Research Notes on the

F-86 / Canadair Sabre

Compiled by John Griffin

Part 2/2

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THE HAWKS MEET THE 'MISSILE'

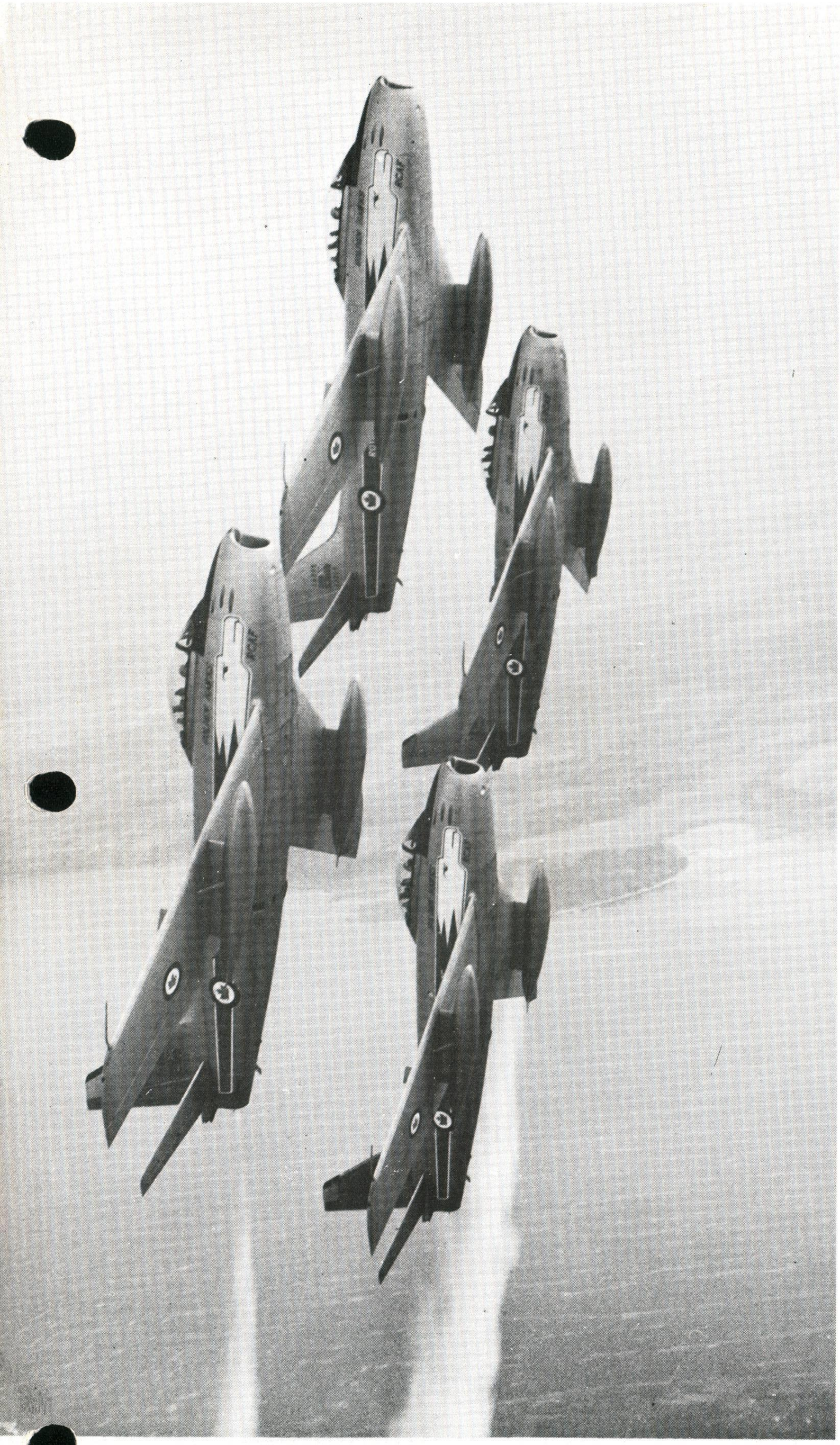


THE GOLDEN HAWKS

BY

SQUADRON LEADER

R. M. L. BOWDERY



Straight up over Lake Ontario, the Golden Hawks put their gleaming Sabres through the paces which have won them a permanent place in the affections of all air-minded Canadians.

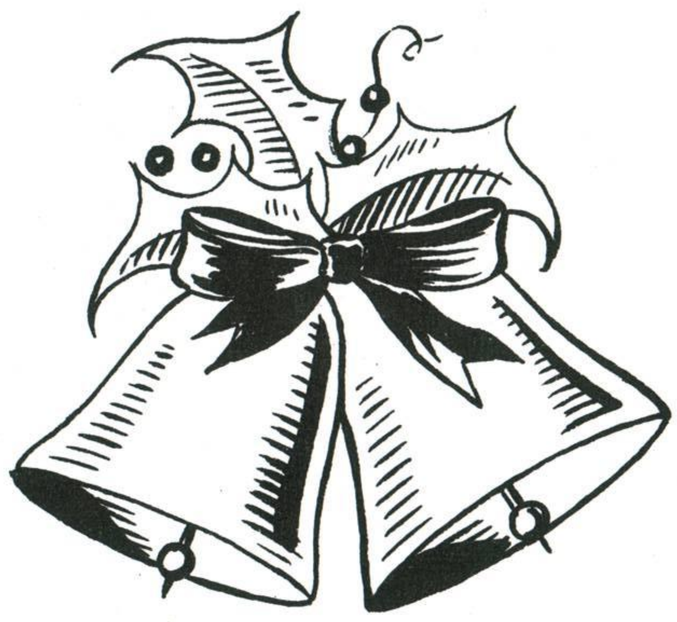
Messages de Noel

atteindrons si nous persévérons dans nos efforts. La plus joyeuse des fêtes chrétiennes vient raviver notre espérance de voir un jour régner la paix et la bonne volonté parmi les hommes.

J'espère que tous et chacun d'entre vous passerez un joyeux Noël et je souhaite que votre bonheur soit encore plus grand au cours de la Nouvelle Année.



(Pierre Sevigny)
Ministre associé de la Défense nationale



DURING THIS joyous season, our thoughts turn from the military preparations that ensure peace to the assertion of faith that eventually peace will prevail on earth as a direct result of the fellowship and goodwill of mankind.

It seems particularly fitting at Christmas to recall that the aim of the Royal Canadian Air Force is the maintenance of peace. We strive to help prevent war so that there will be time to work out peaceably the problems that now beset many countries.

As the New Year approaches, we have renewed confidence that the prospects for lasting peace are growing brighter.

This is the time of year when family gatherings take on added meaning. It is always a matter of regret to me that some of our members cannot be with their families on Christmas Day and New Year's Day. I wish to send to you who are separated from your families, and to your loved ones, especially warm greetings.

I hope that this will indeed by a Merry Christmas for all members of the Royal Canadian Air Force and their families and that the New Year will be filled with peace and happiness.



(Hugh Campbell)
Air Marshal, Chief of the Air Staff.





The Golden Hawks

THE GOLDEN Hawks made their first public appearance at RCAF Station Trenton, Saturday May 30. The Hawks are the RCAF's newest jet aerobatic team which is scheduled to perform before crowds from Sydney, N.S. to Courtnay, B.C. during the coming year. The name Golden Hawks is in recognition of this year being the golden anniversary of powered flight in Canada. In addition, the team is acting as a focal point for ceremonies marking the RCAF's 35th anniversary.

The team is composed of six men; four of whom will fly in the formation, one who will do solo aerobatics, and a stand-by. Reason for having a stand-by man is to allow for any possible post take-off unserviceabilities which might find one of the team with the wheels remaining down, or some other minor trouble. Thus the stand-by man must be capable of filling any one of five positions on seconds notice.

Veteran Jet Jockeys: Chosen with a great deal of care from a volunteer list of highly qualified pilots, the Golden Hawks between them possess a wealth of jet flying and formation aerobatic experience. Leading the team is Squadron Leader Fern Villeneuve who has nearly 3000 jet hours and the experience of two previous aerobatic formations behind him. He held a commercial pilot's licence before joining the RCAF in 1950, and represented the Ottawa region in the Webster Trophy competitions for amateur pilots in 1949. After graduating from flying school with the RCAF, he was sent onto Vampires at the fighter OTU at Chatham. Later he went to 441 (F) Squadron at St. Hubert, P.Q. where he converted to Sabre aircraft. He accompanied the squadron to North Luffenham, England, in 1952.

Flight Lieutenant Ralph Annis, who flies the solo Sabre act with the team, is another veteran of North Luffenham. Later he was a flight commander with the Overseas Ferry Unit, making 15 trans-Atlantic jet flights. F/L Annis in 1956 set the present trans-Canada speed record by leading a pair of Sabre 6's from Vancouver to Halifax in an elapsed time of 5 hours and 30 seconds.

Other members of the team include: Flight Lieutenant Jebb Kerr (number 4, or "box" man); Flight Lieutenant Jim McCombe, number 2; Flying Officer Ed (Rosy) Rozdeba, number 3. Spare is Flying Officer John "JT" Price. With the team as ferry pilots and spares if required are Flying Officers Bill Stewart and Jim Holt.

50th ANNIVERSARY OF FLIGHT IN CANADA

1909 1959 Golden Anniversary of FLIGHT IN CANADA

—a milestone that marks a revolution

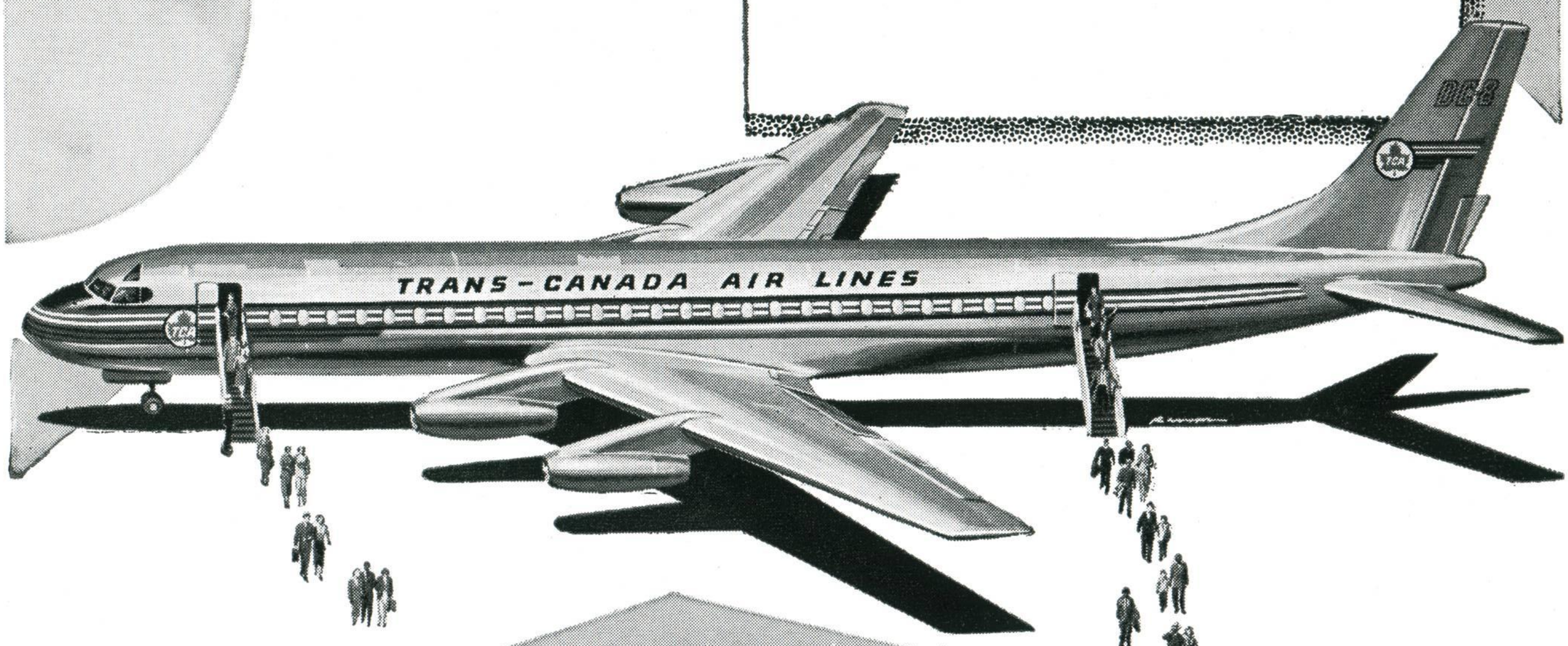
TCA

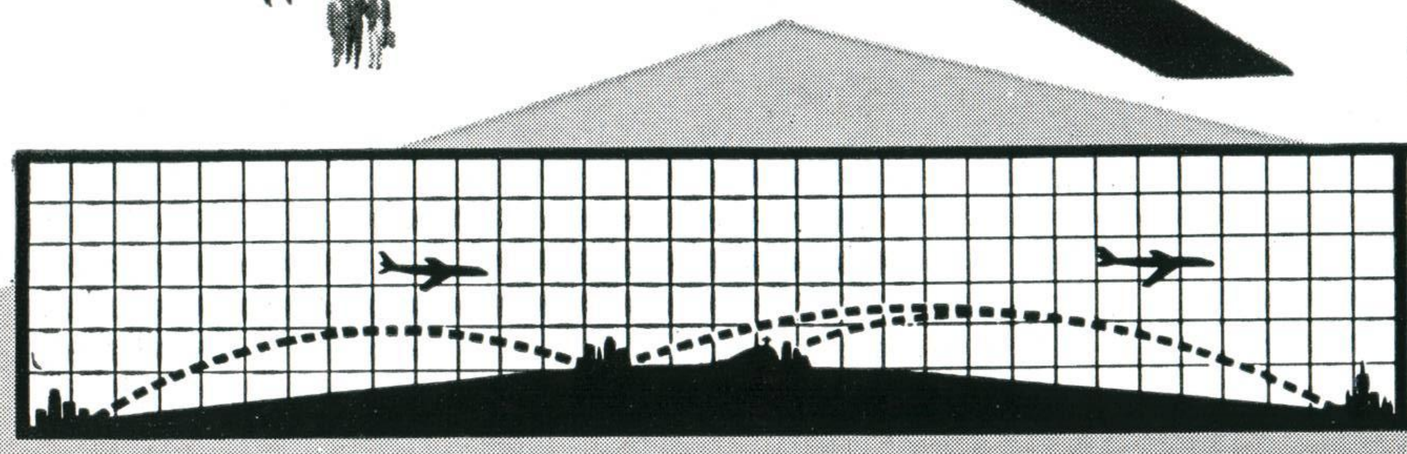
to be world's first intercontinental airline to operate all-turbine fleet

As Canada celebrates its GOLDEN ANNIVERSARY of FLIGHT, TCA is proud to have played an important part in this fifty years of history. 28 years after the "Silver Dart" made its first flight, TCA flew its first passenger service in a 10-seater Lockheed. The route mileage, Vancouver-Seattle, was 122. From this modest beginning, the story has been one of steady progress. Today, TCA flies over 32,000 miles of world air routes, serving 57 communities.

Next year, TCA will introduce 127-seater, 550 m.p.h. DC8 jetliners, powered by Rolls-Royce Conway turbo-jet engines. Shortly after, new prop-jet Vanguards will go into service on TCA's high density inter-city and Southern routes.

With these two new types, and the famous Viscounts, TCA will become the first intercontinental airline in the world to operate an all-turbine fleet. TCA plans to stay in the front rank of world airlines.





Specimen DC-8 flying times – Vancouver to Toronto, 4 hours 10 minutes, Montreal to London, 6 hours 10 minutes.

TRANS-CANADA AIR LINES

one of the world's great airlines



Since their first public appearance at Trenton, Ont., on May 30, the Golden Hawks have been seen a number of times at other centres in Canada. Here they wheel in diamond formation during a practice session.

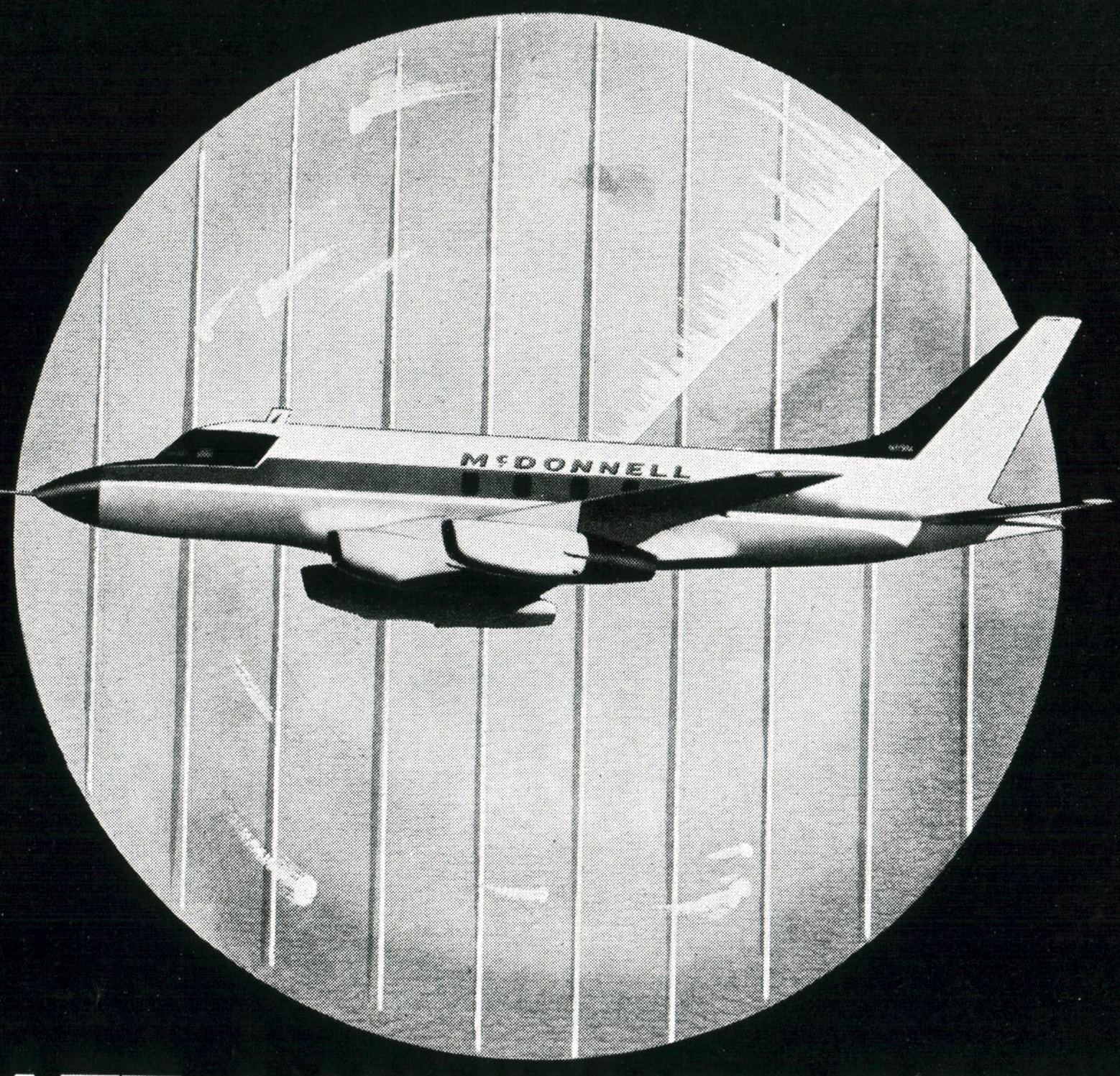


The Golden Hawks return to land at Chatham air base after a practice aerobatic trip. Team can land either in this box, or do a spectacular break-out-of-box when in the pitch position over the runway.



