at the handing-over ceremony. (Seated, left to right) Gen. Jouhaud, C.O. 1st French Air Division; A.V-M. J. L. Plant (R.C.A.F.), A.A.F.C.E.; Lord Ismay; Gen. R. Noiret, C.-in-C. French Forces in Germany; G/C. A. C. Hull; M. Andre Francois-Poncet; Mr. T. C. Davis; A. Cdre. W. R. MacBrian, and Gen. Pierre Fay, Chief of Staff, A.A.F.C.E.

"Flight" photographs

Squadron markings at Zweibrücken. (Left) The white and blue insignia of 434 "Bluenose" Squadron, with the original "Bluenose" yacht on the fin. Resemblance of fuselage badge to B.O.A.C.s Speedbird is doubtless purely coincidental. (Right) The insignia of 427 "Lion" Squadron comprise long red fuselage flash, and lion design on the fin (see also photograph on page 583).

CANADIANS AT ZWEIBRÜCKEN . . .

with the pilots, one received an enthusiastic confirmation of its qualities, as both a base from which to fly and a place in which to live. Flying weather, also, had proved exceptionally good.

The station is situated on a plateau just outside the town of Zweibrücken, and its white concrete dispersal tracks and station buildings, and reddish-brown bulldozed earth, now spread over what was previously woodland and farms. In the background lies a constant reminder of an earlier defence scheme, for the airfield was built over part of what was the Siegfried Line—broken pill-boxes of which can still be seen only a few yards across the perimeter fence from the station's two churches.

K. T. O.

PAPERS ABOUT PLASTICS

THE second British Plastics Exhibition (Olympia, London, June 8th-18th) will again be concurrent with a convention, at which no fewer than 22 papers will be read by specialists in the various fields of plastics manufacture and use.

It may be said that almost all these lectures will, to a greater or lesser extent, be of interest to the aircraft industry, but at least half-a-dozen of them are of more direct concern. Five of these will be given on Wednesday, June 10th, the two sessions on that day being devoted to reinforced plastics.

On the morning of that day the following papers will be given:—

Surface Chemistry and Adhesion of Glass and Plastics, by H. Cole, M.A., F.R.I.C., F.S.G.T., of Pilkington Bros., Ltd.; *Plastics Containing Asbestos as a Reinforcing Filler*, by J. E. Gordon, B.Sc., P. H. H. Bishop, B.Sc., and P. L. McMullen, D.L.C.(Aero Eng.), all of the R.A.E., Farnborough; and *A Critical Survey of Commercial Low-pressure Laminating Resins*, by V. E. Yarsley, D.Sc., F.R.I.C., F.P.I., and A. G. Goodchild, B.Sc., A.R.I.C.

During the afternoon session the papers will be as follows:—

Some Considerations in the Design and Manufacture of Structures in Glass-reinforced Plastics, by G. C. Hulbert, B.Sc., of the Bristol Aeroplane Co., Ltd.; and *Some Problems Associated with the Design and Manufacture of Asbestos-reinforced Plastics*, by D. S. Bancroft, A.F.R.Ae.S., of F. G. Miles, Ltd.

The sixth lecture which may well be of interest to certain aircraft constructors will be given on the afternoon of Thursday, June 11th, when R. A. G. Knight, B.Sc.(Eng.), M.I.Mech.E., of the Composite Wood Section, Forest Products Research Laboratory, will speak on *The Durability of Adhesives for Wood*. Also worthy of note, incidentally, is the morning-session paper on the same day, which, it is stated, "will interest all users of technical products made from plastics": its title is *The Durability of Plastics under Post Office Conditions*, and it will be given by A. D. W. Downes, B.Sc., F.R.I.C., of the P.O. Engineering Department research branch.

In the exhibition itself, over 80 exhibitors will be represented.

TOWARDS AIR SAFETY

ON April 22nd, at the last meeting of the spring lecture-session of the Graduates' and Students' Section of the Royal Aeronautical Society, Mr. Harold Caplan, D.C.Ae., a graduate of the Society, spoke on "Aircraft Accident Investigation."

The lecturer, who is employed in the Air Safety branch of the British Aviation Insurance Co., Ltd., began by stating the ideal objects of aircraft accident investigation, and by distinguishing basically between investigation and inquiry. Defining the various types of investigators, he pleaded for those present "not to shoot the insurance man"—he *was* doing his best, and his object was *not* to avoid meeting claims.

The regrettable gap between the occurrence of accidents and their reporting and investigation, due to inadequate international regulations, was then emphasized by the speaker. He went on to show a representative selection of accident photographs, one of which, illustrating the "raw material of investigation in India," showed a remarkable piece of wreckage, through which jungle creepers had grown in a matter of hours. After outlining a typical investigation, Mr. Caplan expressed his doubts concerning the indiscriminate use of statistics, by co-relating the number of aircraft accidents to the northern Irish suicide-rate and the number of state executions in England.

What was needed, concluded the lecturer, were (1) the prompt reporting of all accidents and incidents, (2) a full scientific investigation of all factors, and (3) a wide publication of results. A new attitude to human errors involved was also necessary, as part of a comprehensive study of "human engineering."

Mr. Walter Tye, O.B.E., B.Sc., F.R.Ae.S., of the Air Registration Board, opened the discussion by questioning a suggestion by Mr. Caplan that investigators should be able to follow [illegible] the results of their investigations. How, he asked, could th[illegible] in to the present system? It could not, admitted the lecturer, but ideally an investigator should have wider duties: "In my Utopia, there is a place for such a man." Other questions concerned accident information from Russian-controlled countries, relative crash-safety in different parts of an aircraft (the lecturer admitted that he personally always sat near the tail), backward-facing seats ("this is a hot subject"), crashworthiness of various basic designs, factors affecting aircraft insurance rates, and possible improvements in altimeter design.

In his closing remarks, the chairman, Mr. J. G. Roxburgh, Grad.R.Ae.S., referred to the need not only to minimize the effect of accidents, but also to prevent their occurrence.

FORTHCOMING EVENTS

May	9-10.	Aéro Club du Finistère: Brest and Côte des Légendes Rally.
May	13.	R.Ae.S. Chester Branch: Annual General Meeting.
May	14-17.	American Helicopter Society: Forum, Washington.
May	14-22.	F.A.I.: 46th Annual Conference, The Hague.
May	16.	Wolverhampton Aero Club: Goodyear Trophy Race and Display.
May	20.	Aircraft Recognition Society: "Supersonic Flight Problems," by Prof. A. A. Hall, M.A., F.R.Ae.S.
May	21.	R.Ae.S.: All-day Meeting on Aeronautical Acoustics (jointly with the Acoustics Group of the Physical Society).
May	23-25.	Aéro-Club d'Epernay: Champagne Rally.
May	23.	Derby Aero Club: Display.
May	25.	S.S.A.F.A.: Display, Yeadon.
May	25.	Air Display, Elmdon, Birmingham.
May	25.	Women's Junior Air Corps: Display, White Waltham.
May	29.	R.Aux.A.F.: Officers' Coronation Ball, London.
May	30.	Auster Flying Club: Ragosine-Auster Homing Trophy.
May	30.	Swansea and District Flying Club: Display and Race.
June	5-7.	Yorkshire Aeroplane Club: International Rally.
June	6.	Leicestershire Aero Club: Coronation Air Display.
June	7.	Aero-Club d'Italia: Rome Grand Prix.
June	8-18.	British Plastics Exhibition and Convention, Olympia, London.
June.	11	R.Ae.S.: Ninth British Commonwealth and Empire Lecture, "Problems in Development of Air Transport in West Africa," by Sir Hubert Walker, C.B.E.
June	13.	"At Home," R.N. Air Station, Lee-on-Solent.
June	13-14.	Aero-Club d'Italia: Air Tour of Sicily.
June	13-14.	Rhodes Centenary Air Display and Rally, Salisbury, Rho[illegible]
June	14.	Aéro-Club de Tangier: Tangiers Rally.
June	14.	R.Ae.S.: Garden Party, Hatfield.
June	15.	Coronation Naval Review.
June	16.	I.C.A.O.: Opening of Seventh Assembly, Brighton.
June	17.	Women's Engineering Society: Annual General Meeting.
June	19.	Institute of Navigation: "Accuracy of Wind Forecasts for Aviation," by C. S. Durst and D. G. Harley.
June	19-28.	Zurich: British Chamber of Commerce "Made in England" Exhibition (inc. Aviation).

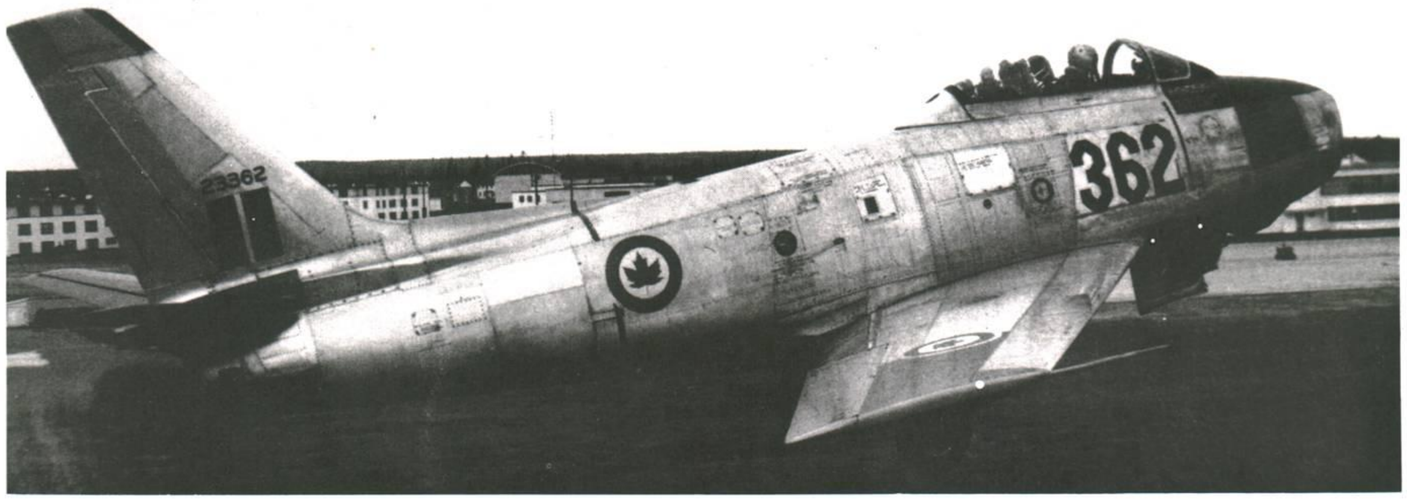
Photo
Keith Barlow.

Sabre 5 Chatham N.B. PL 95566

Returning Sabre 5 four-some from the air-to-air gunnery range over the Atlantic not far from RCAF Station Chatham. Instructor and three students make up flight. Gunnery flight Sabres were the only ones flown

71.2.15A

Gunnery flight Sabre 5 over-shooting at RCAF Station, Chatham. Note gear folding, flaps almost retracted.



71-2-14A

SL ⓒ 222

Bob III

71-2-16A

Sabre MR 6

PL 108346

23360

PL-101-494

J. Beilby

Rockcliffe 9 June 62

J. Griffin

Rockcliffe 8 June 63

London, Ont. 14 Aug 1965

Photos
W. Wheeler

23287

23297

23335

23349

Photo
W. Wheeler

Sabre 23287

London, Ont
14 Aug 1965

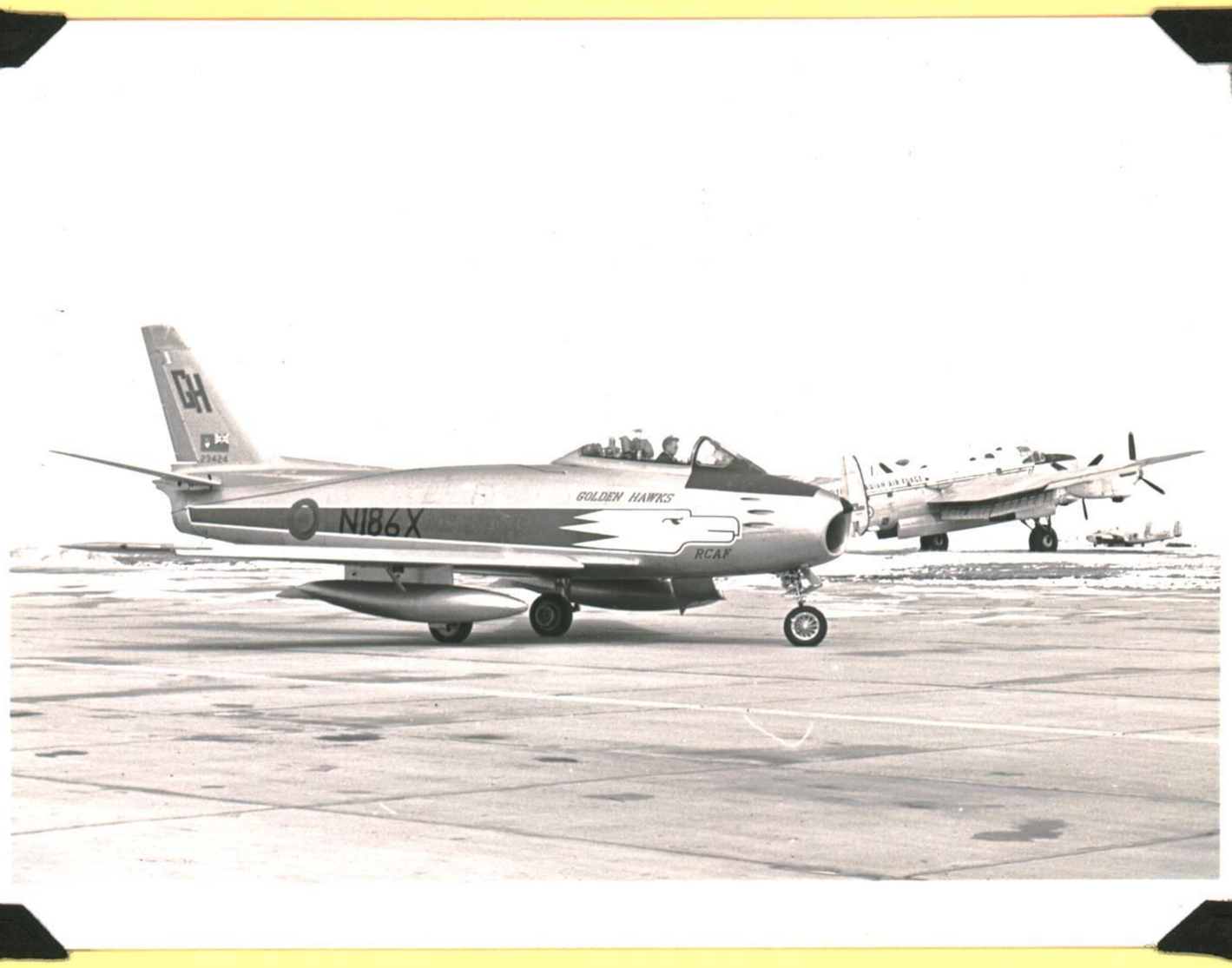
Defected to
Communists

23407

Photo
P. Gardiner

ex 23424

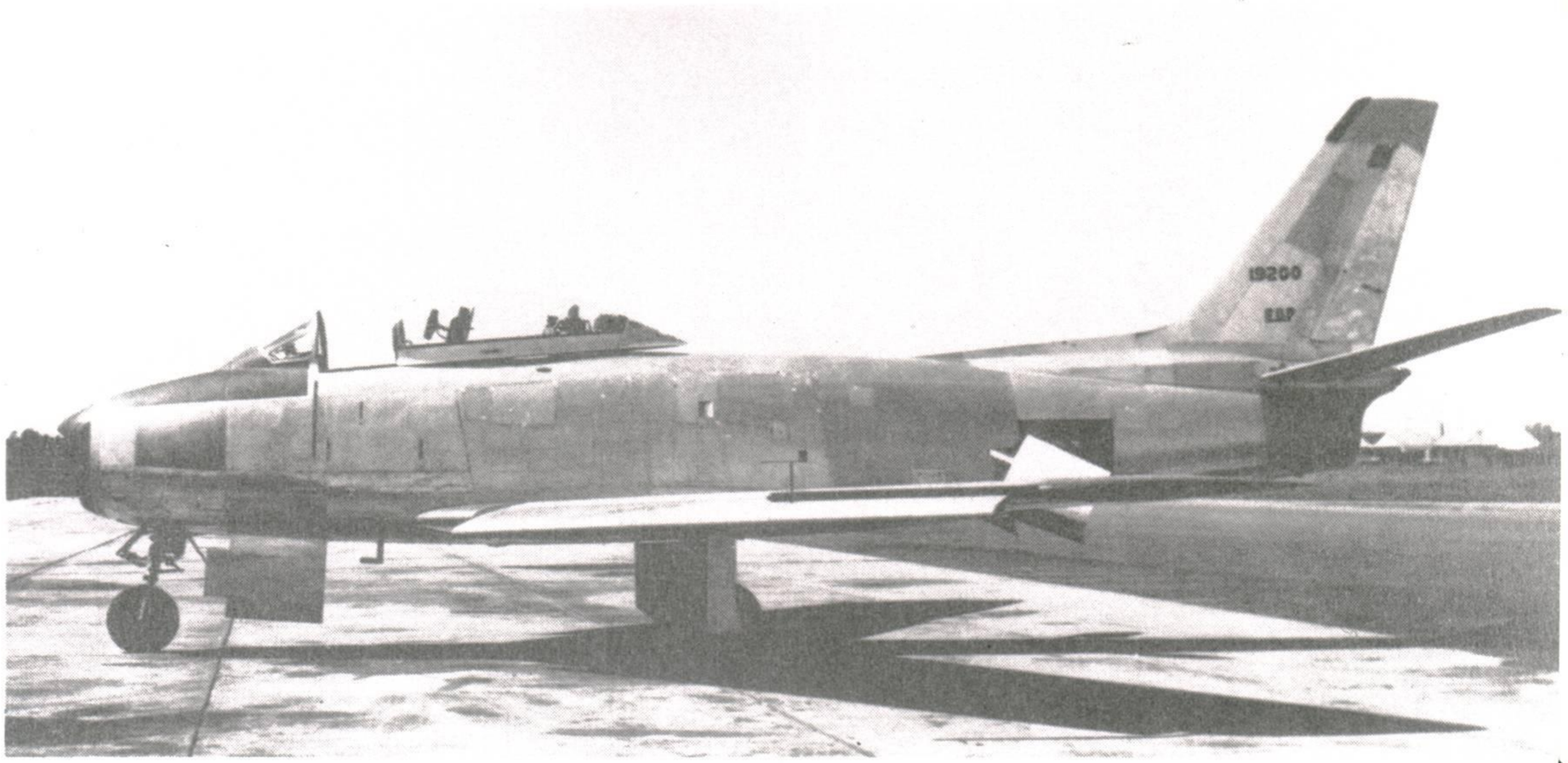
May 1967



Photos:- Ron Wylie

Camp Borden

Sabre 23268



Canadair CL-13 Modified, Sabre prototype Mk. 3
Serial No. 19200 with no military marking