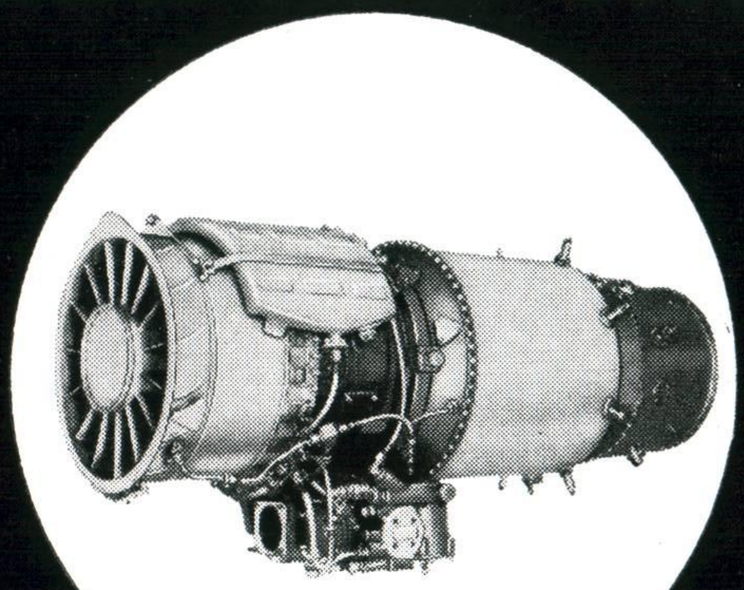
Team gathered at Model A Ford belonging to F/L Jim McCombe (at wheel). L to R: on hood, F/O Bill Stewart, F/O Jim Holt; in front, F/O J. T. Price, S/L Fern Villeneuve, F/L Ralph Annis, F/L Jeb Kerr, F/O Ed Rozdeba (on bumper).

McDONNELL SELECTS



PRATT & WHITNEY POWER FOR MODEL 119B TRANSPORT

Most advanced power plant in its thrust class, Pratt & Whitney Aircraft's JT-12 turbojet has been specified by McDonnell Aircraft for the Model 119B Transport. The choice, as in so many other cases, was dictated by low fuel consumption, a 7 to 1 thrust-to-weight ratio, and Pratt & Whitney Aircraft's reputation for reliability.



McDonnell's judgment in selecting the JT-12 is confirmed by other outstanding airframe manufacturers. Pratt & Whitney JT-12s power Canadair's CL-41 basic trainer, North American's Sabre Liner and Lockheed's Jetstar transport. Republic Aircraft and Fairchild Aircraft also use the engine to power advanced missiles.

Canadian Pratt & Whitney

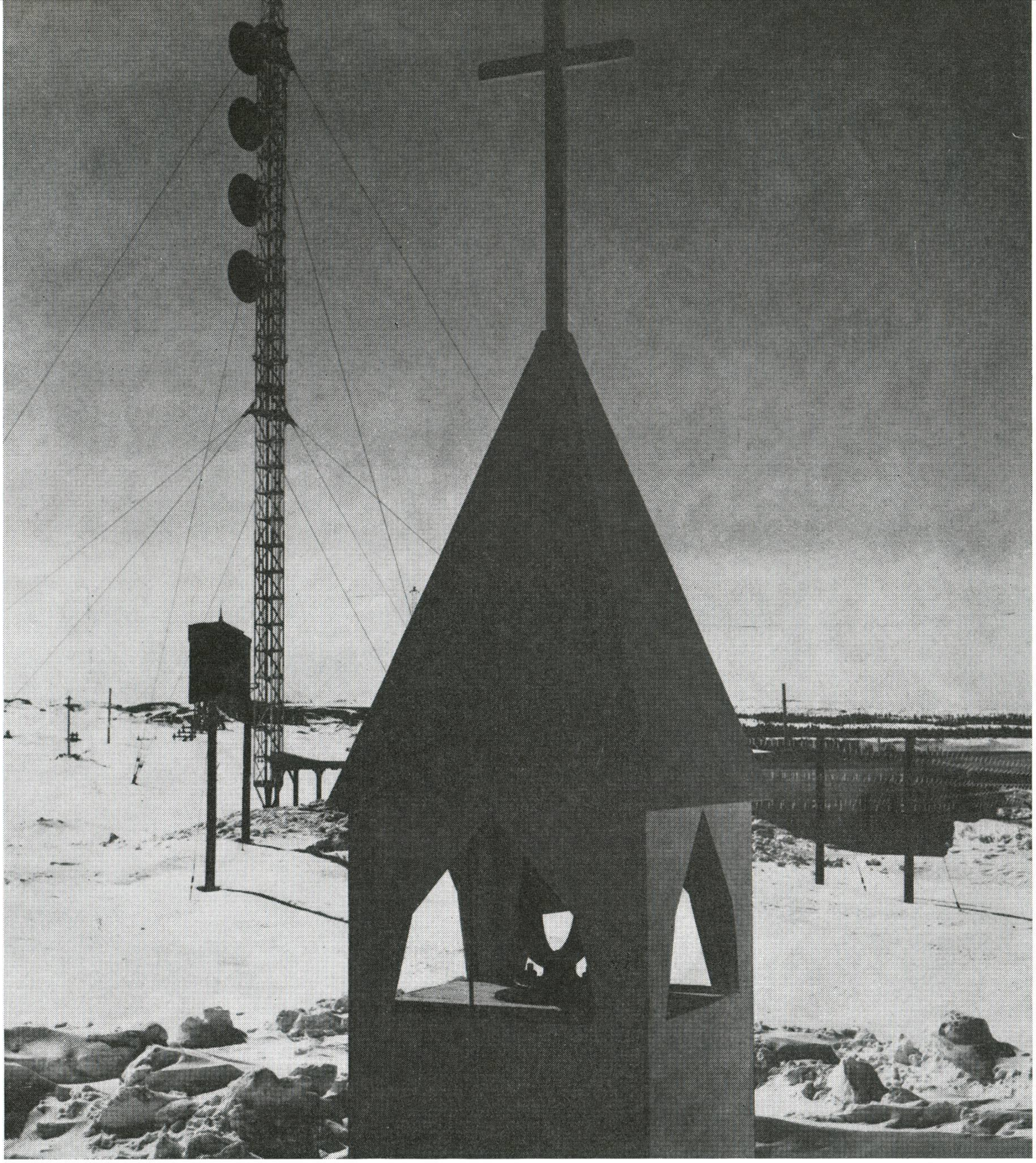
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THE Roundel

VOL. 11, No. 10 DECEMBER 1959



Microwave tower and chapel steeple stand side by side against the northern Canadian sky at RCAF Station Great Whale River on the Mid Canada Line.

Christmas 1959 will be observed by RCAF personnel in widely scattered parts of the world. Those on U.N.E.F. duty are stationed practically next door to the birthplace of this solemn religious festival, others are in Europe, the U.K. or U.S.A., and many in Canada (see above) are still far from the particular spot they regard as home.

To all readers, wherever they may see this magazine, we extend sincere season's greetings.

The Roundel Staff and Editorial Committee.



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(*Hugh Campbell*)
Air Marshal, Chief of the Air Staff.



Warming up over Chatham, N.B.

CHAPTER ONE of this story was written 28 years ago. In 1931, when the Royal Canadian Air Force's first touring aerobatic team was formed, fabric-covered, twin-winged *Siskin* aircraft visited cities and towns across the country, treating thousands to their initial taste of aerial gymnastics.*

Early in 1959, to commemorate the RCAF's 35th Anniversary and Canada's Golden Jubilee of Powered Flight, the Golden Hawks were born. During this year, they have proven worthy successors to the *Siskins,* as they retraced the route of 28 years ago and thrilled a public now attuned to the jet age.

The name for the team came easily, but not so the shade of gold for its svelte swept-wing *Sabre* aircraft. Only after long and critical experimentation came the final colour-scheme decision and the Golden Hawks' *Sabres,* in their now well-known livery, began to roll out of the paint shop at Number 6 Repair Depot in Trenton.

Meanwhile, at the *Sabre* Operational Training Unit at Chatham, S/L J. F. Villeneuve had made a painstaking selection for his team from the 18 or 20 volunteers who possessed the stringent qualifications necessary to join the Golden Hawks. These men, all post-war trained, were well schooled in modern operational flying techniques; all had completed a tour in No. 1 Air Division in Europe; most of them had done formation aerobatics before reporting to the team captain for evaluation, and all were proficient at solo aerobatics.

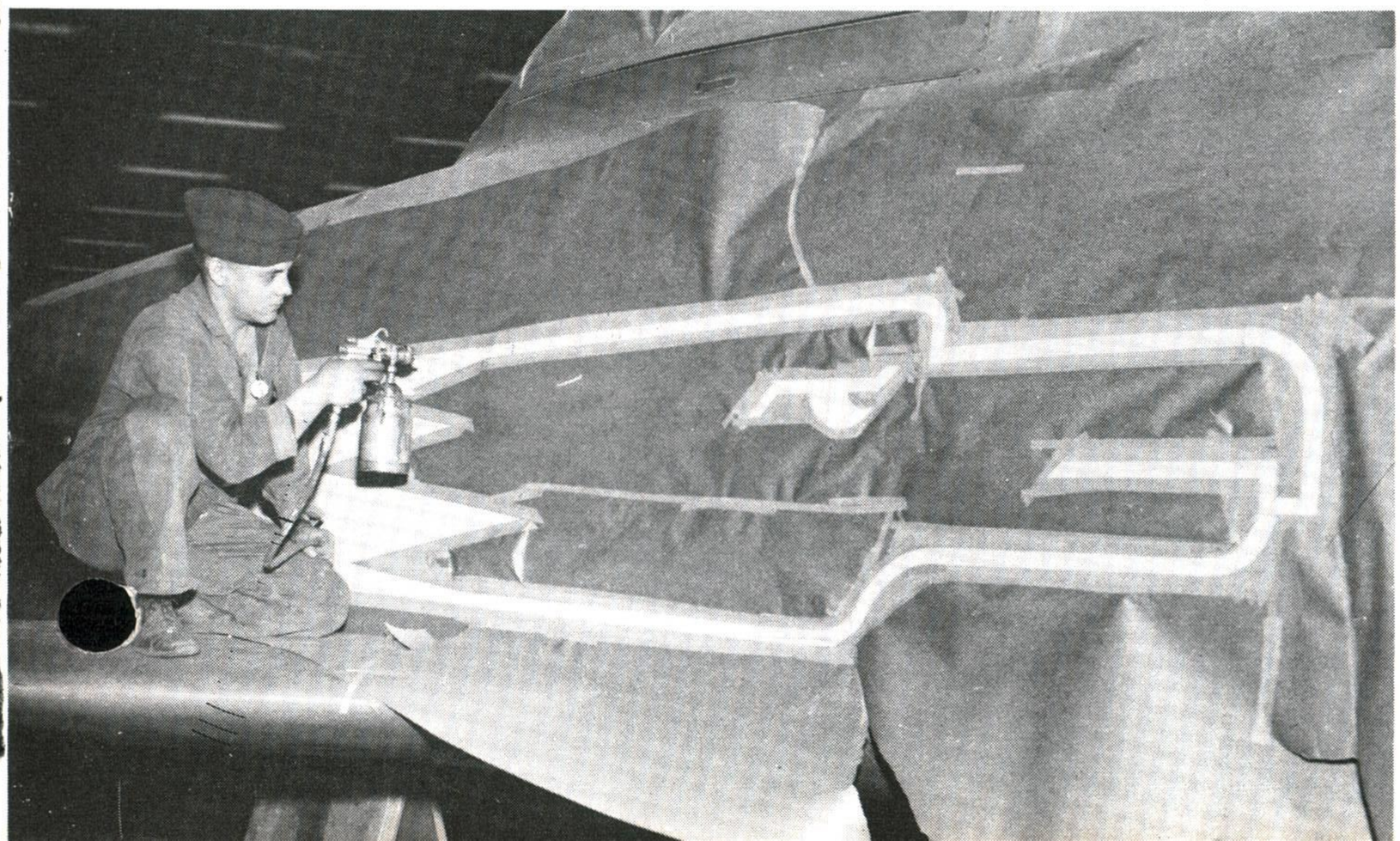
*The Roundel, Vol. 10, No. 7 (Sept. 58)

The author, currently stationed at Trenton as Air Transport Command Staff Officer Public Relations, accompanied the Golden Hawks this summer as tour PRO.

During his 20 years of RCAF service, S/L Bowdery has had a wide variety of assignments, both on the ground and in the air. Enlisting as an airframe mechanic in 1939, he remustered to aircrew in 1942, received his pilots wings at Yorkton, and later flew Liberators on operations in the Far Eastern theatre. Since the war, his duties have included administrative posts from Vancouver to London, England, and a tour of flying at Winnipeg. He graduated from RCAF Staff College in 1958.

PREPARATIONS

His selection completed, S/L Villeneuve began a gruelling flying schedule—three trips a day, six days a week while weather warranted. When the weather 'clamped' the pilots discussed their aerial manoeuvers until each and every motion became second nature. The team had only a scant two and a half months in which to prepare for their first scheduled public performance. G/C N. W. Timmerman, commanding officer of the fledgling Hawks' nest, kept a watchful and fatherly eye on the team's progress. 'Big T', as he was respectfully referred to (in absentia), would be down by the tarmac every afternoon around 1630 hrs., watching the Hawks' final daily practice which they carried out over the station runways. Immediately after landing,



LAC D. R. Edgington gives an F86 the "golden look".



Bomb-burst, one of many spectacular manoeuvers.



The Golden Hawks' maintenance crew watch and wait for their charges to return from an exhibition. Members wore white coveralls and gold caps during the tour.

the Hawks with ruffled feathers were an unapproachable bunch, rapidly recounting their own and their partners' errors with gestulations and gusto.

Slowly, and then seemingly in one swift rush, the team fell into place. The diamond loops became smooth and sure, the rolls looked lazily competent. The Golden Hawks had found their wings; their matchless flying in close-knit formation took on that aura of ease which marks the master craftsman in any trade. These men had now become the precision flying team that would awe Canadians from coast to coast. Three things had prevailed to make them so: opportunity, ability and practice.

GOAL: PERFECTION

Fern Villeneuve, a quietly modest man except when talking flying, has a penchant for perfection. His own flying is flawless and he demanded the same from his teammates. They delivered, and quickly, for all were as anxious as he to have the Hawks ready for their public debut.

In the shadow of the swooping diving Hawks, the important work of the groundcrews never ceased. Cigar chewing F/O Ray Grandy, the team's engineering officer, pressed his men for their utmost. Competent NCO's such as FS Tousignant, Sgts. Latraverse, Metcalf, Johnson and Campbell, figuratively cracked the whip. Pilots and groundcrew alike had the same goal: perfection.

But perfection on the ground wasn't achieved any more easily than it had been in the air; long hours of overtime were demanded from and worked by the teams' technicians, willingly and without complaint. In early April the team's golden aircraft began to arrive in Chatham. Up to this time the Hawks had been flying Chatham-based *Sabres,* with distinguishing yellow numbers in place of the station's normal black. Now the liveried MarkV's were being delivered by 129 Acceptance and Ferry Flight pilots or by members of the team who had previously flight-tested these aircraft. The new arrivals were torn apart and put together again by the careful Golden Hawk groundcrews. Eventually, when the golden *Sabres* were rolled out into the brisk New Brunswick air they were well and truly "accepted".

PLANNING THE ROUTE

The route that the team would follow was gradually fashioned by W/C J. F. 'Jake' Easton, designated by the AOC Training Command, A/V/M J. G. Bryans, as the commanding officer of the RCAF Display Team. This team included not only the Golden Hawks, but also the replica *Silver Dart* and its crew under F/O C. V. Walker. W/C Easton seemed tireless as he literally flew from one coast of Canada to the other and back again, meeting with civilian committees and COs of stations where the Hawks would perform.

Gradually, bit by bit, the pieces began to fit together. The team began to fill out; the Hawks had feathers, now they were growing beaks and feet as well.

The flying Hawks had invited comment and criticism from one

and all, and they themselves were their own hardest taskmasters. By early May they were ready for their first big test: an AFHQ command performance at RCAF Station Rockcliffe on 11 May. Six men made their way with measured steps to their waiting *Sabres*. Quickly and efficiently they settled themselves in their seats and for the next 22 minutes proceeded to dash through the air in the same aerial routine that they would perform so many more times in their cross-Canada tour.

To call the tune at this performance was another man whose palms were wet with sweat as he talked the team through each manoeuver, every loop and roll, each formation change. The excitement in his voice was contagious, as he directed attention "to the right and to the left of this display area where the co-ordinated solo aircraft are approaching each other at a combined speed of nearly 1200 miles per hour." F/O G. L. MacDonald had found his place on the team. He was to be the Golden Voice of the Hawks throughout their cavalcade. A commentator of superlative ability, F/O MacDonald never lost that breathless excitement that added so much to the Hawks' performance.

THE TOUR BEGINS

Two days before their first scheduled show, the Hawks arrived in Newfoundland in brilliant sunshine and then spent two miserable days sweating out the weather. 16 May dawned raw and damp but with some promise of improvement. However, the capricious Newfoundland fog finally decided the issue and the opening performance was regretfully postponed.

On Sunday the weather relented and the premiere of the Golden Hawks was held at Torbay, albeit a day later than promised. Spectators had been gathering all morning at the airport to witness their own aerobatic team in action. The team was just as anxious as the audience. The take-off was delayed once, twice, three times until at last the clouds broke and the Hawks unfurled their feathers to thrill the people of Newfoundland who had come to watch. At the end of the show, as the Hawks swept low over the field in one last farewell, a roar of applause rose from the crowd below.

You might say that from that day the team 'never looked back'.

Their schedule was a tough one. Originally booked to appear for 58 shows, the Hawks in actual fact did 65 official performances during their four-month tour. Not that this worried the aircrew; F/L E. J. Rozdeba continually campaigned for a tighter and tighter schedule, until he was dubbed 'Three-a-day Ed' by the rest of the team.

AVIATION HISTORY

When A/M Hugh Campbell, Chief of the Air Staff, decided to form the Golden Hawks as a centre piece for Canada's anniversary year celebrations, other significant decisions were also made. For the first time since the inauguration of Air Force Day in 1947, air force stations held their Air Force Days on different dates instead of on the time-honoured second Saturday in June, allowing them to build their shows around the Golden Hawks. In addition, in many of the larger centres, civilian 50th Anniversary of Flight Committees were formed to organize appropriate commemorative events. And what better way to do this than to have the Golden Hawks provide the emphasis with their whistling jets?

And so the schedule grew—from Torbay to Trenton, to Camp Borden to Kingston to Rockcliffe, and from there to Val d'Or, "The Valley of Gold", where the kind people of northern Quebec proved a most enthusiastic audience. The weather was perfect as the Golden Hawks slipped noisily in and out of their arena, with each entry winning new acclaim from the watching crowds below. Old-time bush pilots Frank Young, Tim Sims, Arthur Fecteau, Rene Vachon, Babe Woolett, Kelly Edmuson and Pat Twist were in Val d'Or at the time to receive accolades for their pioneering the area from the air. After seeing the Hawks, Frank Young said, "These are the men who should be honoured; they are making aviation history here today."

A record crowd was present at Val d'Or's Aviation Day. The Golden Hawks continued to play to record crowds at many spots across the dominion.

AERIAL DRAMA

The Golden Hawks aerial proficiency was dramatically brought to public attention when F/O J. T. Price, one of the solo pilots, struck a seagull while flying at over 500 miles per hour, a scant 800 feet above Bedford Basin near Halifax. The impact shattered his windscreen, disintegrated the canopy and tore the visor from his helmet. Flying debris momentarily blinded F/O Price, but he managed to right his aircraft, hold it on a steady course and announce to his flying partner, F/L R. E. Annis, "Hey, Ralph, I can't see—I just hit a bird and I can't see, buddy".

Ralph roared up beside his injured partner and coached him through his first few moments of shock, until John had a chance to clear his face of blood and feathers. Together they flew to the Dartmouth airport where John skillfully landed his damaged aircraft and taxied it to the ramp. In the meantime, F/L Annis had zoomed back to the display area at full bore and then, reminiscent of a Bugs Bunny film where the talented rabbit plays tennis with himself, flew the last few maneouvers that were normally flown by both him and his injured partner.

The team's tour of the Maritimes continued without further incident, through appearances at Greenwood, Summerside, Fredericton, St John's and Chatham. At Fredericton the ceiling was too low for the team to do their full show, but they put on a stirring "flat show" in which the formation team displayed various formations to the crowd while the two solos flew by in their varied rolling manoeuvers. At the conclusion of the display F/L J. D. McCombe, who comes



The Hawks were made honorary warriors of the Kineani Tribe.



Sgt. N. Johnston and LAC D. Edgington ponder possible use of Abacus for calculations on the Golden Hawk maintenance line. The Chinese gadget was on display at the P.N.E. in Vancouver.

At the Calgary Stampede drum majorettes Jean and Barbara Lounsbury demonstrate precision drill to precision flyers F/L R. Annis, F/L J. McCombe and F/O J. Price.



from Fredericton, landed his aircraft while the rest of the team returned to Greenwood.

The crowd was so overwhelmed by the fact their own Jimmy was one of these precision pilots that they broke through the restraining barriers and over 1500 people crowded around Jim's aircraft. F/L McCombe is a retiring young fellow and he was momentarily taken aback by this enthusiastic show of admiration. However, he soon rallied and began shaking hands and signing autographs until rescued some 20 minutes later.

Outright adulation of the Golden Hawks was evidenced at more than one point in their tour; at Rockcliffe for instance, autograph seekers broke down snow fences which had been erected to keep the crowd back from the active flight line.

TIGHT SCHEDULE

The team's busiest time during their tour was in early July. On Dominion Day they did a show at St John's and another at Summerside, hopped to North Bay on 2nd July, carried out a fly-past through

the "Porcupine area" on the 3rd, flew a show at Falconbridge and a show at North Bay on the 4th. That same evening they flew to Portage la Prairie and on to Calgary the next morning in order to do a show at the Calgary airport on the afternoon of 5th July.

Calgary won the Hawks over completely; during Stampede Week everyone is young and the Hawks entered into the spirit of the time with enthusiasm. Calgary was also the scene of the tragic death of F/L G. J. Kerr. This unfortunate accident struck the rest of the crew deeply; each and every one felt the passing of Gebb Kerr to be a keen personal loss.

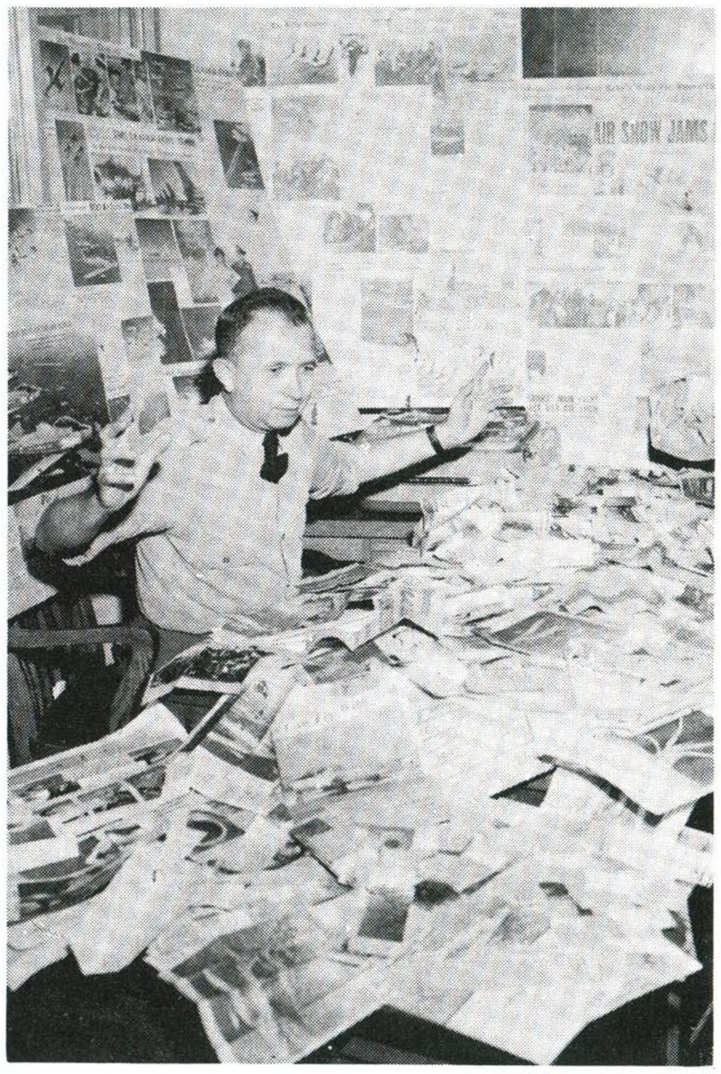
Calgary during this time was a city of sympathy. Friends and associates of the Golden Hawks were quietly helpful. The mayor himself, members of the committee, and the Stampede Board all were understanding in a firm masculine manner which the Hawks appreciated. If any city has top place in the Hawks' affections it is Calgary, and deservedly so.

True to the oldest tradition, the show went on. The Hawks played to a crowd enjoying barbecued elk at Rocky Mountain House, they performed for west coast crowds at Victoria and Comox, and at the Pacific National Exhibition in Vancouver—F/L Annis flying the slot position, F/Os W. C. Stewart and J. A. Holt alternated in the solos with F/O Price.

CLIMAX

At the Canadian International Air Show in Toronto, the USAF Thunderbirds and the Golden Hawks flew aerobatic demonstrations each day. On Saturday morning before their final show, both teams took to the air and joined up to form the first international jet aerobatic team to fly in Canadian skies. Flying in a Thunderbird *T-33* to record photographically this unique event was Corporal George Hardy, the Golden Hawks' official aerial photographer.

With their tour drawing rapidly to a close, the pilots were pressing for additional commitments. Rumours that they might be growing 'tired' and were perhaps in need of a rest were greeted with derision. The announcement that the team would appear at the Eastern States Exposition in Springfield, Mass., and at Kincheloe Air Force Base in Michigan was accepted as a reprieve.



"A million dollars worth" of publicity clippings is surveyed by WO2 C. A. Raizenne at AFHQ public relations directorate.

The team's final aerial demonstration was given in a cloudless sky over Kincheloe on Friday, 25 September, when an elaborate military ceremony formally dedicated that base to the memory of one of aviation's great modern pioneers, Captain Iven Carl Kincheloe.

During their four and a half months' tour the Golden Hawks had publicly performed at 65 shows in 34 different locations before an estimated 2,419,000 people.

Formed to highlight Canada's Golden Jubilee of Powered Flight, and the Royal Canadian Air Forces' 35th Anniversary, the Golden Hawks had done much more than this; the team had awakened Canada's pride in her possession of an aerobatic team second to none. As A/M Campbell stated at Trenton during the Golden Hawks stand-down parade, "I have heard nothing but the highest compliments for the superb performances of our flying team . . . The Hawks have given the 51,000 members of the RCAF an even greater pride in their Service."

Stand-down at Trenton: (l. to r.) W/C J. F. Easton, A/M Hugh Campbell, S/L J. F. Villeneuve, F/L J. D. McCombe, F/L E. J. Rozdeba.

During this anniversary year of Canadian aviation, ceremonies have been held to commemorate the 50th birthday of powered flight in the Dominion, the 35th birthday of the Royal Canadian Air Force, and the 10th birthday of the RCAF Association. As a grand finale to the year's anniversary celebrations, a combined wings parade for pilots and observers will be held at RCAF Station Winnipeg on 18 December 1959. On this occasion the wings will be presented by Air Marshal C. R. Slemon, who, 35 years ago, was a graduate in

The First Wings Parade

BY WING COMMANDER F. H. HITCHINS,
RCAF Air Historian

TWO MONTHS after the Canadian Air Force began using the designation "Royal" in March 1923, an item appeared in daily routine orders for the Training Depot Station at Camp Borden which marked the beginning of another most significant development in the history of the service. The item, in orders for 16 May 1923, listed seven university students, Cadets C. M. Anderson, E. J. Durnin, H. M. Durnin, B. C. C. Glynn, R. E. Knowles, C. R. Slemon and W. C. Weaver, who were taken on strength ("for all purposes except pay") to begin flying training. Subsequently the names of Cadets J. C. McLennan and W. O. Stevens were added to this historic course.

As originally constituted in 1920, the Canadian Air Force existed only to give refresher training, in the air and on the ground, to officers and men who had served with the Royal Flying Corps, the Royal Naval Air Service or the Royal Air Force during the Great War. No provision was made for training new pilots. Such a policy doomed the new CAF to increasing atrophy and ultimate senility. If the service was not to wither away and die new blood must be infused into it. The Air Board had given serious consideration to this problem and, guided largely by the advice of W/C E. W. Stedman, the Director of Technical Services, it drafted a scheme to draw recruits from the engineering and science schools of Canadian universities.

ROTP FORERUNNER

Briefly, the scheme was that each year a number of first year student would be selected to go to Camp Borden for training during the summer vacation. In addition to food and quarters they would receive "a small rate of pay corresponding to the amount they would probably earn while engaged on survey parties or working in factories." Their training at Camp Borden would be both theoretical and practical. In addition to learning to fly, the cadets would pass through the workshops to learn the construction of aircraft and engines and would take courses of lectures on all phases of aeronautics. The experience thus gained would be invaluable to them in their engineering and science courses and, on the other hand, the universities would continue the theoretical training during the academic terms by giving lectures on aerodynamics and kindred subjects.

After three summers of instruction at Camp Borden the cadets could qualify for their pilot's flying badge. Even if all the graduates could not find positions in the small Air Force or in commercial aviation, they would form a reserve from which a supply of pilots could be obtained if need arose. "There would thus be ensured to aviation a constant stream of the best type of young men, thoroughly trained, not only in flying, but having the splendid background of a thoroughly scientific education as well."

Candidates for the scheme were required to be members of the Canadian Officers Training Corps at their university and to have passed the practical examination for their "A" certificate before beginning training; they must also be students in a course leading to a degree in applied science, physically fit, under 21 years, unmarried, and recommended by the university's military committee. In addition to pay ($3 a day for the first term, $3.50 for the second, and $4 for the third), the cadets received quarters, rations, uniform, travelling allowance and medical and dental treatment. On completion

was certainly unfortunate, coinciding as it did with the departure for Rolls-Royce of Mr. Whitney Straight, the Corporation's efficient and hard-working deputy chairman, whose services are not directly replaced. It is to be hoped that this gap will be filled by an executive with practical experience from the ranks of the Corporation. Had such an appointment been made, it is doubtful whether the Ferguson announcement would have created more than passing interest. Indications are that Sir Miles will not devote much time to the Ferguson concern, production of whose revolutionary vehicle is not expected to begin for many months. As things stand, however, the onlooker's impression has been that the management of a major national airline with a staff of 17,000 must leave barely enough time for relaxation—let alone additional business interests.

Civil Aircraft Expenditure

IN a written reply to a Commons question by Mr. George Wigg (Lab., Dudley) the Minister of Supply, Mr. Reginald Maudling, last Monday gave a list of the sums of money spent by his Ministry since the war on the development of specific types of civil aircraft. The total amount was £26m. Details were as follows:—

Air Horse, £350,000; Apollo, £1.25m; Brabazon, £6.5m; Comet 1, 2 and 3, £4.25m; Hermes, £1.3m; Princess, £8m; Sandringham, £120,000; Shetland, £1m; Solent, £100,000; Tudor, £650,000; V.1000, £2.3m.

In another written reply the Minister stated that the decision to cancel the V.1000 and order Britannias would save public money: their cost, even when added to any expenditure incurred with the V.1000, would be substantially less than the estimated cost of developing and completing six V.1000s for the Royal Air Force.

Hawker Strike Settled

IN its tenth week, the strike at the Hawker factory at Blackpool ended last Friday after the 2,000 strikers had voted, at a meeting two days earlier, to return to work. The decision was reached with a majority of three to one.

Before the Blackpool decision was known, meetings of employees at the company's works at Kingston-on-Thames, Dunsfold and Langley had passed resolutions that they would abandon the four-week-old go-slow tactics which they had been following in sympathy with the Blackpool men.

The strike, though closely watched and debated by the unions concerned, was an unofficial one. It arose in support of a demand for a 5d an hour bonus for night work, the Blackpool men claiming that they should be put on the same basis as their southern counterparts, who receive this sum. The stoppage and go-slow are understood to have seriously held up production of Hunters. Some of the strikers are said to have lost as much as £140 in wages.