Fin Markings
19200 – Serial
EOP – Experimental
Orenda
Prototype

The Canadian Aircraft Operator

CANADA'S GENERAL AVIATION NEWSPAPER

Editor and Publisher
ROBERT G. HALFORD

VOL. 17, NO. 19 SATURDAY, NOVEMBER 1, 1980

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Telephone: (416) 826-2287 **Telex: 06-217700**

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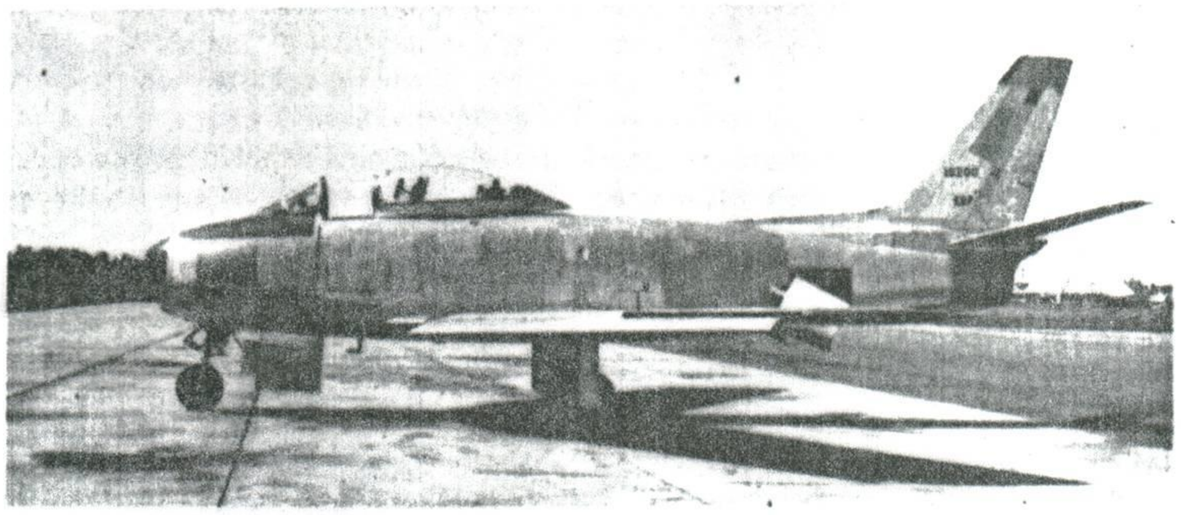
Mk.3



The one and only Sabre Mk. 3, as it appeared for Cochran's record flights.

Footnote to a Footnote to History

In our Sept. 1-issue in this column, we commented on the death of Jacqueline Cochran and her record setting flights in a Canadair-built Sabre, which we identified as an Orenda-powered F-86E. It wasn't just any old F-86E, we have since learned courtesy of "Canadair News".

The News gives further details of Miss Cochran's achievement in its September issue, noting that Canadair had been producing the Mk. 2 Sabre, powered by the GE J-47 engine, when Orenda developed the more powerful Orenda 3 turbojet. "Aircraft No. 100, RCAF SN 19200, was taken off the production line and the Orenda engine was installed. The aircraft became known as the Mk. 3, Experimental Orenda Prototype; the aircraft, with 6,000 pounds of thrust, outperformed the Mk. 2 with its 5,200 pounds of thrust.

"This aircraft came to the attention of Miss Cochran and she sought permission to fly it in an attempt to raise the world speed record, then held by Mme. Jacqueline Auriol, daughter of the president of France, at 540 miles per hour.

"Permission was granted and Miss Cochran spent some time at Canadair as a "flight consultant". Bill Longhurst, then Canadair chief test pilot, gave her several familiarization flights in a T-33 before she flew the Sabre.

"Longhurst flew the aircraft to Edwards Air Force base, California, and Miss Cochran, with the well-known Col. Chuck Yeager, USAF, as monitor, flew the Sabre Mk. 3 to 652.552 mph over a 100 km course, and followed this on June 3 with 675.471 mph over a 15 km closed-circuit course. She thus became the first woman to fly faster than the speed of sound.

"She not only shattered the Jacqueline Auriol record, but also the record for men, held by Col. J.F. Ascani, USAF, who flew 635 mph in 1951.

"Some years ago, Canadair News learned that aircraft 19200 had been discovered in a farmer's field outside the airport near St. Jean, Québec. It was donated by the Canadian Armed Forces to the Reserve Squadron in Toronto, where, after refurbishment, the aircraft will become a gate guardian."

CANADIAN AVIATION: THE FORMATIVE YEARS

General Airways: Ai

By K. M. MOLSON

One of the most interesting, possibly *the* most interesting, of the smaller bush flying companies of the 1920s and 1930s was General Airways Ltd. It was formed in the spring of 1928 by A. Roy Brown who had been credited with shooting down the famous "Red Baron", Manfred von Richtofen, in April 1918.

A Fairchild FC-2 (see CAO, June 1, 1979) formed its original equipment and a D.H.60, Moth, was added in the summer. Its original manager and chief pilot was W.N. Cumming who left in two weeks without ever flying for the company. Its first employees were R.S. Baker who became its chief mechanic and W.H. Clarke, originally an assistant to Baker but soon to become chief pilot and manager. Bretislov Pliske, a Czech, was then appointed chief pilot and manager and shortly G.C. Dingwall was hired as a second pilot.

A base was established at Amos, Que., and the greater part of its initial flying operations was done into the Malarctic area where the O'Bien, Cadillac, Siscoe and other mines were located, but flights were made as far north as James Bay.

The original arrangements did not work out and in May 1929 the young, inexperienced, Clarke took over as chief pilot. This proved to be just what was needed and under his leadership General Airways not only survived but expanded during the difficult depression years. "Clarkie", as he was known, became immensely popular not only within his company but throughout the area and indeed it was written in the '30s that he "may well become a legendary figure in the north" and that he was "an amazing, colorful figure, a devil-may-care, reckless, loveable rascal". And it should have been added, that he was a natural pilot whose skill and ability were widely respected by his associates.

General opened a new base at Rouyn, Que., which became their main operating base and for periods during their

General Airways' Rou
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Hudson and Chaplea
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early depression ye
operated a small fleet
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Reliants. In all Gene
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Moths; 1 Fairchild
Super Universal; 4
Pacemakers; 1 Bell
Pacemaker; 5 Stins
1 Noorduyn Norsema

General's pilots w
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General pilots, believ
and Kelly Edmison, a

Your Family

By ROBERT S. GRANT

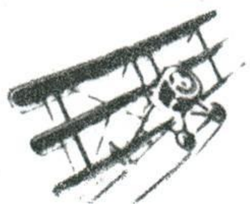
FROBISHER BAY, NWT. — The first Series 300 Twin Otter built circled the globe twice on sales tours. She later was used in membrane water bomber testing and her photograph appeared in almost every aviation magazine in the world.

Where is this airplane?

Board a Nordair 737 out of Montreal bound for Frobisher Bay, N.W.T. Wait patiently at the airport and you will eventually see an orange Twin Otter touch down lightly on Runway 36.