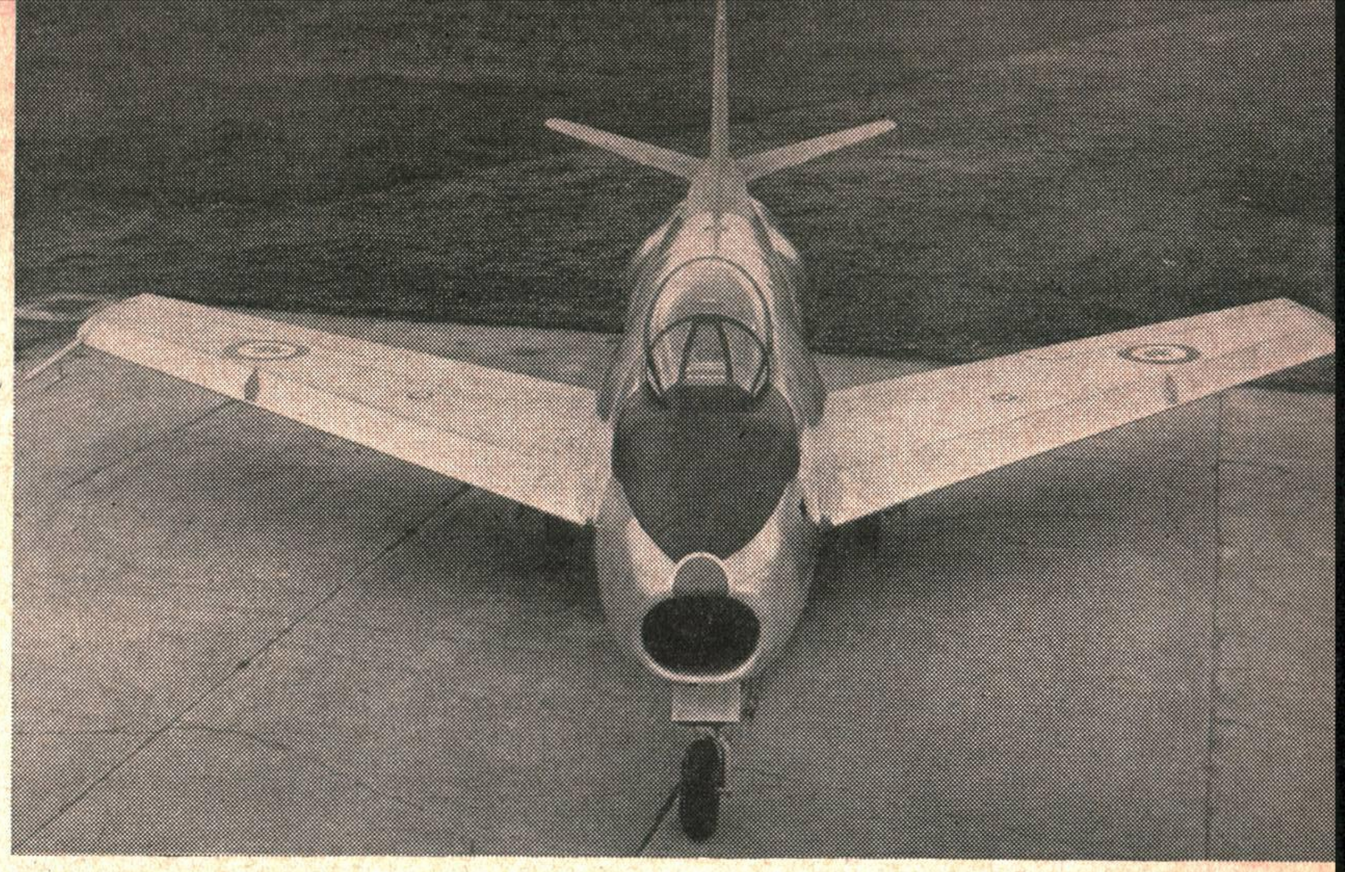
There was no sign at the week-end of settlement of another major dispute in the aircraft industry—a strike of 7,500 workers at the three Scottish factories of Rolls-Royce, Ltd. The trouble, which began over a month ago, arose because one man earned "excessive" bonus payments.

G/C. W. A. Rollason

WITH the death on November 16th of G/C. W. A. Rollason, F.R.S.A., the British flying community loses a popular figure.

William Arthur Rollason was born on June 22nd, 1899, and educated at Mundella and Clarks. Early in the 1914-18 war he joined the Army, having "adjusted" his age to do so. In 1916 he transferred to the R.F.C. and was awarded his wings early in 1917; thereupon he was posted for service in France and Belgium, where he remained until the end of the war. The war over, he entered the car business, but in the early 1920s returned to flying and did much joy-riding with Avro 504Ks and D.H.6s. In the late 1920s he was flying from Brooklands and Ford for Dudley Watt.

During 1930 he transferred his flying interests to Croydon, and in the same year formed a company known as Rollason Aviation, Ltd., offering instruction on Gipsy Moths and undertaking joy-riding with Avro 504s and later with Desoutter cabin monoplanes (he took over the first Desoutter Mk II from Marcel Desoutter for this purpose). In 1933 he purchased a D.H.84, and, with a Desoutter Mk I and a Spartan open three-seater, toured Great Britain with British Hospitals Air Pageants, Ltd., himself flying the D.H.84. At the end of the tour, in October 1933, he formed another company called Rollason Aircraft Services, Ltd., and took in as a director Mr. F. A. Kent, formerly his chief engineer. The new company specialized in overhauling Moths and engines and achieved early success. By 1936 it employed about 700 workers and was engaged, too, in the reconditioning of Hart variants and in modifying Wellesleys, under subcontract to Vickers. In the same year the company was sold to British Continental Airways, who sold it to the Hunting Group in 1939.



WAISTED SABRE: This view of the special experimental F-86 built by Canadair for the R.C.A.F. and the National Aeronautical Establishment shows clearly the "area ruled" contours of the fuselage. A Ministry of Supply statement on area rule appears on page 808.

Capt. Rollason (he was known by his World War I rank) remained with the company as director and general manager, resigning in August 1939 to rejoin the R.A.F. He was given the rank of squadron leader and was posted for duties with 43 Group, remaining with the Group until 1942, when he was transferred to Flying Training Command with the rank of wing commander. In this rank, during 1943, he joined the A.I.D. as A.D.A.I., being mainly concerned with the control of inspection at R.A.F. maintenance units. During his A.I.D. service he was promoted group captain.

When the late war ended he returned to Croydon and formed in turn three companies, first W. A. Rollason, Ltd., then Rollason Aero Engines, Ltd., and thirdly Rollason Aerocessories, Ltd. These companies are still actively engaged on sales and reconditioning of aircraft and engines, and in the design and manufacture of test equipment for the industry. They are now in the hands of G/C. Rollason's other directors, Messrs. Bennett and Millard.

G/C. Rollason leaves a widow, a daughter and a son.

Basil B. Henderson

WITH deep regret we record the death of Mr. Basil B. Henderson, an aircraft designer and engineer of note. He was born in Dulwich in 1902 and educated at Tonbridge and Caius College, Cambridge. From 1924-28 he was on the technical staff of A. V. Roe and Co., Ltd., and when that firm decided to close down the Hamble works he resigned his position and in 1928 formed, with Mr. H. A. Miles, the Hendy Aircraft Company. During 1929, in a small shed at Shoreham, Henderson and Miles constructed the Hendy 302 low-wing cabin monoplane, embodying a new type of wing spar construction developed by the former. Known as the Hobo, the little machine was a single-seater with a 40 h.p. A.B.C. Scorpion engine. There followed in 1930 the Hendy 302 cabin machine, a tandem two-seater of notably clean design, construction of which was undertaken by George Parnall and Company, of Bristol. In the King's Cup Race of 1930 the 302 was flown by Capt. Edgar Percival, who had by then joined forces with Henderson and Miles (they to do the actual design work and he to contribute practical advice), and, had compass trouble not been experienced, the machine might have secured second place.

The last design of the Hendy Aircraft Company was the Heck, completed in 1934 and technically interesting for the thorough application of Handley Page slots and trailing-edge flaps. The prototype was built by George Parnall and Co. and was taken over by Parnall Aircraft, Ltd. A small batch was put into production. The Heck was notable for its speed range of 40-170 m.p.h., and in 1935 set up a new record for the South Africa to England flight (F/O. David Llewellyn). Mr. Henderson was subsequently appointed chief designer to Parnall Aircraft, Ltd., and the last of his designs to be constructed was the Type 382 tandem-seat trainer, with D.H. Gipsy Six engine.

In the late pre-war years the company acquired the patents and pending contracts relating to Nash and Thompson armament devices—particularly turrets. It was on a Heck that one of the first wing-mounted installations of Browning guns was made in this country—an installation which provided invaluable data for the Hurricane and Spitfire eight-gun schemes.

During the war years Mr. Henderson's work was mainly concerned with Parnall power-operated turrets. Thereafter he spent a period as a consultant and in March 1950 joined Boulton Paul Aircraft, Ltd., being responsible for co-ordinating the sales of powered controls and other hydraulic devices. On leaving that company, in June 1953, he joined the Denison Engineering Co., of Columbus, Ohio.



"Flight" photograph

AUSTER J5R ALPINE

A Willing New Type for the Tropics

By C. M. LAMBERT

THE latest addition to the range of Auster aircraft, the J5R Alpine, has been specially developed for operations from high-altitude fields in hot climates. It consists mainly of the combination of the Aiglet's fuselage with the Autocar's wings; but other modifications, including more effective ailerons, have given it quite outstandingly good handling qualities and a standard of comfort better than that of other models.

The Autocar has a capacious cabin and large payload capacity, but in tropical climates and at high take-off altitudes these often cannot be fully used. The Alpine's rear-cabin accommodation is therefore scaled down while the large wing and powerful engine are retained, resulting in take-off and landing characteristics which are excellent for such operations. Yet the new aircraft is more comfortable, for the Aiglet front seat gives more leg-room and elbow-room than that of the Autocar; and deep cushions, shaped to give pleasant support in the small of the back, have been added. The fact that the full 42.5in cabin width of the Aiglet is also retained means that two large people can be very comfortably seated. A rear bench-seat will accommodate a third person. Yet both the right-hand and rear seats can be removed to make room for bulky freight or for a stretcher. There are also four adjustable ventilators which will mean much in the tropics, while sunblinds covering the whole of the roof Perspex are optional to order.

The cockpit features which made the Aiglet suitable for training flying are retained, including the guard over the front passenger's heel-brake pedals which, incidentally, make a very comfortable foot-rest.

The most remarkable improvement is the fitting of ailerons with greater balance area and modified shrouds, which make lateral control really good at all speeds—and this is in comparison with other types of aircraft as well as with previous Austers. I was particularly impressed with the Alpine's responsiveness at the lower end of the speed range. It is a really significant advance.

There are in fact two versions of Alpine, the J5R with the de Havilland Gipsy Major 10 of 145 h.p., and the J5Q with the Major 1 of 130 h.p. It was the J5R which I flew last week at Rearsby, and I was most impressed.

My first introduction to it was as a passenger, as Ranald Porteous, Auster's chief test pilot, presented it in lively fashion for *Flight's* photographer, L. W. McLaren, who was standing on a corner of the airfield. We darted and zoomed past the camera and, after landing alongside to consult, took off again for some close passes with one wheel practically on the ground. A pilot must have a reputation as good as Ranald's before Mac will stand for that sort of treatment. I was already impressed with what I could see of the Alpine's handling.

When McLaren's hair was thoroughly ruffled, Ranald took him up in another Auster so that he could take some air-to-air pictures of me flying the Alpine. The door beside him was removed to give his camera full play and he was further blown about as he took aim and then gestured instructions to me.

On the ground I had settled myself comfortably in the Alpine, turned on the battery and magneto switches, given a few strokes of the primer and pressed the button. The engine started easily once I had been shown how much to prime it, and I released the car-type handbrake and began taxying. Visibility over the nose was not unduly restricted by the engine and not much weaving was needed to keep the ground ahead in sight. Engine control was positive and I found the heel brakes comfortable and effective to just the right degree. At about 1,000 r.p.m. the aircraft responded fairly well to application of rudder alone. The roll was quite smooth and comfortable.

I lined up for take-off and carried out the normal sequence of checks, selecting the port tank and one-third flap. The large knurled wheel for throttle friction adjustment is a good feature. Take-off itself was completely straightforward—a firmish forward pressure to raise the tail and a touch of port rudder to counteract a very slight swing. Ground run was 10 sec or less and very short. At 40 m.p.h. indicated I eased the control column back to unstick, with excellent elevator control immediately available. The rudder was light and little movement was required in any flight condition. Harmonization of all controls was good, with the ailerons the stiffest of the three. Raising of the flaps caused



"Flight" photograph

"Ranald Porteous, Auster's chief test pilot, presented it in lively fashion for 'Flight's' photographer, L. W. McLaren . . ."

A Handy Naval Weapon

CHANCE VOUGHT Cutlass F7U-3 tailless deck-landing fighters will soon be operating with the U.S. Fleet, according to a makers' announcement. The F7U-3—one of which makes a striking picture here—is powered with two Westinghouse J46 turbojets, delivering, with afterburners, a total thrust of nearly 12,000 lb. Supersonic speed was attained in dives during development flying and pilots reported very good handling characteristics throughout the sonic range. Rate of climb is quoted as more than 13,000ft/min and combat ceiling as over 45,000ft.

Notwithstanding its tailless design, the Cutlass is claimed to have remarkable low-speed handling characteristics, and to be unusually stable right down to the stall. The present F7U-3 can be catapult-launched with a bomb load of about 5,500 lb, but a developed version, intended primarily for attack and designated A2U-1, can be catapulted with a bomb load of more than 9,000 lb —a startling figure indeed. The A2U-1 will have longer range and increased armour protection. Normal armament of the F7U-3 consists of four 20 mm guns and a "belly pack" of air-to-air rockets.

Hubert Scott-Paine

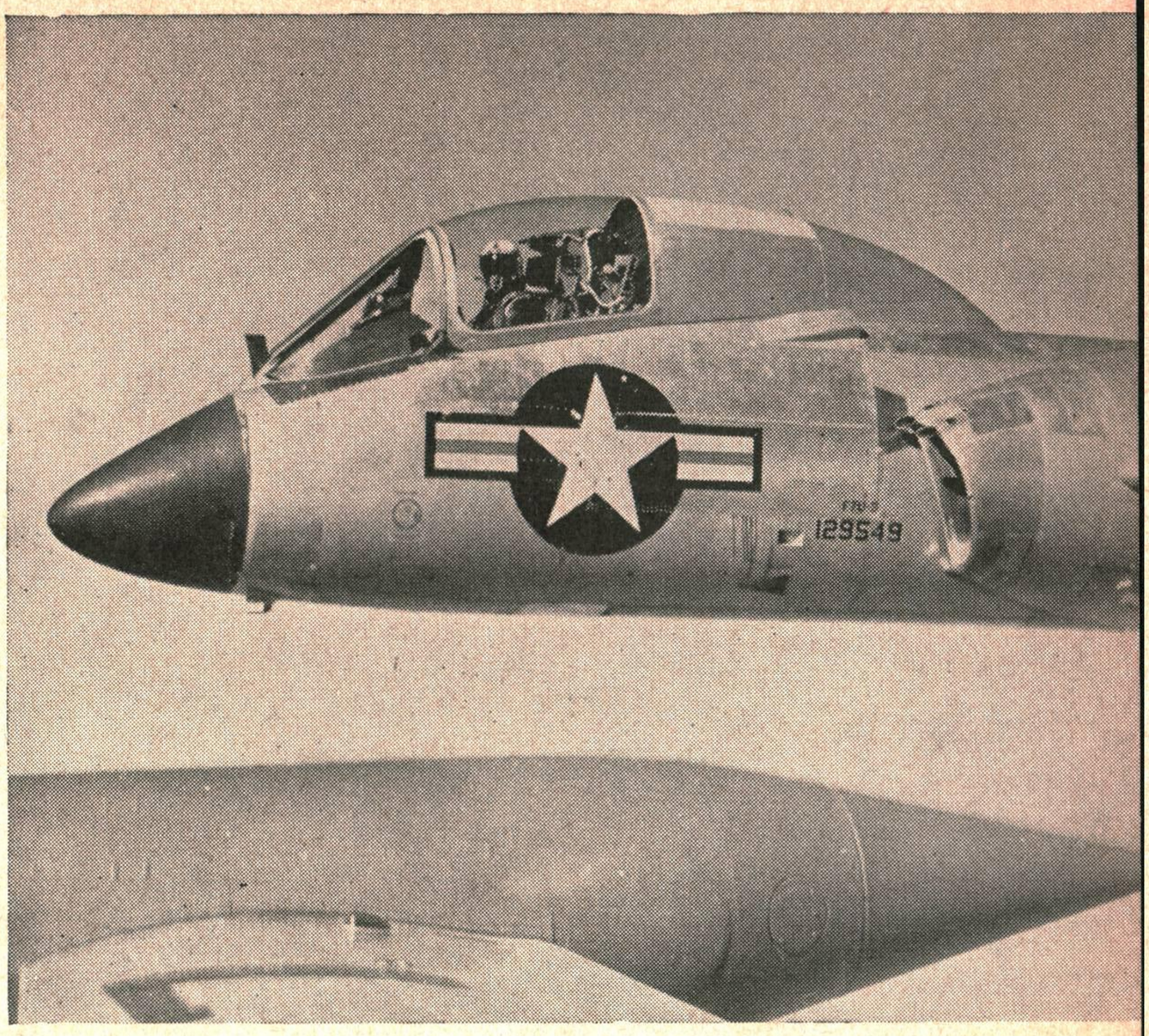
FROM America comes news, as we go to press, of the death of Mr. Hubert Scott-Paine, in Greenwich, Connecticut, at the age of 63. In British aviation, he will be remembered in connection with the early days of the Supermarine Aviation Works, with pioneer airline work, and with the Schneider Trophy Races. To his aeronautical career we hope to devote space next week.

Joining Dunlop Aviation

IT is announced that A.V-M. C. E. H. Allen, C.B., D.F.C., B.A. (Cantab), M.I.Mech.E., has joined the Dunlop aviation division as liaison officer with the Ministry of Supply, the Air Ministry and aircraft firms. A.V-M. Allen, who was born in South Africa, joined the Royal Flying Corps in 1917 at the age of 18, and won the D.F.C. within a year. He has served continuously from then until his retirement last month, successively as an operational pilot, a flying instructor, R.A.E. test pilot and, latterly, as a senior officer of the Technical Branch. From 1927 to 1931 he studied engineering as a member of the R.A.F. officers' engineering course, Henlow, and at Cambridge University. Overseas he served on engineering duties in Singapore and the Middle East, and on general flying duties in India. He returned to England in 1940 and, after a short spell with the Ministry of Aircraft Production, he commanded Henlow from 1940 to 1943 and Cosford from 1943 to 1946. He was S.A.S.O. 43 Group before going out to the Middle East Air Force in 1949 as Group S.T.S.O. In 1952 he returned from Egypt to become Director-General of Technical Services at the Air Ministry.