The most famous DHC-6, C-FYFT, is alive and well. Her home base is 'Frob' on beautiful Baffin Island, and she is owned by Bell Canada but crewed by Bradley Air Services of Carp, Ont. who took over the contract from Survair when that company met its unfortunate financial demise several

The Prop Shop



at Toronto
Buttonville Airport
Markham
Ontario L3P 3J9
416-297-1422

TIME AND PLACE

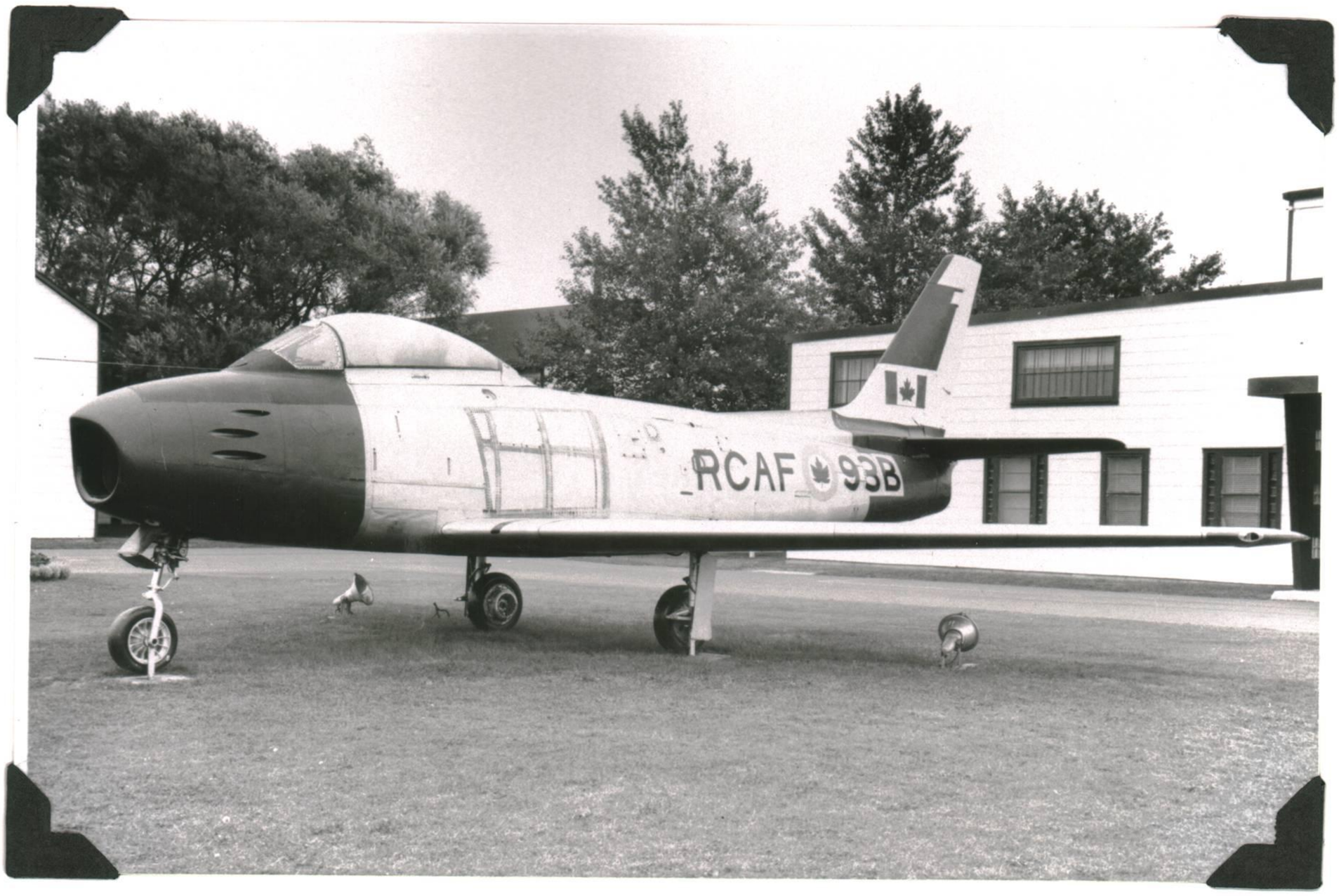
1981

January 18-21, Anaheim, Calif. — Helicopter Association of America Annual Meeting and Industry Exposition, Anaheim Convention Centre.

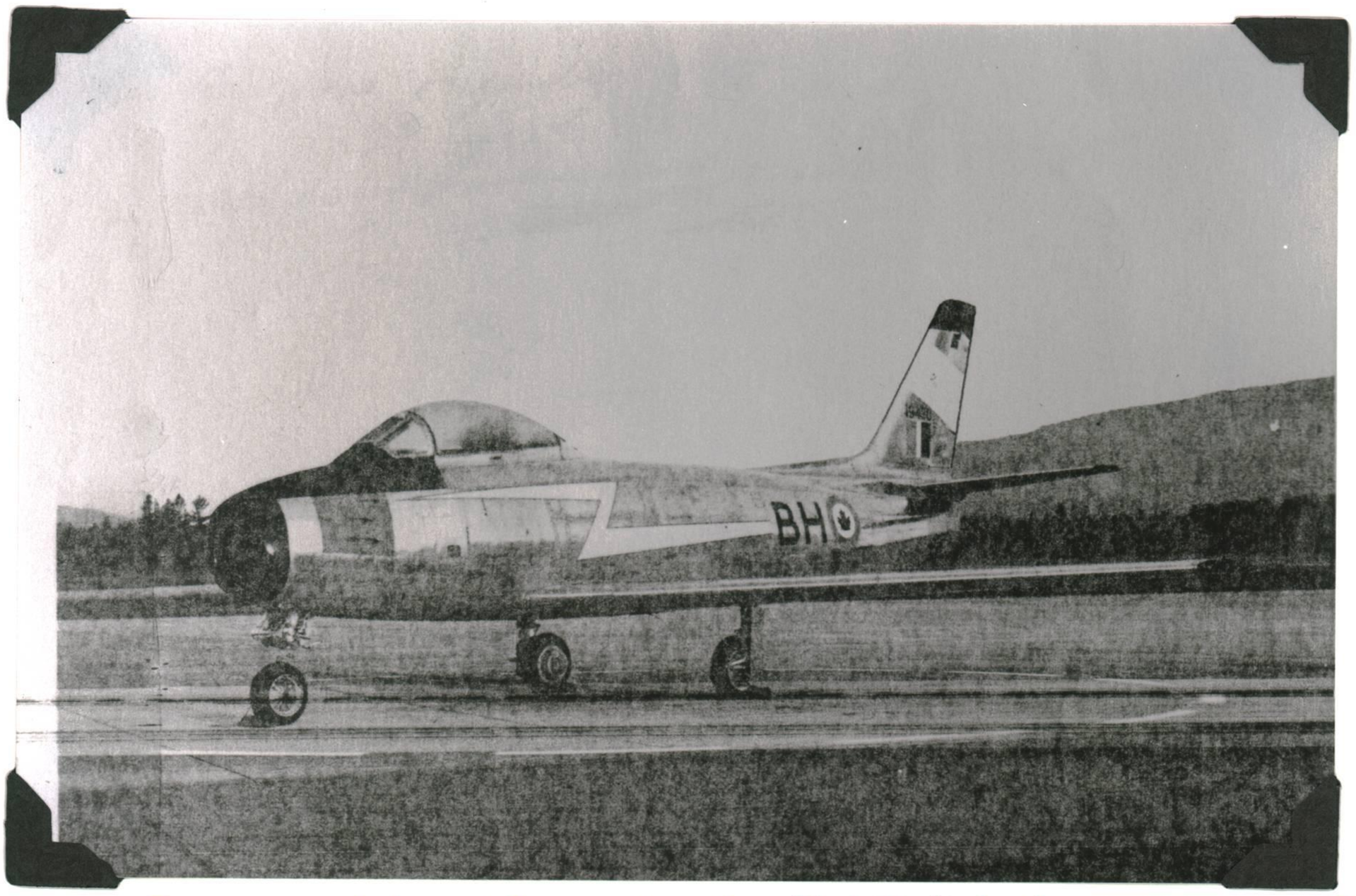
January 31 - February 1, Bromont, Que. — 2nd Annual Skiing Fly-in, Eastern Canada Tribe, International Comanche Society. Contact: Norman Berneche, (514)

March 20-22, Red Deer, Alta. — Alberta Flying Farmers Annual Convention, Capri Motor Hotel.

April 7-9, Wichita, Kan. — SAE Business Aircraft



Canadair CL-13, Sabre MK. 2, Serial 19118 Converted
Instructional Number 5933



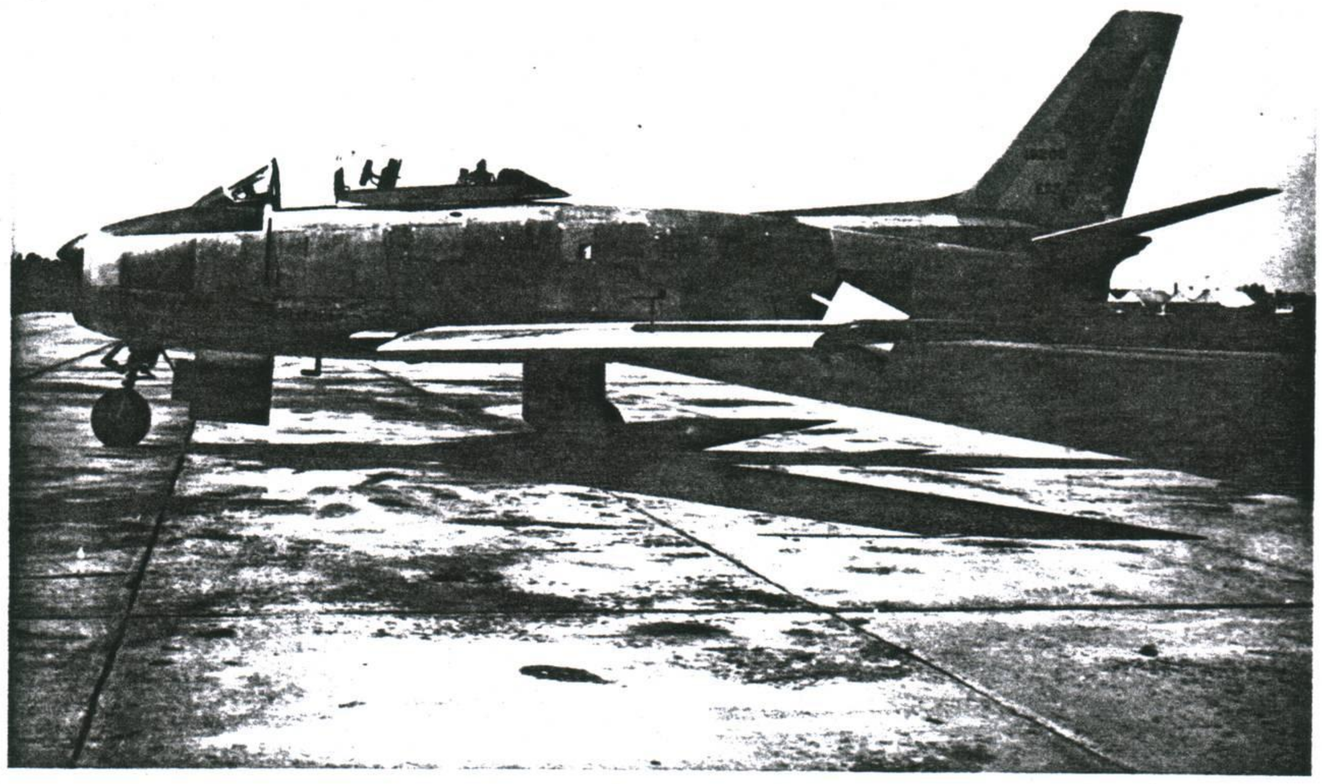
Canadair Sabre MK. 2 19118 Repainted to represent
Air Division aircraft 19430 of 430 Sqn

Canadair Sabre MK 3

PP01
2155

00

TOTYPE ORENDA 3
MEMBER OF CANADAIR STAFF
ELINE COCHRAN USED THIS A/C
WARDS AFB TO ESTABLISH
NEW INTERNATIONAL RECORDS
52:
km CLOSED COURSE 652.5 MPH
Km " " 590.3 MPH
m STRAIGHT " 670 MPH.



OM
R

Check the Original

EOP an Fw

Experimental Orenda Prototype.

REMARKS:

RECORD OF WRITE-OFF

APPLICATION RC'D FROM	DATE	FILE No.	DATE APPROVED	APPROVED BY	APPROVAL SENT TO	DATE	T.O. No.

DISPOSAL PARTICULARS

REMARKS:

EFFECTIVE DATE WRITTEN-OFF

R.C.A.F. E 233—30M-5-52 (7256) LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

ENTRY AT IITSU DATE 21 JUNE 54 TRANSFER ORDER No. 1247

TRANSFERS DATE	TO	AUTHORITY	TRANSFERS DATE	TO	AUTHORITY
June 54	IITSU (Canadair) C &	OTO 1247			
JUNE 54	AMC (CE & PE ROCKCLIFFE)	OTO 1247			
May 54	C & + P E (~~Det Uplands~~)	OTO-1371			
~~Sept 54~~	C E + P E (~~Det Flight Uplands~~)	Log 165			
Aug 55	TC (Ste St Jean converted to Instructional	OTO 808 Category)			

REMARKS:

RECEIVED AT IITSU (CANADAIR) OFF CD 601

TC 1070 TR (Sabre/4) 19 Dec 61 Converted back to St Jean

E OF EQUIPMENT N WHICH USED	ORENDA I				
ATCH No.	QUAN. IN BATCH	LEDGER FOLIO		SPECIFICATION No.	
TRATION No.	MAKE & MODEL		YEAR	TYPE	MANUFACTURER'S No.
9200 613B	SABRE 3 Instructional TC				613B

19200

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S NO.
19200 6138	SABRE 3			

OVERHAUL DATA

	DATE	REASON	DONE BY	REQ'N NO.	COST	HOURS SINCE NEW	DATE COMPLETED	ALLOTMENT
1	21 June 54	See O T O	Canadair	CO 10 6 51450				
2								
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12								

ACCIDENT RECORD

	DATE	CATEGORY	PLACE	TIME	REPORT REFERENCE	DATE	AIRCRAFT TYPE	NUMBER	DISPOSAL	DATE SER
1										
2										
3										
4										
5										
6										
7										
8										

MAJOR EQUIPMENT RECORD CARD

REMARKS

Canadair Sabre 23 May 70

On 22 January 1970 the CAF made the last official Sabre flight from Cartierville, Que to CAFB Trenton, A/C 23102 was a chase plane at Canadair - see photo Aircraft Illustrated for Apr 1970 Page 126

F. Bailey 78

F. Beilby 79

192

SWORD SWALLOWER.—The capacity of the Bristol Freighter to carry bulky loads was further illustrated recently when a complete Sabre fuselage was carried from Gros Tenquin, France, to Filton, Bristol by one of the R.C.A.F. Freighter 31s. The Sabre, damaged in a ground accident, was for repair by the Bristol Aeroplane Co.

J Beilby (81)

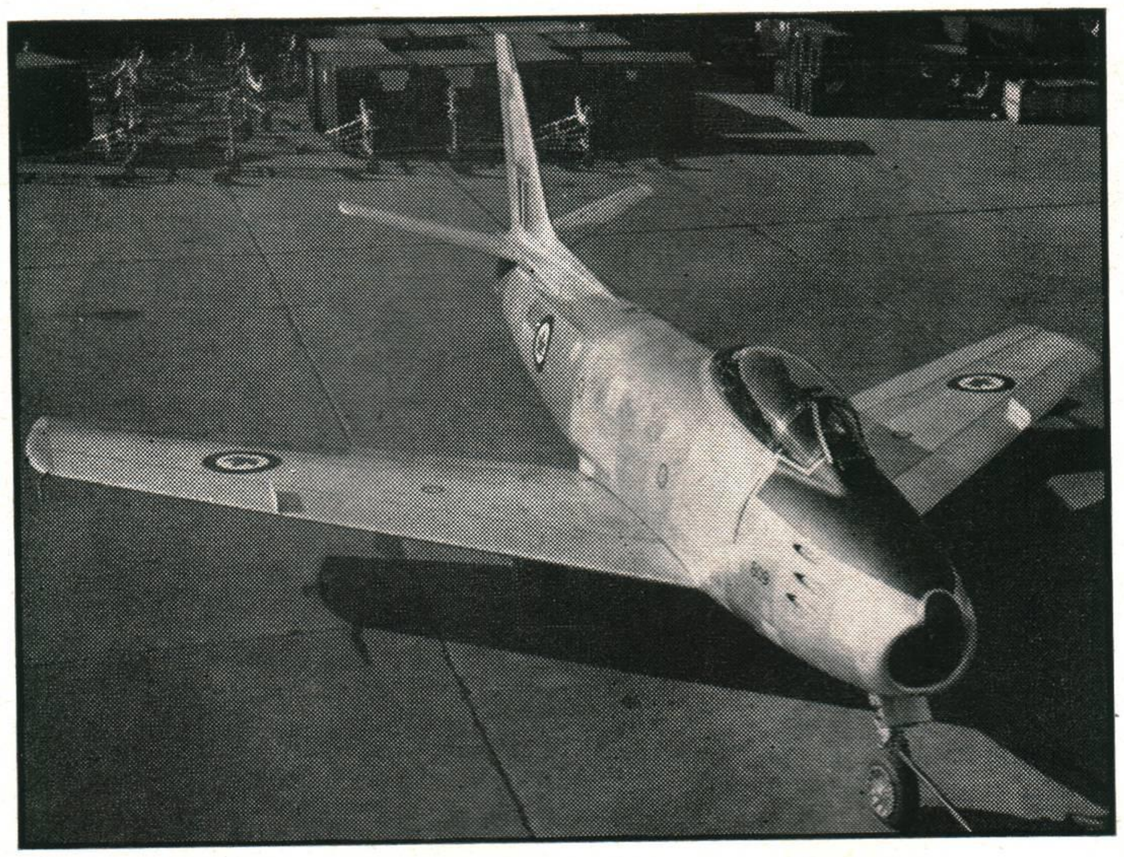
FIRST of 100 canadian-built *Sabres* recently made its test flight. Later production models will be powered by A. V. Roe *Orenda* jet engines instead of J-47's