A.V-M. Allen.



PREPARING TO BOARD? Its name—Cutlass; its Service—the U.S. Navy; and its proximity—a few feet to starboard of a Lockheed jet trainer (a tip tank of which is seen), suggest old-time tactics on the part of this Chance Vought deck-landing fighter. (See news item adjacent.)

A Belfast Loss—and an Appointment

TWO announcements were made by Short Brothers and Harland, Ltd., shortly before Easter. The first recorded "with deep regret" the death of Mr. A. W. S. Clarke, the Belfast company's chief engineer. He joined the firm in 1914, six years after they had produced their first aeroplane. The list of famous Short designs with which he was concerned is an impressive one, and as early as 1932 he was appointed assistant designer in charge of detail design on the six-engined Sarafand.

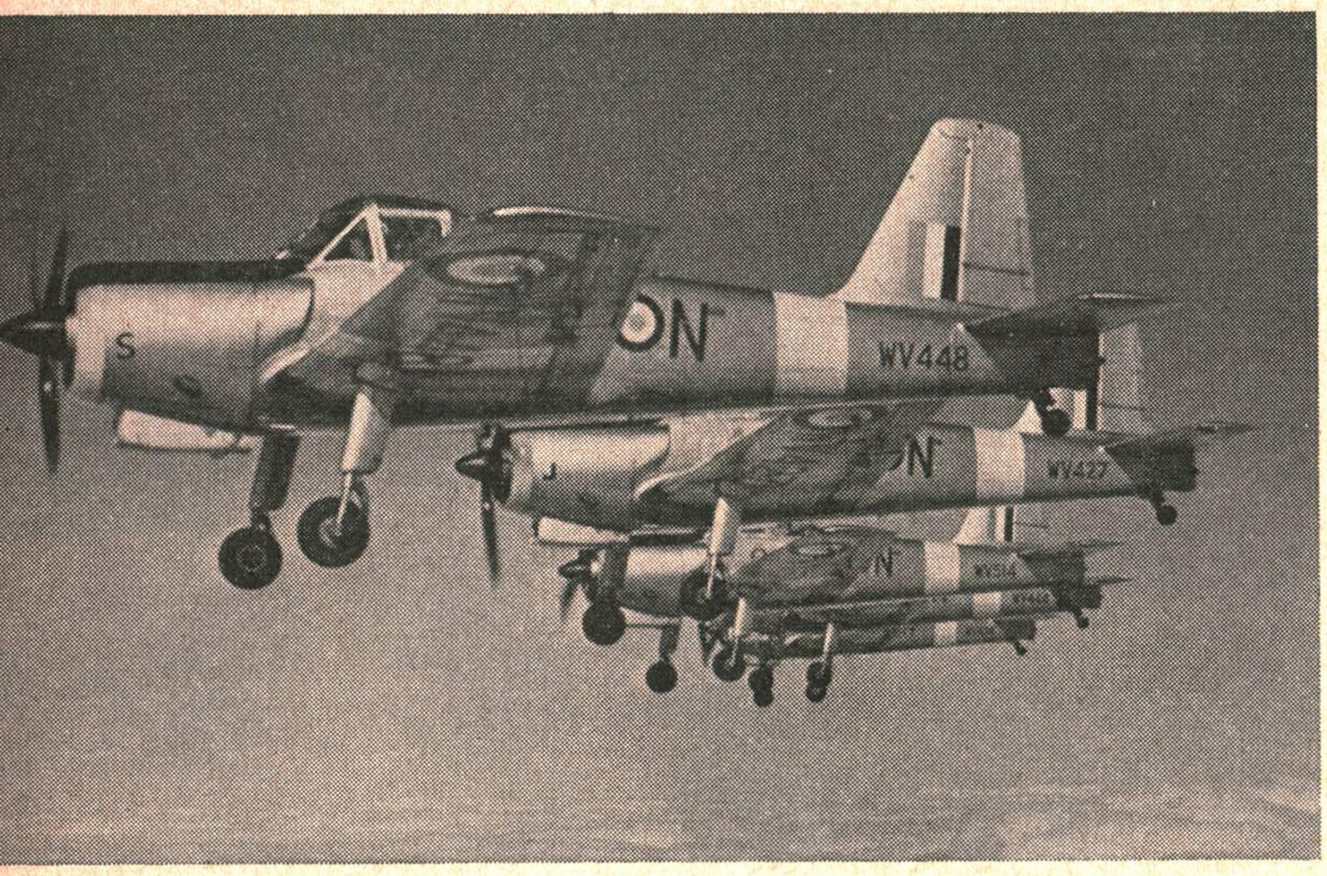
"His flair for design," writes a colleague, "was outstanding, and his honestly critical appraisal of schemes submitted for his approval earned the respect of all, even when accompanied by the bluntest of comments—a bluntness, however, which was never offensive, for he was essentially a kindly person. It is, indeed, in the peculiar quality of his honesty that the key to his character lay."

The second announcement was of the appointment of Mr. H. G. Conway, M.A., F.R.Ae.S., M.I.Mech.E., as chief engineer in succession to Mr. Clarke. Born in Vancouver in 1914 and educated in Edinburgh and at Cambridge University, he held similar posts with Aircraft Equipment, Ltd. (1938-45), and Dunlop Aviation Division (1945-47). Before joining Short Brothers he was technical director of British Messier, Ltd.

NINE, NINE, NINE: Photographed (like the Cutlass above) from a Lockheed jet trainer, this Sabre 5 (Avro Canada Orenda) is the 999th Sabre built by Canadair. Beneath the shapely canopy is Bill Longhurst, the chief test pilot.

The Proof of the Provost

First Provost/Vampire Course on its Way



Leg show: Ternhill Provosts in close echelon.

THE new R.A.F. flying training system is now coming into play. After a rather fluid post-war period of indecision and frequent changes, the routine has been largely adjusted to the needs of a jet air force. Where previously pupils might have flown any of five types of aircraft before qualifying for their wings, they will now fly only two, the Provost and the Vampire T.11. The stand-bys of the old system, the staid Prentice and the rugged Harvard, are steadily being replaced by the new types. The three principal factors in the new order are side-by-side seating all through, the high-powered basic trainer and the turbojet-powered advanced trainer. At first sight, such innovations might appear formidable, but in practice no great difficulties are foreseen. Certainly the Provost has so far given rise to no complaints.

The first course to be trained entirely in the new system recently completed basic training on the Provost at Ternhill, and *Flight* visited the station to see how this first stage went. Arriving in the office of the O.C. Flying Wing, and prepared to savour once again the rigours of a training station and the frustration attendant on the introduction into service of a new aircraft, we were immediately—and pleasantly—disillusioned. The station was attractive and businesslike, the sky teeming with Provosts and resonant with their as-yet-unfamiliar engine noise. The new trainer was most palpably giving good service.

After being warmly received by W/C. G. W. Garton, D.S.O., D.F.C., we settled down to find out about the Provost in service. Basically the new training schedule is as follows. It begins with 12 weeks of I.T.S. ground training, rather similar to that of the Army's Officer Cadet Training Units, and concerned mainly with personal qualities pertinent to the holding of a commission. This initial warming-up period is followed by a 30-week course on Provosts, covering substantially the same ground as the old Prentice course, but involving 120 hours of flying instead of 65 hours. The acting pilot officer, as the pupil-pilot is now styled, leaves his Provost course with a thorough foundation in the accepted range of ground subjects and a really useful number of hours on a machine which truly qualifies for the name of aeroplane.

The remarkable quality of the Provost is that it behaves in nearly all important respects like an aircraft of substantial size, while preserving completely those qualities of lightness and sensitivity which the R.A.F. has always demanded of a basic trainer.

After three weeks' leave, the pupil passes on to a 30-week course of 110 flying hours in the Vampire T.11. Though this may appear to be a considerable step forward at a comparatively early stage in his experience, we hope to show in the remainder of this story—and in a proposed sequel—that the step forward is not so radical as some might be led to believe.

It is on the T.11 that the pupil will gain his wings and also his first instrument rating. After a further period of leave, the now-qualified pilot goes on to an O.T.U. and learns the work of the branch to which he has been assigned.

This new scheme is eminently reasonable, and it contrasts fairly strongly with the old order. Hitherto, a pupil pilot might have had to fly first the Chipmunk or the Prentice, and then the Harvard, Balliol or Oxford, before achieving his wings. After that (and after having, in more recent times, obtained a "white" instrument rating on piston aircraft) he would go on to a jet A.F.S., learn to fly a Meteor, obtain a white instrument rating for jets, and pass finally to an O.C.U. He would first graduate as a "steam pilot" on piston-engined aircraft, and would not meet the crucial test of jet conversion until he was nearly trained. If this step were too much for him, however, then the initial training period and the concomitant expense would be wasted. It must be remembered that the cost of training must necessarily rise in proportion to the cost of operational flying and of operational aircraft. As more and more jet aircraft are introduced into service, it becomes increasingly necessary to produce not merely a qualified pilot, but a jet pilot.

It is to produce this jet pilot as efficiently as possible that the high-powered basic trainer has been adopted. The initial grading course, consisting of a score or so of hours on Chipmunks (usually operated by civil schools) is now considered to offer no advantage. The pupil comes straight from the I.T.S. to the F.T.S., and after two days of ground lectures he receives his first flying experience in the Provost.

During our visit to Ternhill we had the opportunity of flying the Provost, and were greatly impressed with its qualities. One immediately feels on take-off that the aircraft has the power to "go places"; yet with many of the characteristics of a large aircraft it handles, one might say, delicately. The Leonides engine gives it something of the feel of a release from gravity which is characteristic of the effortless performance of a jet. But despite its lightness and straightforwardness, the pilot must still manage the aircraft properly if he is to obtain the required results from it.

The first question we asked W/C. Garton was about the effect of 550 h.p. on an *ab initio* trainer. It was not till we had flown the aircraft that we realized how little effect there was, and how well the engine fits the airframe. We next enquired about the side-by-side seating arrangement. This is not new in a basic trainer, but it is novel in an aircraft with a performance similar to that of the Harvard. The general opinion among instructors was most favourable. The psychological advantage of side-by-side seating is difficult to define, but advantage there is. The instructor can more accurately assess his pupil's ability, and the pupil will more rapidly gain that confidence in his new environment which is most necessary to later success. More direct contact between instructor and pupil considerably eases the instructor's task, and lessens the nervous strain which may have existed before.

The station commander, G/C. R. J. B. Burns, O.B.E., and the O.C., Flying Wing, W/C. G. W. Garton, D.S.O., D.F.C., outside S.H.Q. at Ternhill.




GOLDEN HAWKS


ROYAL CANADIAN AIR FORCE
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IMPERIAL OILWAYS

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AN IMPERIAL OIL LIMITED PUBLICATION



COVER: The RCAF's famous Golden Hawks—currently in tour across Canada—fly on echelon, vertical abreast, over southern Ontario. (RCAF photo.)

the National Oil Policy

THE objectives of the National Oil Policy can be met in general but they cannot, and should not, be measured in terms of a precise volume on a given date, Imperial president W. O. Twaits told the company's annual general meeting.

Mr. Twaits said that fixing objectives in terms of barrels per day by a certain date cannot take into account such uncontrollable factors as refinery shut-downs and unpredictable changes in demand. He pointed out that the success of the policy depended in great measure on provincial regulations covering the production of, and exploration for, crude oil and natural gas.

"The industry's problems today are partly the result of its own investment decisions, and to a great extent, of well-intentioned but impractical government regulations in various phases of the business," Mr. Twaits said. "The oil and gas industry is operating under a variety of regulations imposed by municipal, provincial and federal governments. It is time, in our opinion, that conflicts among these jurisdictions be reduced in order to secure the economies of operation which are fundamental to the concept of a national oil policy."

He added that governments cannot and should not be expected to cure all problems of the industry or to compensate for imprudent investment judgment. Government can only provide a continuing investment environment and private capital must take its chances within this environment.

Mr. Twaits said that a slow but encouraging upturn in the Canadian economy may be in progress. "As to the longer term outlook, we believe that prospects are bright if industry and governmental policies attack basic problems and take advantage of new opportunities."

The meeting was told that tax increases have substantially obscured price decreases to the consumer. During the past ten years provincial gasoline taxes rose 15 per cent to 46 per cent. In the major cities, road taxes now amount to from 46 per cent to 156 per cent of the wholesale price received by the company for its automotive fuels. These taxes now range from 12 to 27 cents per gallon. During 1960 the net profit earned by Imperial from all sources was equivalent to an average of 1.6 cents per gallon of sales.

THE GOLDEN Hawks

Representative of RCAF flying ability, the pilots of the Golden Hawks are carrying on the enviable tradition in the air that was established for Canada by the excellence of her airmen in two world wars, and during years of peacetime operations in the development of the nation.

The seven members of the team are typical of RCAF aircrews who are supporting the cause of peace and freedom through NATO, NORAD and the United Nations.

The Golden Hawks are all well seasoned fliers with combined experience totalling over 20,000 hours — enough time in a Sabre jet to make 27 return trips to the moon. The men of this team characterize the dedication and skill demanded by the RCAF in peace and war.





DOUBLE LOOP



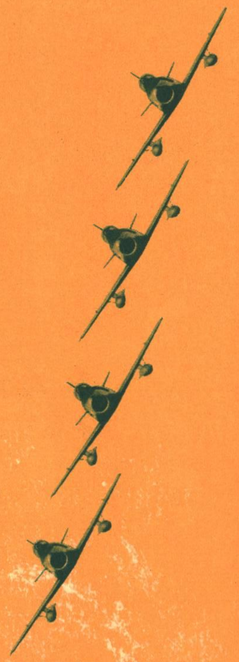
SYNCHRO-LOOPS



CUBAN-EIGHT



BOMBURST AND CROSS-OVER



THE GOLDEN Hawks

RCAF GOLDEN Hawks



PILOTS AND FLYING POSITIONS



In their golden Sabre jets, with red and white hawks emblazoned on the fuselage, the Golden Hawks perform a series of rolls, loops, crossovers, bombursts, and Cuban-eights with graceful precision. These manoeuvres are indicative of the skill and high standards of flying to which RCAF pilots are trained.

COMMENTATOR

FLYING OFFICER GEORGE L. MacDONALD, the voice of the Golden Hawks, is a 36 year-old pilot from Ottawa. Prior to enrolling with the RCAF in 1956, George worked at radio stations in Ottawa and Sudbury, Ont. When he is not announcing with the Golden Hawks, F/O MacDonald is an instructor at RCAF Station Centralia, Ontario.

POSITION TWO

FLIGHT LIEUTENANT JIM D. McCOMBE, 27, is from Fredericton, N.B. His first squadron after enrolling in 1951, was 434 "Bluenose" Fighter Squadron, based at No. 3 Fighter Wing, Zweibrucken, Germany, and from there he was transferred to the Fighter Operational Training Unit, at Chatham, N.B., as an instructor.

POSITION FOUR

FLYING OFFICER BILL C. STEWART, is 26 years old, from Dalhousie, N.B., joined the RCAF immediately after leaving high school. On completion of his training, he was posted to 434 "Bluenose" Fighter Squadron, at No. 3 Fighter Wing, Germany. In 1957 he returned to Canada on instructional duties until he was selected as a member of the Golden Hawks.

POSITION THREE

FLIGHT LIEUTENANT ED J. ROZDEBA of Bienfait, Sask., was eighteen when he joined the RCAF in 1951. He served with 439 "Sabre Tooth Tiger" Squadron in England and France, then returned to Canada as an instructor at Tactics Flight, of the Operational Training Unit, at Chatham, N.B.

LEADER

SQUADRON LEADER FERN C. VILLENEUVE, 32, of Ottawa, soloed at eighteen after three hours and forty minutes. Since that day he has logged 3,800 flying hours. He joined the RCAF in 1950 and was an instructor at the RCAF Central Flying School prior to being chosen the first captain of the Golden Hawks aerobatic team.

LEAD SOLO

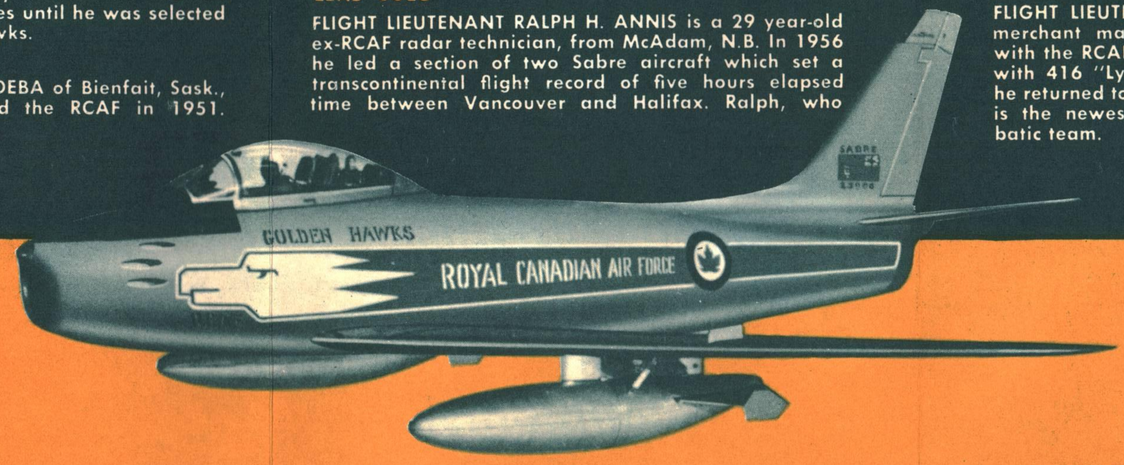
FLIGHT LIEUTENANT RALPH H. ANNIS is a 29 year-old ex-RCAF radar technician, from McAdam, N.B. In 1956 he led a section of two Sabre aircraft which set a transcontinental flight record of five hours elapsed time between Vancouver and Halifax. Ralph, who enrolled in 1948, was an instructor at the RCAF Flying Instructor School prior to joining the Golden Hawks.

SOLO

FLIGHT LIEUTENANT JOHN T. PRICE, 29, of Knowlton, P.Q., joined the RCAF twelve years ago as an aero-engine technician. In 1951 he was selected and trained as a pilot, then sent overseas to No. 4 Fighter Wing in Germany. He returned to Canada in 1957; assigned to instructional duties at Chatham where he served until he was selected for the Golden Hawks.

SPARE

FLIGHT LIEUTENANT DAVE V. TINSON, 28, is an ex-merchant marine from Toronto, Ont., who enrolled with the RCAF as a pilot in 1952. He served in Europe with 416 "Lynx" Fighter Squadron until 1954, when he returned to Canada as a flying instructor. F/L Tinson is the newest member of the Golden Hawks aerobatic team.



Golden Hawks



#4-23433, #3-23465, #6-23470

Trenton Ontario
July 27/62



#1-23651



#23649



#5-23424, #2-23641, #1-23651

Photo
D. Kennedy



JUL • 62

Sabre 23510

Trenton
21 July 62

H. Tate Collection



23195 (1959 Scheme)



23649 At Mountain View for Scrapping. (1963 Scheme)

P. Kennedy Photo



JUN • 63

Golden Hawks. Trenton June 1/63

Fin "GH" in Roundel Red.



D. Kennedy Photo
Trenton June 1/63



JUN • 63

23410



JUN • 63

23454



JUN • 63

23424



JUN • 63

23470

D. Kennedy Photos
Trenton June 1/63



JUN • 63

23600



JUN • 63

23649



• JUN • 63

23641



JUN • 63

23651

Photos
T.A.G.

Z3649



Sabre Z3649 Brockville 15 July 67

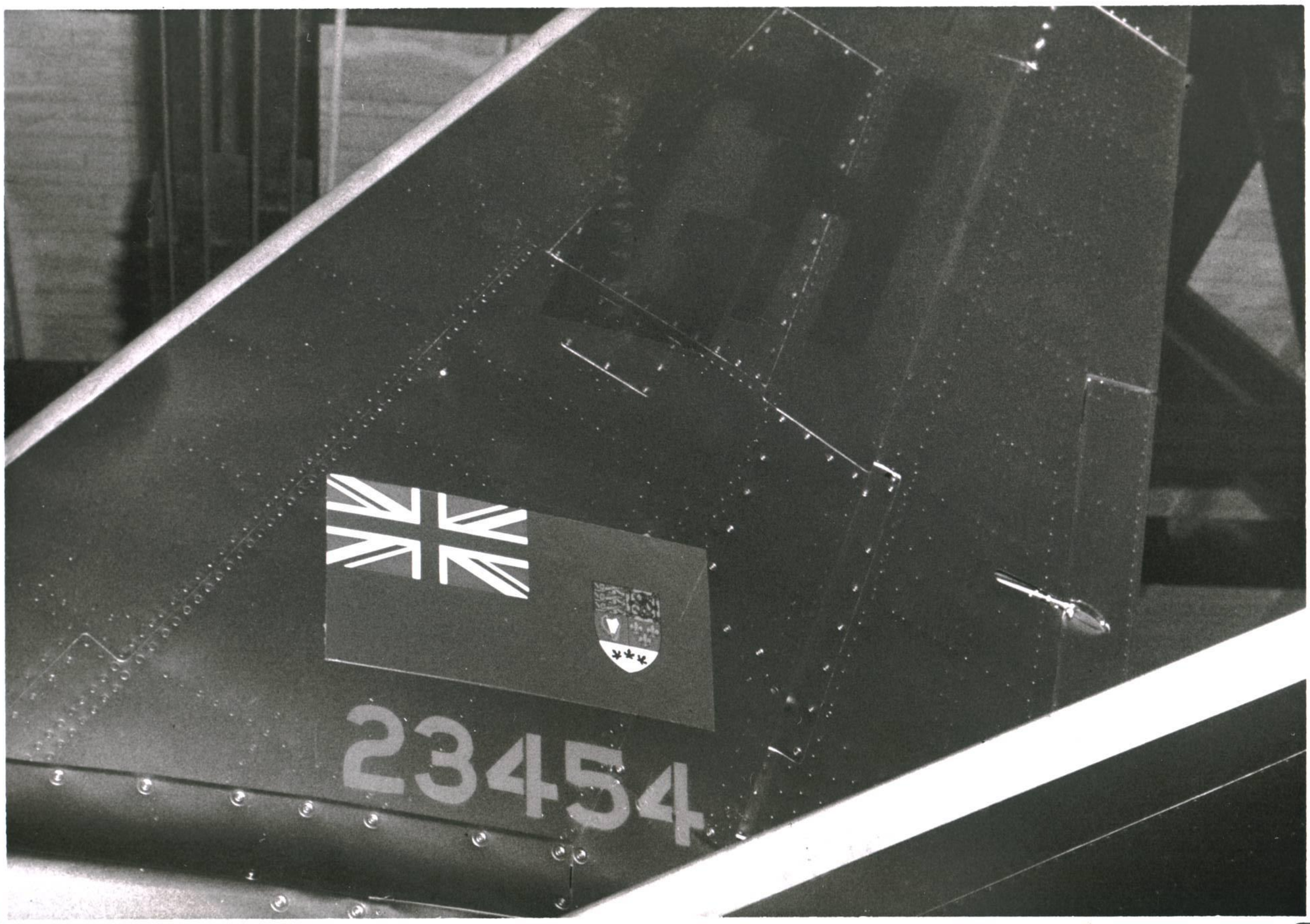


Prior to display at park.

RCAF Photos



Sabre at Mountain View before scrapping. May 1964



Photos: R. Wylie.

Belleville, Ont
17 Nov 67

23053











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

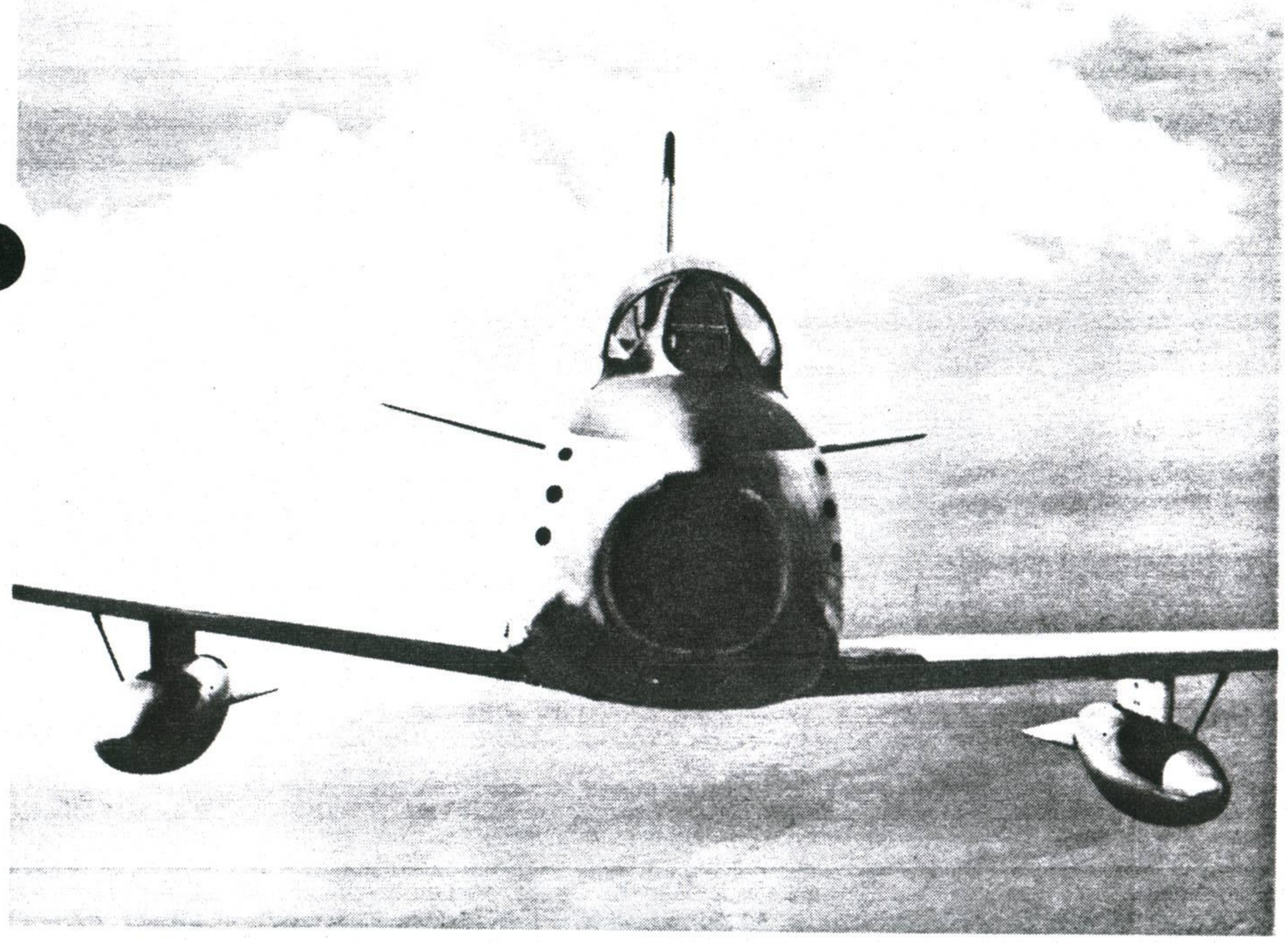
Constructor's No.	*No.*	*No. Built*	*Cumulative*	*Operator*
1161-1452	23371-23662	292	292	RCAF
1453-1458	2021-2026	6	298	Colombia
1459-1492	350-383	34	332	SAAF
1493-1519	23363-23689	27	359	RCAF
1520	23753*	1	360	RCAF
1521-1522	23690-23691	2	362	RCAF
1523-1526	23754-23757*	4	366	RCAF
1527-1530	23692-23695	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

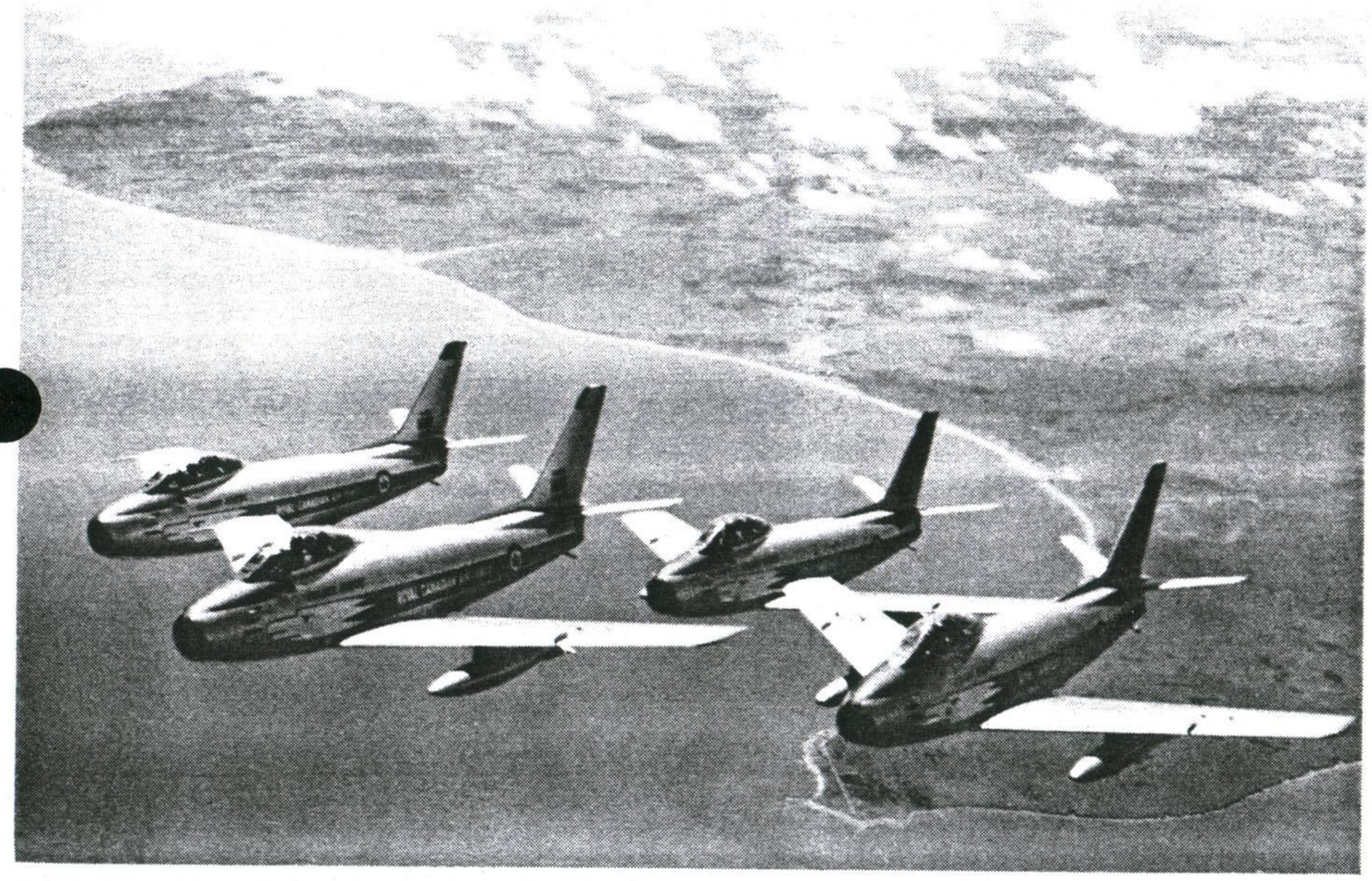
*Originally Israeli AF Nos.6030-6037

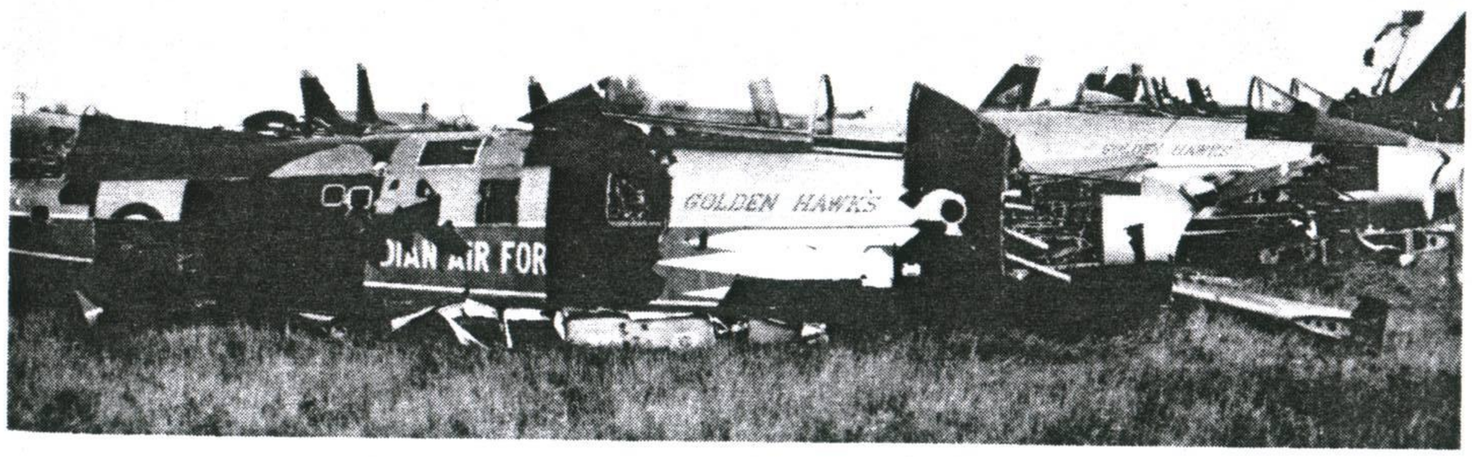
Summary of RAF Sabres

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.







(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.

and it was exceptional to meet an airman of Sgt rank or below who wanted to make the USAF a career. Senior USAF officers called their junior pilots "GI Pilots" and treated them as such. Of 34 squadron members of 1st Lt and 2nd Lt rank only three were interested in the service as a career. RCAF and RAF exchange officers were highly regarded by USAF Squadron Commanders at 51 F Wing and were specially sought after.

The younger pilots also felt the Sabre or any jet was dangerous to fly. This was not due to battle casualties as these were practically non-existent. (74 MiGs shot down in Jun 53 against NIL Sabre losses.) The squadron commander was aware of this and when questioned said he felt it was a partial result of recruiting information which led one to believe a particularly outstanding man was required to fly jets. This feeling seemed to be decreasing just prior to writer being returned.

The senior USAF officers such as Squadron Commander, Operations Officer and above were extremely able, well-qualified men who did their very best under difficult circumstances. The same applies to the senior NCO ranks who were career men. (A fuller appreciation and explanation of some of the morale problems appeared in 31 Oct.53 *Saturday Evening Post*.)

In addition, all functions of command seemed to be up at least one rank in USAF, the Joint Operations Centre entered far more into the detailed operation of Wing flying than is customary for RCAF or RAF procedure. Squadron and Wing Commanders complained bitterly of this.

Other Activities

9 The writer spent five days with Canadian Army and 14 days with the Canadian Navy aboard HMCS *Iroquois* on a trip to Hong Kong. The return trip to Japan was made via USN Neptune from Kai Tak to Kadena on Okinawa. This island has been tremendously built up by the American Forces, four lane routes similar to Queen Elizabeth highway connect various installations. Speaking generally one of the most impressive items on the tour was the build-up of American power in Japan.

An additional four days were spent at "Freedom Village" during repatriation of POW's in the expectation of S/L MacKenzie's return.

Items Considered to be of Specific Value to RCAF

10 (a) The "barrier" arrangement which prevents excessive damage to aircraft leaving runway. This has been thoroughly discussed elsewhere.