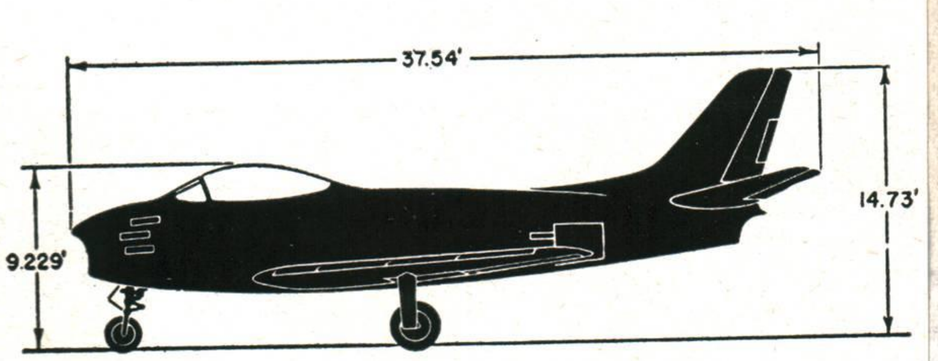
SEPTEMBER, 1951

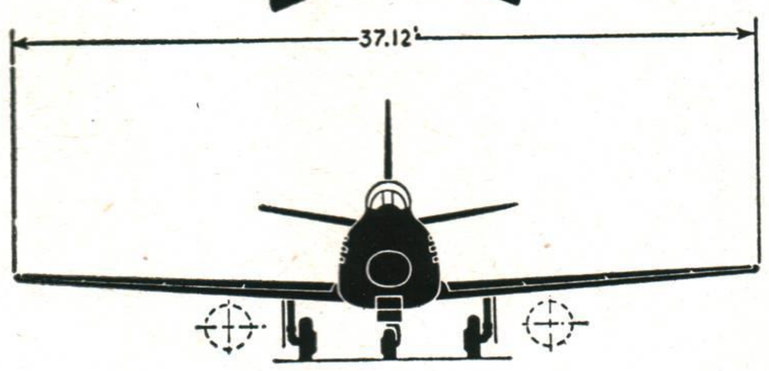
Ce

THE F-86 is HARTMAN EQUIPPED

J. Bailey 80







Now in full production at Canadair is the Mk. 5 version of the F-86E Sabre, more popularly known as the Sabre 5. (The "5" is shown in the photo above; the three-view at left is of earlier versions.) The first of these improved aircraft are now going into service with the RCAF in Europe. The Sabre 5 is powered by an Orenda 10 of 6,500 lbs. st. th., which gives materially improved take-off and climb performance, as well as better performance at high altitudes. Though the Orenda is only 121 in. long, as compared to 144 in. for the 5,200 lb. th. J-47, there is no noticeable difference in the external fuselage shape of new Sabre. The wing of the Sabre 5 has a "hard" leading edge, the slats of the Mks. 2 and 4 having been eliminated. The leading edge has also been extended at the root by 6 in., tapering to 3 in. at the tip. The new wing has small boundary layer fences on the leading edge of each wing, at about 2/3 span.