(b) The system of radio beacons and network set up specifically to facilitate jet operations in Korea and Japan.

(c) While it is a round-about way of arriving at a conclusion the writer feels strongly that the USAF in Korea demonstrates the value of RCAF training and selection to produce both officers and pilots.

Summary

11 The original reason for sending RCAF officers to Korea ceased five days after writer's arrival.

There was still knowledge to be gained however and it is felt the tour was of benefit. However the same result could be obtained in 90 days temporary duty tours as the USAF practices instead of six months. All USAF officers encountered were very friendly and especially those who previously served with RCAF or RAF during WWII; the latter seemed to go out of their way to speak highly of their former service.

A total of 72:25 hours was flown in F-86F and 189:50 hours passenger time in 8 different types of aircraft.

D. Warren S/L
OC 410(F) Sqn.

RCAF Sabre Pilots in Korea

Name	*USAF Squadron*	*Period*	*F-86 Sorties*	*Kills*	*Probables*	*Damaged*
Bliss, S/L W.H.F.*	334th	March-August 1953	31			
Carew, F/O R.D.*	335th	February-July 1953	50			
Davidson, W/C R.T.P.*	335th	September-December 1952	51			
Donald, F/O J.D.		April-May 1952	0			
Evans, F/L F.W.*	334th	December 1952 - March 1953	50			
Fleming, F/O S.B.[x]	336th	March-June 1952	82		1	2
Fox, S/L*	(51st FW)	May-October 1953	29			
Glover, F/L E.A.[x]•	334th	June-October 1952	50	3		3
Hale, G/C E.B.[x]	16th	April-May 1952	26			
LaFrance, F/L J.C.A.[x]	39th	May-September 1952	49	1		
Lambros, F/O A.*	39th	October 1952 - March 1953	50			2
Levesque, F/L J.A.O.*[x]	334th	November 1950 - June 1951	71	1		
Lindsay, S/L J.D.[x]	39th	July-December 1952	70	2		3
Lowry, F/L R.E.*	25th	July-December 1952	50			
MacKay, S/L J.*	39th	March-July 1953	50	1		
MacKenzie, S/L A.R.	39th	December 1952, POW	5			
Mullin, F/O J.B.	335th	June-November 1953	55			
Nichols, F/L G.H.*	16th	January-May 1953	50		1	
Nixon, F/0 G.W.*	16th, 25th	March-July 1952	50			
Smith, S/L E.G.*	334th	August-December 1952	50			
Spurr, F/L L.E.[x]	25th	April-July 1952	50	1		
Warren, S/L D.	39th	July-December 1953	67			
		Totals	1036	9	2	10

*Awarded US Air Medal
[x]Awarded US Distinguished Flying Cross
•Awarded RCAF Distinguished Flying Cross

Thousands: 23

CAF service till April 1964
Last official flight 22.1.70

Type	Serial	c/n	T.O.S.	S.O.S.	Previous	Subsequent	Disposition	Remarks
Canadair Sabre 5	021	811	11.1.55	23.6.70				6 RD Mountain View
	034	824	25.1.54	23.6.70				
	036	826	23.12.53	9.9.70				Stn Chatham
	047	837	31.12.53	22.6.70			CADC	Stn London
	058	848	31.12.53	23.6.70				
	060	850	4.1.54	16.10.69				Display Aircraft
	097	887	8.12.53	9.9.70				
	102	892	8.12.53	9.9.70			CADC	last official flight 22
	106	896	23.2.54	9.9.70			CADC	
	128	918	3.3.54	9.9.70			CADC	
	129	919	3.3.54	9.9.70			CADC	
	133	923	3.3.54	9.9.70			CADC	
	135	925	9.3.54	9.9.70			CADC	
	146	936	19.3.54	9.9.70			CADC	
	147	937	17.3.54	9.9.70			CADC	
	151	941	2.3.54	9.9.70			CADC	
	160	950	16.2.54	3.9.70			CADC	
	164	954	7.3.54	13.4.70			CADC	
	190	980	18.3.54	9.9.70			CADC	
	195	985	18.3.54	9.9.70			CADC	
	198	988	18.3.54	9.9.70			CADC	
	202	992	6.4.54	9.9.70			CADC	
	203	993	6.4.54	9.9.70			CADC	
	206	996	6.4.54	23.6.70			CADC	
	207	997	6.4.54	12.7.68			CADC	
	208	998	6.4.54	12.7.68			CADC	
	209	999	6.4.54	12.7.68			CADC	
	215	1005	6.4.54	23.6.68			CADC	
	221	1011	30.4.54	16.2.68			w/o	RMC Kingston
	222	1012	6.4.54	12.7.68			CADC	
	223	1013	6.4.54	15.1.70			w/o	
	224	1014	2.7.54	23.6.70			CADC	
	226	1016	6.4.54	23.6.70			CADC	
	227	1017	6.4.54	23.6.70			CADC	
	228	1018	6.4.54			A709	CI 24.6.69	
	231	1021	6.4.54	9.9.70			CADC	
	241	1031	12.5.54	3.10.70			CADC	To Lockheed Test Flg
	245	1035	12.5.54	Museum		623B	CI 26.4.57	Instructional Only
	252	1042	2.7.54	9.9.70			CADC	
	257	1047	11.6.54			A710	CI 24.6.69	
	259	1049	12.5.54	9.9.70			CADC	
	268	1058	12.5.54	9.9.70			CADC	
	275	1065	14.10.54	12.7.68				
	280	1070	28.7.54	9.9.70			CADC	
	283	1073	22.7.54	9.9.70			CADC	
	285	1075	22.7.54	23.6.70				
	289	1079	22.7.54	9.9.70			CADC	
	291	1081	28.7.54	9.9.70			CADC	
	293	1083	28.7.54	9.9.70		735B	CI 15.1.70	

Thousands: 23

Type	Serial	c/n	T.O.S.	S.O.S.	Previous	Subsequent	Disposition	Remarks
	295	1085	15.7.54	9.9.70		A634	cl 30.7.59	Instructional Only
	300	1090	2.7.54	9.9.70			CADC	
	301	1091	2.7.54	26.10.70			CADC	
	303	1093	2.7.54	9.9.70			CADC	
	306	1096	2.7.54	9.9.70			CADC	
	308	1098	2.7.54	9.9.70			CADC	
	309	1099	2.7.54	9.9.70			CADC	
	310	1100	1.8.54	9.9.70			CADC	
	314	1104	2.7.54	9.9.70			CADC	
	315	1105	2.7.54	9.9.70			CADC	
	316	1106	2.7.54	22.5.68			w/o	Cat C 1 Air D
	320	1110	30.9.54	1.8.68			w/o	To N.A. Rockwell USA
	323	1113	2.7.54	9.9.70			CADC	
	330	1120	30.9.54	9.9.70			CADC	
	331	1121	30.9.54	9.9.70			CADC	
	338	1128	29.10.54	9.9.70			CADC	
	339	1129	30.9.54	9.9.70			CADC	
	344	1134	30.9.54	9.9.70			CADC	
	347	1137	30.9.54	9.9.70			CADC	
	351	1141	30.9.54	9.9.70			CADC	
	352	1142	30.9.54	9.9.70			CADC	
	358	1148	30.9.54	9.9.70			CADC	
	363	1153	14.10.54	9.9.70			CADC	
	367	1157	14.10.54	9.9.70			CADC	

All Apdal 1.9.64

Thousands: 23

Type	Serial	c/n	T.O.S.	S.O.S.	Previous	Subsequent	Disposition	Remarks
Canadair Sabre 5	23021	811	11.1.55	23.6.70			Apdal	
5	23034	824	25.1.54	23.6.70	No Cards		Apdal.	
5	23036	826	23.12.53	9.9.70			"	
5	23017	837	31.12.53	22.6.70	?	cADC	W/O	
5	23058	848	31.12.53	23.6.70			Apdal	
5	23079	869	23.2.54	7.4.67	—		6.6.66	Apdal
					—			23.10.67
5	23094	884	14.1.55	7.4.67	↓		1.6.66	
					SOS			
5	23097	887	8.12.53	9.9.70			Apdal	
5	23102	892	8.12.53	9.9.70 ✓			Apdal	Last official flight 22.1.70
5	23106	896	16.2.54	12.7.68	9.9.70 ✓	cADC	Apdal	
5	23128	918	3.3.54	23.6.70	9.9.70 ✓	cADC	"	
5	23129	919	3.3.54	23.6.70	9.9.70 ✓	"	"	
5	23133	923	"	23.6.70	" ✓	"	"	
5	23135	925	4.3.54	23.6.70	" ✓	"	"	
5	23146	936	"	23.6.70	" ✓	"	"	
5	23147	937	"	23.6.70	" ✓	"	"	
5	23151	941	3.3.54	23.6.70	" ✓	"	"	
5	23160	950	16.2.54	12.7.68	3.9.70 ✓	"	"	
5	23164	954	7.3.54	12.7.68	13.4.70 ✓		"	
5	23190	980	18.3.54	23.6.70	9.9.70 ✓	"	"	
5	23195	985	"	12.7.68	" ✓	"	"	
5	23198	988	"	12.7.68	" ✓	"	"	
5	23202	992	6.4.54	12.7.68	" ✓	"	"	
5	23203	993	"	12.7.68	" ✓	"	"	
5	23204	994	22.4.54	9.6.66	7.4.67 ✓		"	
5	23206	996	6.4.54	23.6.70 ✓	"	"	"	
5	23207	997	"	12.7.68 ✓	"	"	"	
5	23208	998	"	12.7.68 ✓	"	"	"	
5	23209	999	"	12.7.68 ✓	"	"	"	
5	23215	1005	"	23.6.70 ✓	"	"	"	
5	23221	1011	30.4.54	16.2.68 ✓			W/O	Ret Kingsford
5	23222	1012	6.4.54	12.7.68 ✓	"	"	Apdal	
5	23223	1013	"	15.1.70 ✓	"	"	W/O	
5	23224	1014	27.54	23.6.70 ✓	"	"	Apdal	
5	23226	1016	6.4.54	23.6.70 ✓	"	"	"	
5	23227	1017	"	23.6.70 ✓	"	"	"	
5	23228	1018	"			A709	Cl 24.6.69	
5	23231	1021	6.4.54	12.7.68	9.9.70 ✓	cADC	Apdal	
5	23233	1023	"	9.6.66	7.4.67 ✓		"	
5	23241	1031	12.5.54	23.6.70	3.10.70 ✓	cADC	Apdal	To Lockheed Test Fl
5	23252	1042	2.7.54	23.6.70	9.9.70 ✓	cADC	"	
5	23257	1047	11.4.54			A710	Cl 24.6.69	
5	23259	1049	12.5.54	23.6.70	9.9.70 ✓	cAX	Apdal	
5	23268	1058	"	23.6.70	"	"	"	
5	23270	1060	2.7.54	9.6.66	7.4.67		"	
5	23275	1065	14.10.54	12.7.68	↓		"	

Thousands: 23

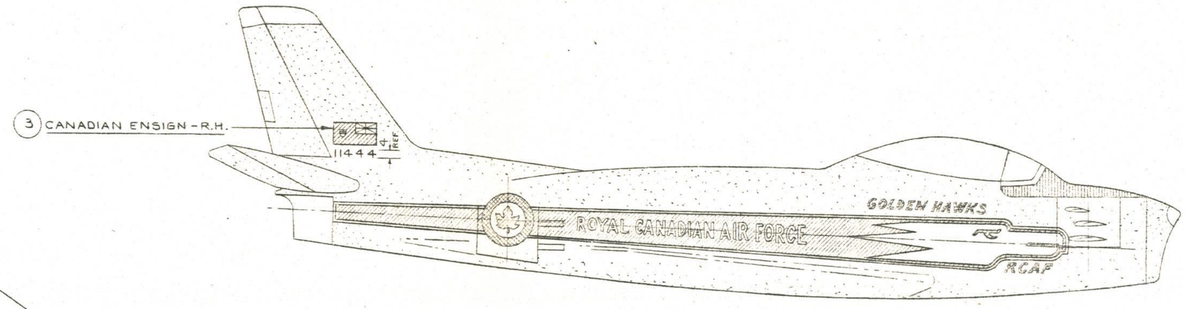
Type	Serial	c/n	T.O.S.	S.O.S.	Previous SOS	Subsequent	Disposition	Remarks
Canadair Sabre 5	23277	1067	12.5.54	9.6.66	•7.4.67		Hfldsl	
5	23280	1070	28.7.54	23.6.70	9.9.70	CADC	"	
5	23283	1073	22.7.54	23.6.70	"	"	"	
5	23281	1074	"	9.6.66	•7.4.67		"	
5	23285	1075	"	23.6.70			"	
5	23289	1079	22.7.54	23.6.70	9.9.70	CADC	"	
5	23291	1081	28.7.54	23.6.70	9.9.70	"	"	
5	23293	1083	"	9.9.70	"	735 Sq	15.1.70	—
5	23300	1090	2.7.54	23.6.70	"	CADC	Hfldsl	
5	23301	1091	"	23.6.70	26.10.70	"	"	Pinecrest School Bloor
5	23303	1093	"	23.6.70	9.9.70	"	"	
5	23306	1096	"	12.7.68	"	"	Hfldsl	
5	23308	1098	"	12.7.68	"	"	"	
5	23309	1099	"	23.6.70	"	"	"	
5	23310	1100	1.8.54	12.7.68	"	"	"	
5	23314	1104	2.7.54	23.6.70	"	"	"	
5	23315	1105	"	23.6.70	"	•	"	
5	23316	1106	2.7.54	22.5.68	✓		W/O	Cat C 1 Air Div.
5	23320	1110	30.9.54	1.5.68	✓		W/O	To N.A. Aviation Co-P
5	23323	1113	2.7.54	23.6.70	9.9.70	"	Hfldsl	
5	23330	1120	30.9.54	23.6.70	"	"	"	
5	23331	1121	"	12.7.68	"	"	"	
5	23338	1128	29.10.54	23.6.70	"	"	"	
5	23339	1129	30.9.54	23.6.70	"	"	"	
5	23344	1134	"	12.7.68	"	"	"	
5	23347	1137	"	23.6.70	"	"	"	
5	23351	1141	"	23.6.70	"	"	"	
5	23352	1142	"	23.6.70	"	"	"	
5	23354	1144	15.3.55 ✓	9.6.66	•7-5-67		"	
5	23358	1148	30.9.54	23.6.70	9.9.70	"	Hfldsl	
5	23361	1151	14.10.54	9.6.66	•7.4.67		"	
5	23363	1153	14.10.54	23.6.70	9.9.70	"	"	
5	23367	1157	14.10.54	23.6.70	9.9.70	"	Hfldsl	
6	23410	1200	31.3.55	•27.5.66			19.64	
6	23433	1223	25.5.55	•31.3.67			3.6.64	
6	23465	1255	28.6.55	•27.5.66	—		1.9.64	
6	23469	1259	11.7.55	•31.3.67	—		4.6.64	
6	23470	1260	21.6.55	•31.3.67	—		"	
6	23482	1272	18.11.55	•27.5.66	—		1.9.64	CEPE
6	23487	1277	15.11.55	•27.5.66	—		"	Golden H.
6	23498	1288	27.6.55	•31.3.67	—		4.6.64	1 Air Div
6	23504	1294	17.11.55	•4.4.66	—		1.9.64	CEPE
6	23506	1296	3.10.55	•31.3.67	—		4.6.64	
6	23539	1329	15.7.55	•27.5.66	—		1.9.64	A.V.Roe
6	23551	1341	29.8.55	•31.3.67	—		4.6.64	1 Air Div
6	23559	1349	12.10.55	•27.5.66	—		1.9.64	CEPE

Thousands: 23

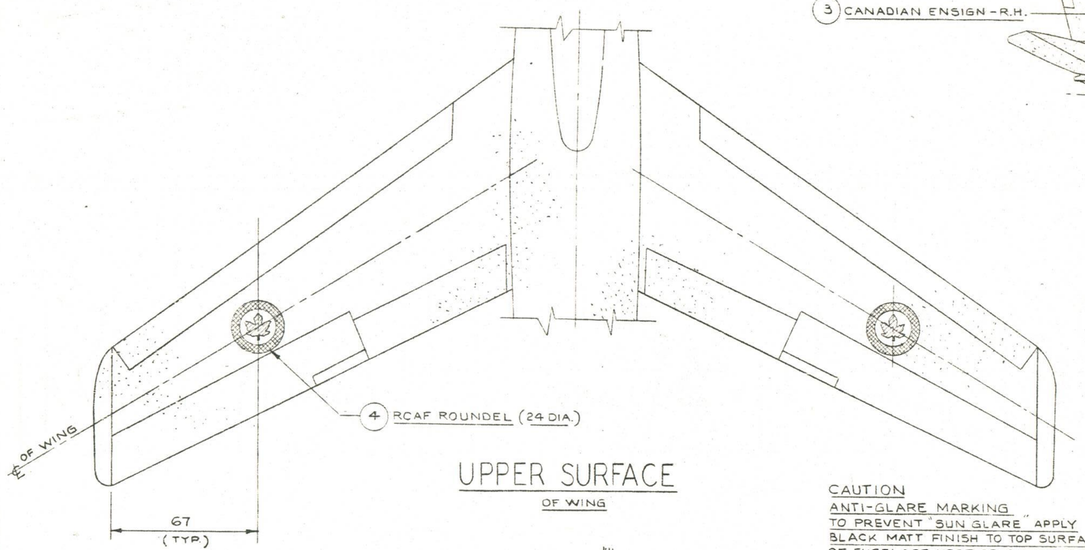
Type	Serial	c/n	T.O.S.	S.O.S.	Previous	Subsequent	Disposition	Remarks
Sabre 6	23600	1390	6.1.56	31.3.67	—	CF-JJB	4.6.64	
Canadair Sabre 6	23610	1400	23.8.56	31.3.67	—		"	
6	23641	1431	29.3.56	4.4.67	—		"	1 Air Div
6	23642	1432	19.3.56	27.5.66	—		1.9.64	
6	23649	1439	3.4.56	1.2.67	—		4.6.64	
6	23668	1458	17.8.56	31.3.67	—		"	1 Air Div
6	23670	1460	27.8.56	27.5.66	—		1.9.64	"
6	23671	1461	2.10.56	27.5.66	—		"	"
6	23672	1462	27.8.56	31.3.67	—		4.6.64	
6	23703	1493	28.1.57	27.5.66	—		1.9.64	
6	23708	1498	17.1.57	"	—		"	
6	23712	1502	4.3.57	"	—		"	
6	23729	1519	16.4.57	"	—		"	
6	23732	1522	6.5.57	"	—		"	
6	23733	1523	10.5.57	"	—		"	
6	23744	1534	5.6.57	"	—		"	
6	23751	1541	5.6.57	"	—		"	

REPORT ALL ERRORS TO D.O.