CANADAIR SABRE

Photos
J. Griffin

Mountain View
22 July 1971

71-15-7

71-15-8

Photos.
D. Kennedy

Bloomfield, Ont.
8 September 1975

Photo J. Griffin

Mountain View

22 July 1971

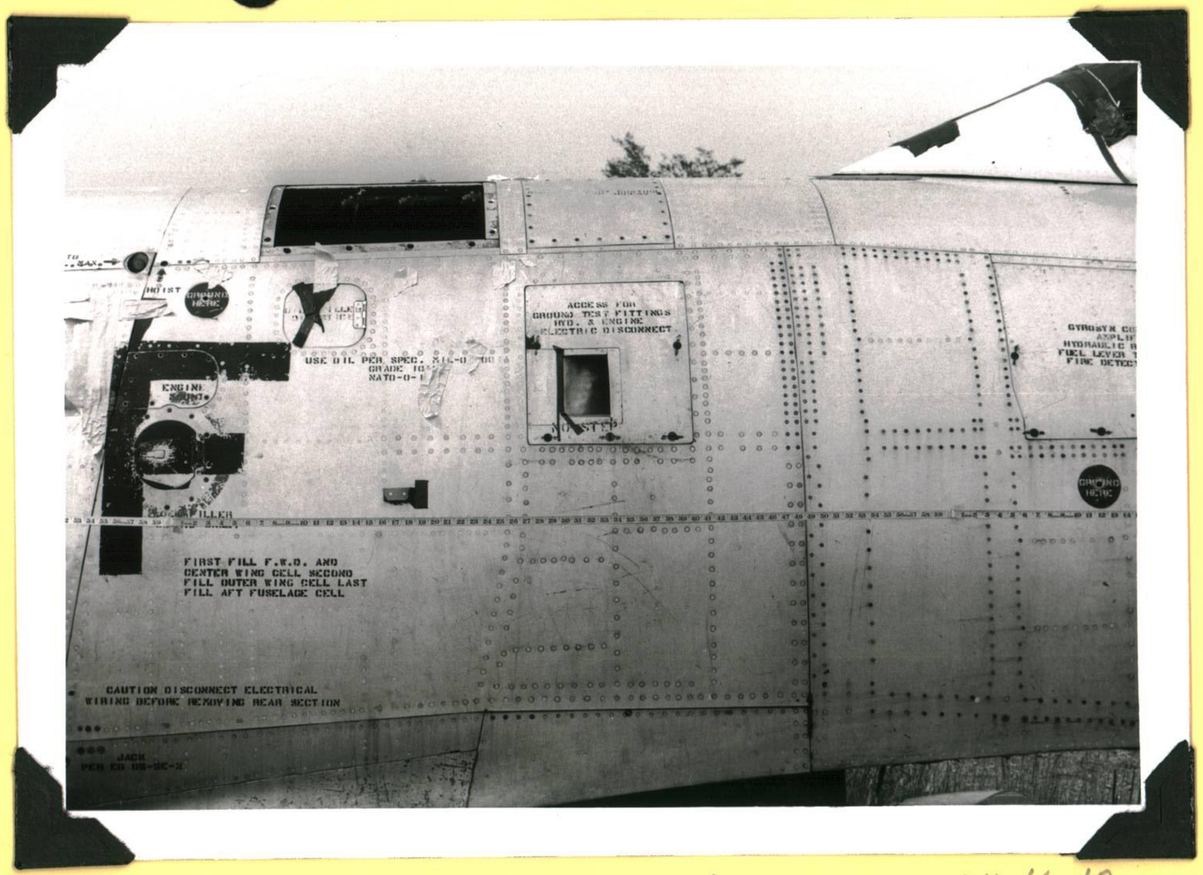
Sabre 23283

71-16-7

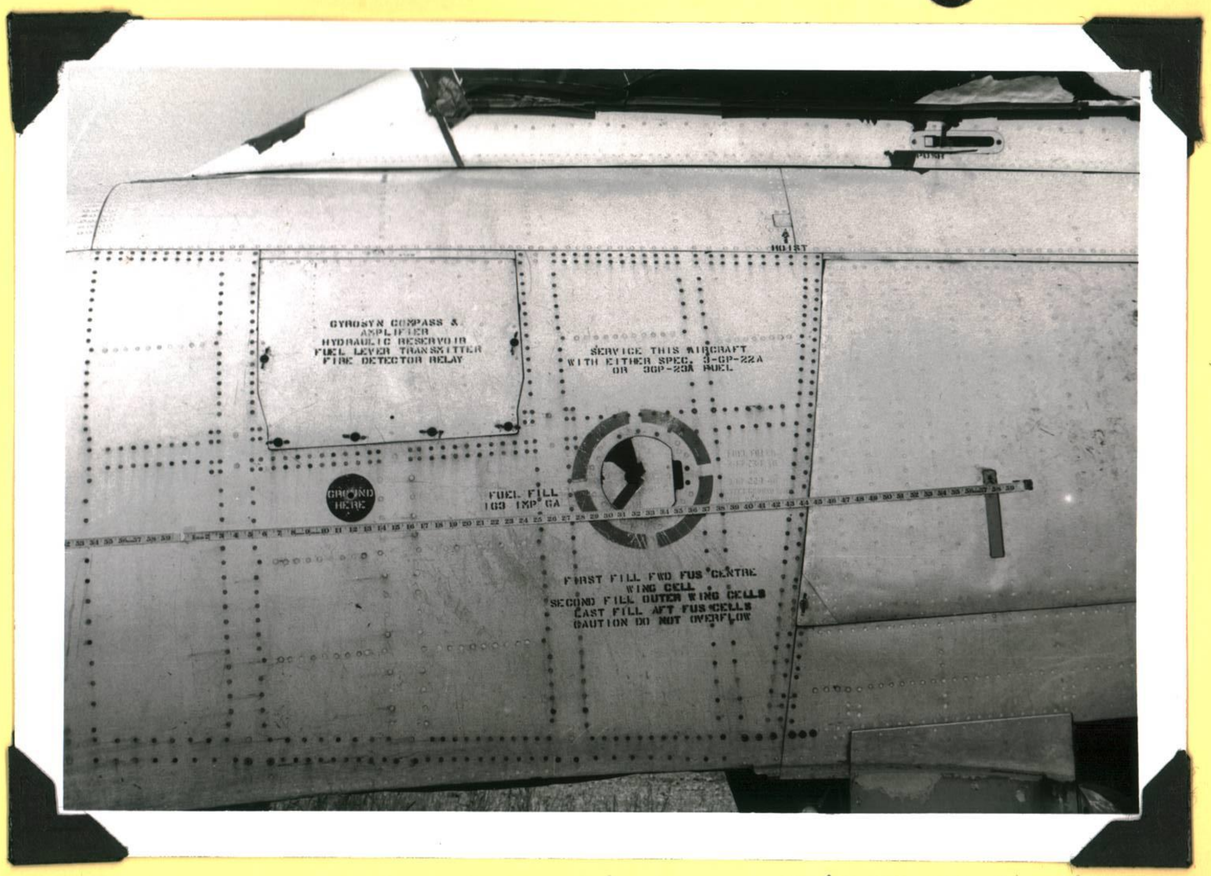
71-16-8

71-16-9

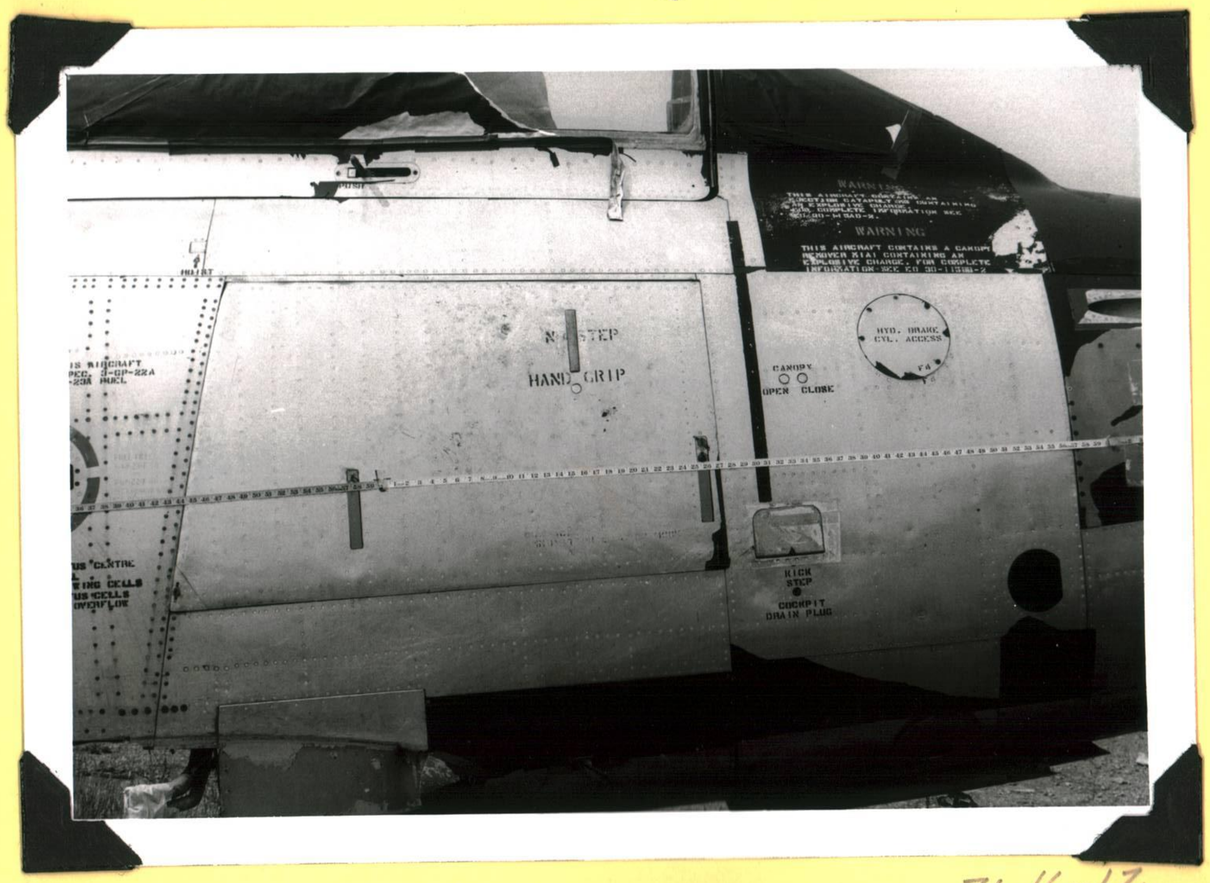
Photos J. Griffin



Sclare 23283 right side 71-16-10



Mountain View, 22 July 71 71-16-11

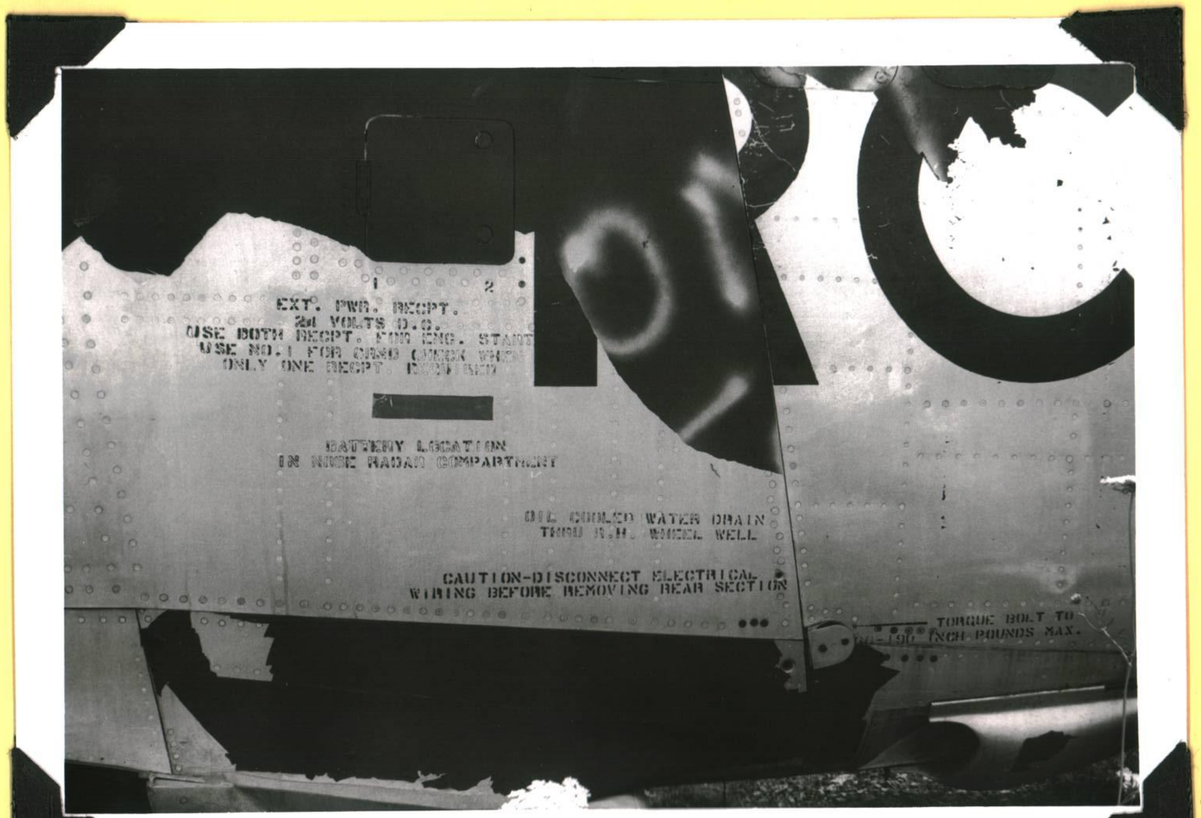


71-16-12

71-16-13

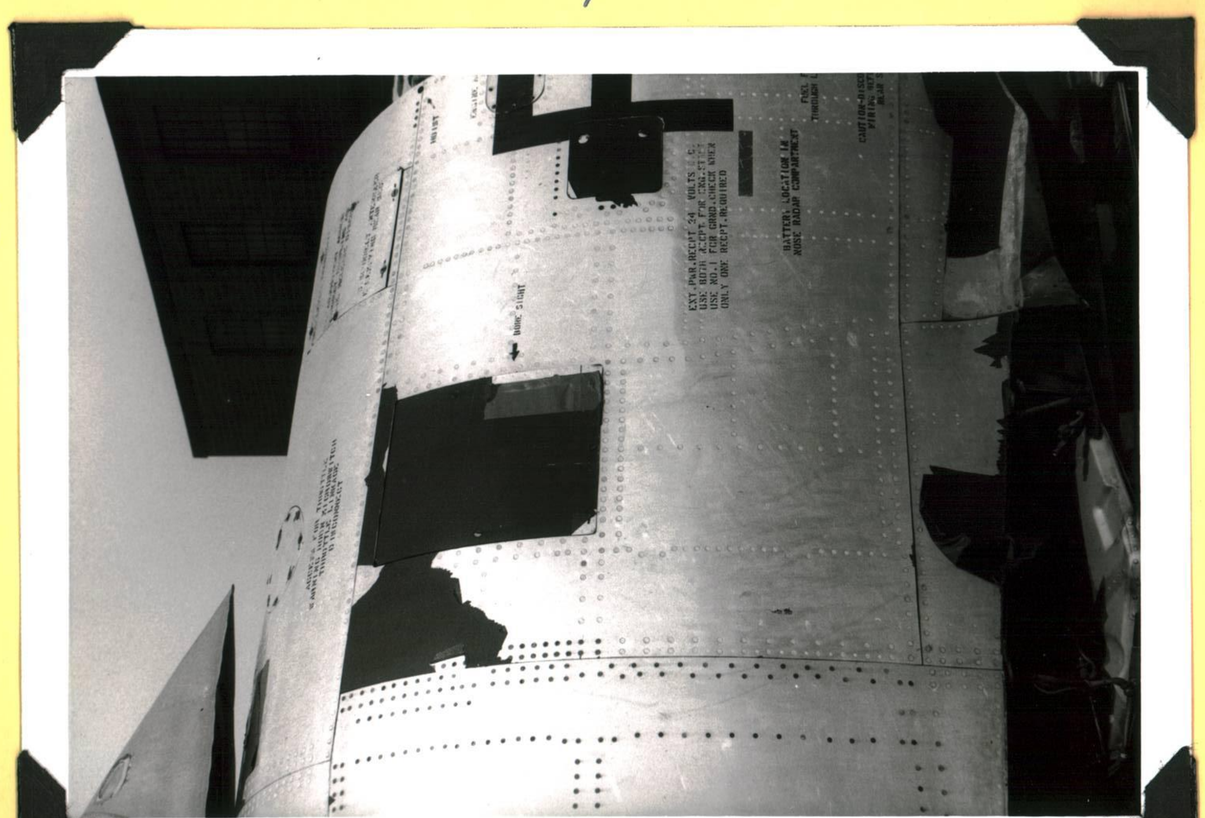
Sabres 23280 and 23283 71-15-19

Mountain View 22 July 1971 71-16-6



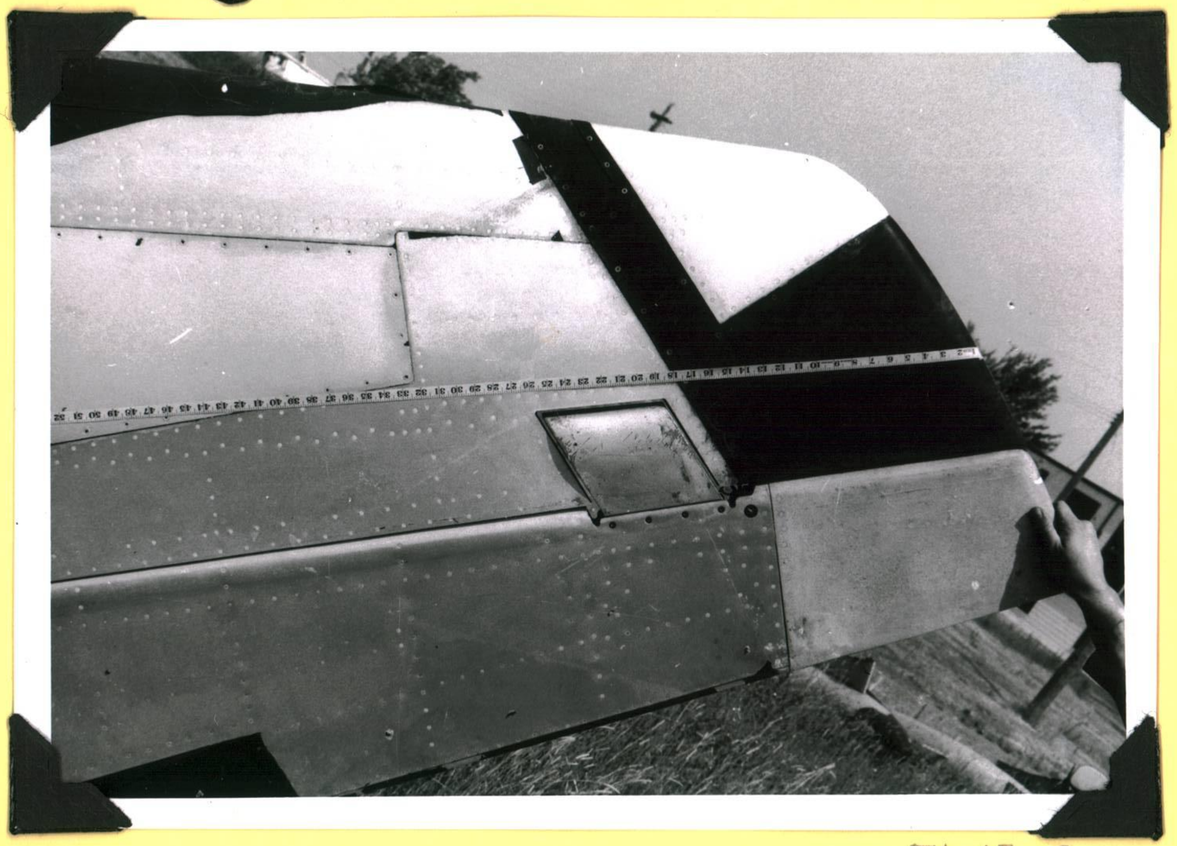
23283 71-16-5

23283



71-16-4

Photo J. Griffin



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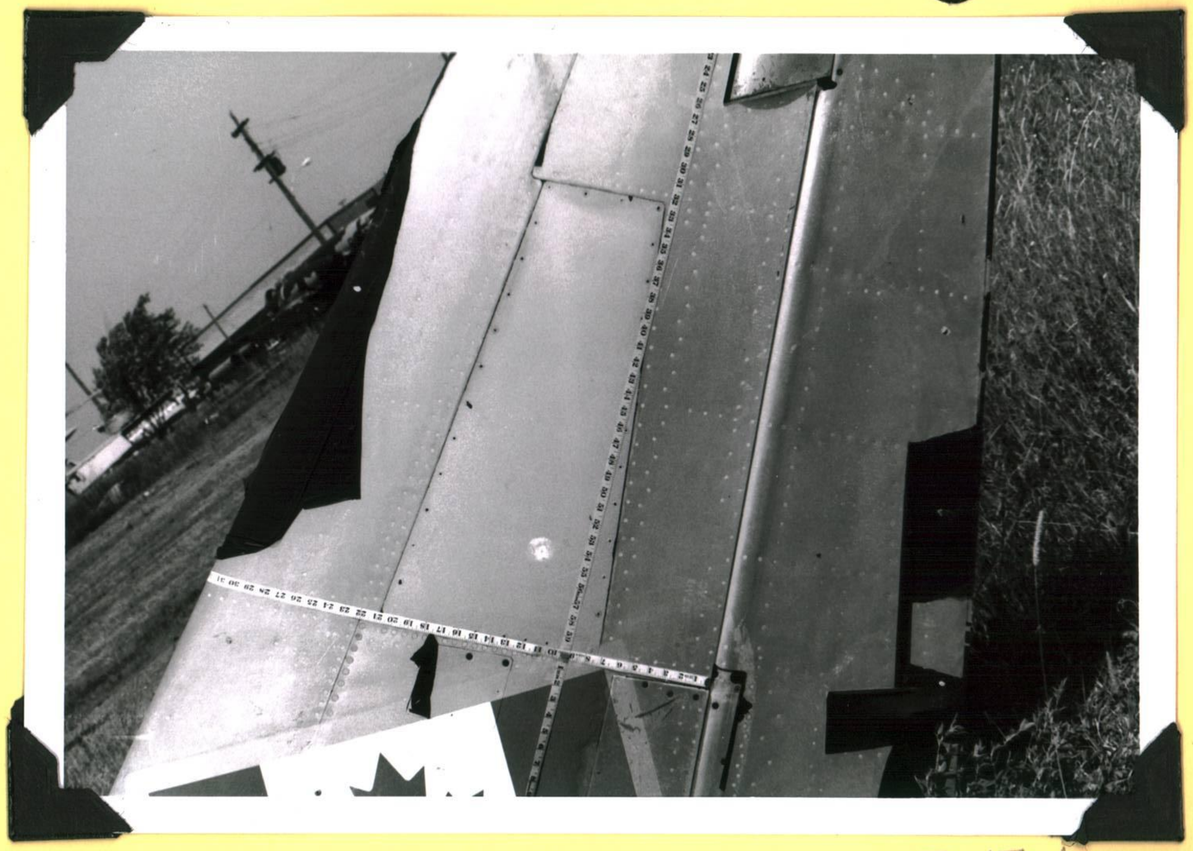
Mountain View 22 July 1971



71-17-1

Fin of Sabre 23268

71-17-2

71-17-3

Photos
H. Tate Collection

23190

Sabre 6

Canadair Sabre 411 Sqn.

Photos :-
K. Molson

#23350

Trenton
May 1959

Trenton
May 1959