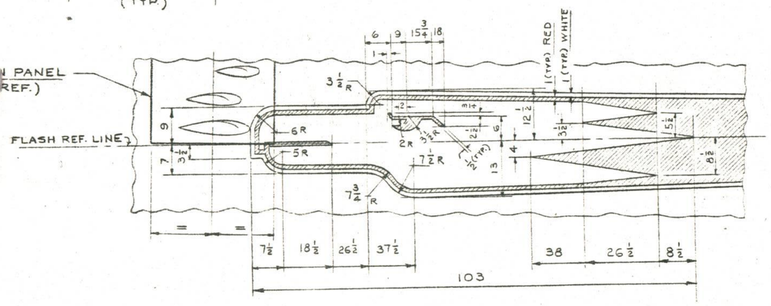
SYM.	REVISIONS	CKD.	DATE	APPD.
A	FIRST RELEASE			
B	1 PAINT REMOVED FROM UNPAINTED AREAS AND NOTES ADDED. 2 AIRCRAFT NAME DELETED ABOVE CAN. ENSIGN ON FIN. 3 COLOR CHART REVISED. 4 NOTES REVISED NOTES 1 & 2 ADDED. AUTH. 1938-3 (1901) 14 DEC 58 MAY 59 AND 51-GAC-319 (1905) 14 JAN 59 30 MAY 59	NORMAN	15 DEC/59	RCAF



STARBOARD SIDE



UPPER SURFACE
OF WING

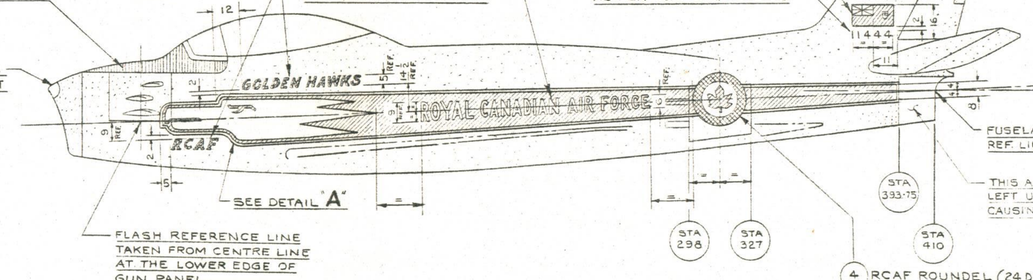


CAUTION
ANTI-GLARE MARKING
TO PREVENT "SUN GLARE" APPLY
BLACK MATT FINISH TO TOP SURFACE
OF FUSELAGE NOSE BELOW WINDSCREEN
AS SHOWN.

PLASTIC AREA ON
NOSE, TO BE LEFT
UNPAINTED.

"GOLDEN HAWKS" AND "RCAF"
BLUE LETTERING
SEE RCAF DWG Nº 6008.

"ROYAL CANADIAN AIR FORCE"
WHITE LETTERING
SEE RCAF DWG Nº 6009.



2 CANADIAN ENSIGN - L.H.

REGISTRATION NUMBER
BLUE NUMERALS,
AS PER RCAF DWG Nº 12103

PLASTIC AREA COVERING
ANTENNA TO BE LEFT
UNPAINTED.

FUSELAGE REFERENCE LINE.

FUSELAGE REF. LINE AND FLASH
REF. LINE CROSS AT THIS POINT.

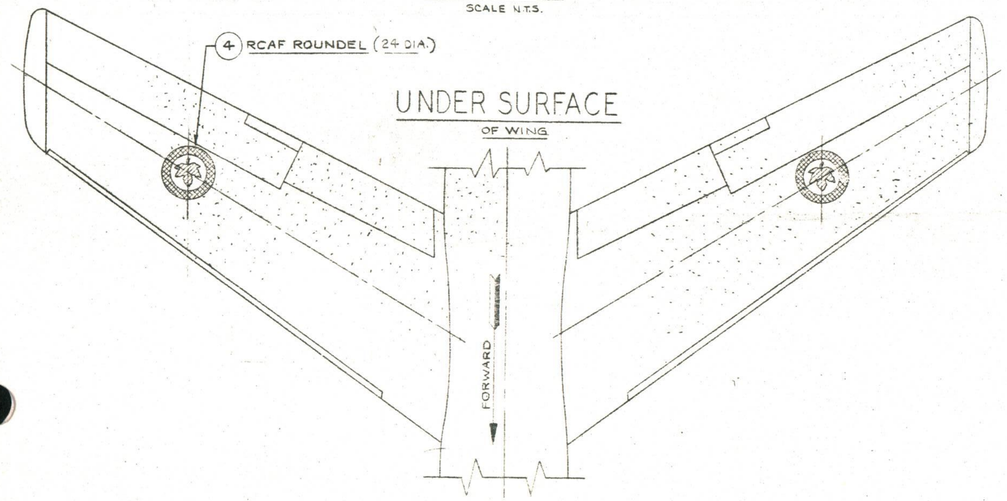
THIS AREA AFT OF STA 333.75 TO BE
LEFT UNPAINTED DUE TO SMOKE GENERATOR
CAUSING EXCESSIVE PAINT BURN-OFF.

4 RCAF ROUNDEL (24 DIA.)

FLASH REFERENCE LINE
TAKEN FROM CENTRE LINE
AT THE LOWER EDGE OF
GUN PANEL.

PORT SIDE
STARBOARD SIDE — SIMILAR

DETAIL "A"
SCALE N.T.S.



UNDER SURFACE
OF WING

NOTES

1. MIX GOLD PAINT. THE GOLD PAINT IS MIXED IN THE PROPORTION OF ONE POUND THREE OUNCES OF POWDER TO ONE GALLON OF LACQUER. DISSOLVE THE ONE POUND THREE OUNCES OF GOLD POWDER IN CELLUOSE NITRATE THINNER BEFORE ADDING TO CLEAR LACQUER. APPLY 3 COATS OF PAINT TO AIRCRAFT.
2. LEADING EDGES TO BE SPRAYED WITH CELIX OR DULUX CLEAR VEHICLE.
3. CLEAN AND DRY ALUMINUM SURFACE THOROUGHLY.
4. APPLY ONE FOG SPRAY COAT OF REFERENCE 33A305 PRIMER SPEC MIL-C-15328A, ALLOW ONE HOUR TO DRY.
5. APPLY ONE FOG COAT OF REFERENCE 33A462 PRIMER ZINC CHROMATE SPEC 1-GP-132 ALLOW TO DRY 30 MINUTES.
6. THE AIRCRAFT REGISTRATION NUMBER SHOWN ON THIS DRAWING IS USED FOR REFERENCE PURPOSES ONLY. (CHECK FOR THE CORRECT REGISTRATION NUMBER OF EACH AIRCRAFT.)
7. DISTANCE BETWEEN LETTERING AND NUMERALS HAS NOT BEEN GIVEN, EACH LETTER OR NUMERAL SHALL BE SPACED WITH REFERENCE TO ITS SHAPE AND THE SHAPE OF THE LETTER OR NUMERAL PRECEDING IT. (APPLICABLE TO NAME AND REGISTRATION NUMBER OF AIRCRAFT.)

PAINT SUPPLIES

	DULUX RED	DU93-2622R	DUPONT OF CANADA LTD	PAINT OUTLET
	DULUX WHITE	DU246-1497	DUPONT OF CANADA LTD	PAINT OUTLET
	DULUX BLUE	DU93-24160	DUPONT OF CANADA LTD	PAINT OUTLET
	MATT BLACK			
	SHEFFIELD LUXOR PALE GOLD POWDER (STD MESH Nº103)		SHEFFIELD BRONZE POWDER CO. 139 STEVENSON, TORONTO, ONT.	
SEE NOTE 1.	CLEAR LACQUER Nº 4105 Nº 1234 CLEAR		CANADIAN INDUSTRIES LTD LAUGHTON AVE. TORONTO, ONT.	
	THINNER - CELLULOSE NITRATE		1 SUPPLY DEPOT	SECTION 5 REF. 33A466
	THINNER - BLUSH RESISTANT		1 SUPPLY DEPOT	SECTION 5 REF 33A465
SEE NOTE 2.	CELIX OR DULUX CLEAR, VEHICLE			

ITEM	DRAWING NO.	PART NO.	RCAF STOCK NO.	NAME	L.H.	R.H.	NO. REQD	SIZE AND DESCRIPTION	SPECIFICATION / MATERIAL
	12103			LETTER AND NUMBER AIRCRAFT IDENT. MARKING					
	6009			LETTERING — "ROYAL CANADIAN AIR FORCE"					
	6008			LETTERING — "GOLDEN HAWKS" — "RCAF"					
4			27H10114	ROUNDEL - RCAF			6	DECAL (24 DIA.)	
3		5184-2	27H10208	CANADIAN ENSIGN-R.H.			1	DECAL (RED) 10 x 20	
2		5184-1	27H10207	CANADIAN ENSIGN-L.H.			1	DECAL (RED) 10 x 20	
1	5212			MARKING - AEROBATIC					

DRAWN A. CRAIG 3 APR 59
CHECKED J.T. NORMAN 15 DEC 59
D.O. R. [illegible] 15 DEC 59
ENG. [illegible] 15 DEC 59
RCAF APPROVED
SQDR. J.E.M. 16 DEC 59
AUTH. J. NORMAN 15 DEC 59

TITLE
AEROBATIC MARKING
SABRE (F-86) ACFT

DEPARTMENT OF NATIONAL DEFENCE
ROYAL CANADIAN AIR FORCE

DRAWING NO. 5212
SHEET 1 OF 1 SHEETS

NEXT ASSY. | L.H. | R.H. | NO. REQD | REV. B A

DWG. SIZE F | SCALE 1/30 & NOTED

WORK ORDER Nº
1050-26 CJ

ROYAL CANADIAN AIR FORCE

PORT SIDE

ROYAL CANADIAN AIR FORCE

STARBOARD SIDE

GOLDEN HAWKS

RCAF

THIS DRAWING MAY BE
USED AS A TEMPLATE

	SABRE A/C GOLDEN HAWKS-RCAF LETTERING	3212	
	DEPARTMENT OF NATIONAL DEF. — ROYAL CANADIAN AIR F. HQ	6008	

J. Bailey 153

The R.C.A.F.'s "Golden Hawks" aerobatic team which was created last year made its first public appearance of the year on 14th May. The gold, red and white finish of the team's Sabre 5s is becoming increasingly familiar in Canada.



216

Photo 1960

19101

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. 885 E. 233 LOWE-MARTIN M'F'G

MAJOR EQUIPMENT RECORD CARD

FIRST ENTRY AT CANADAIR DATE 11 Aug 50 TRANSFER ORDER No. T197

TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY	TRANSFERS DATE	TRANSFERS TO	TRANSFERS AUTHORITY
11 Aug 50	ATC (NRC ARNPRIOR)	T O 1197			
28 June 51	No 11 TSU (Canadair)	T01194			
17 July 51	406 (AE Arnprior)	T01229			
16 May 52	11TSU (Canadair)	T O 1124			
16/17 May 52	ATC (CE&PE Det Arnprior) Del. 11TSU Q 845, 21 May.	T O 1125			
10 June 52	CE&PE Det Arnprior	T O 1197.			
25 June 52	11TSU (Canadair) Del. Rockcliffe OST, 28 June	T O 1220			
23 June 52	CE&PE Rockcliffe	T O 1230			
Jan 53	C E&P E Det replaced	T O - 1517			
19 Oct 55	SR Stn Lincoln Park for storage at Chatham for future use as Museum A/C	T O 421			

REMARKS: RECEIVED AT CANADAIR OFF CD 601

DATE

~~O&T-305~~

TYPE OF EQUIPMENT IN WHICH USED — 067-475

DATCH No. — SPECIFICATION No.

PART NUMBER 19101 — YEAR — TYPE — MANUFACTURER'S No.

19101 S26E F86A 1 AMC

REGISTRATION NO.	MAKE & MODEL	YEAR	TYPE	MANUFACTURER'S NO.
19101	SABRE F86A 1			

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 fuselage	tank Canadair	CDS11962				17.7.51	ATC
2	16.5.52	fly in repairs	Canadair	W511962					
3	23.6.52	fly in repairs	Canadair	W 511962					
4									
5	16-5.52								
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

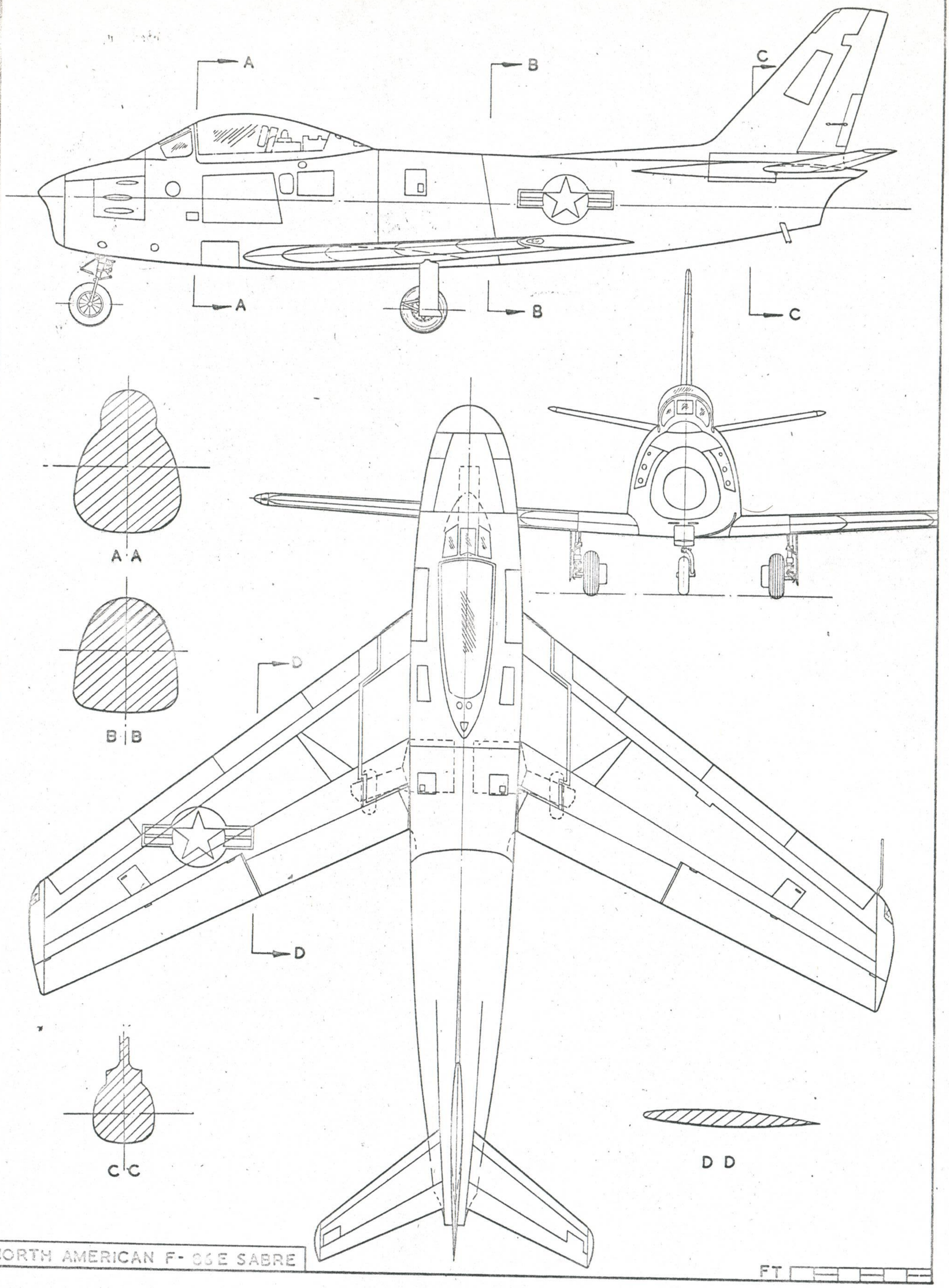
REMARKS

23-9.52 - AFRU 497 d 18 July - Amc of TO 14487 d 23-9-52

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	SR 75 Leth Museum		LC IP QL 250 x 1		
24 Nov 64	QTO 794	Aphd 1007 + 10 Leth as		agreement and Ltr		
25 Aug 65	W i M 61	C + DC sold to:		dispos authority		
(W pending 7 Sep 65)		no 700 (City of Edmonton) Wing	ME 2721			
		Air Association		Sale Order 215-797		
		11420 - 117 St Edmonton Alta				



NORTH AMERICAN F- 86 E SABRE

FT



1



2



3

ON A SABRE COMING OVER

Operation Becher's Brook : Atlantic Ferrying of Canadian Sabres for the R.A.F.



4

FOR the story of Operation Becher's Brook please turn to page 686. These dramatic photographs were taken on one of the nine convoys which to date have made the 3,100-mile delivery journey: (1) The take-off from St. Hubert, Montreal. (2) Arrival at R.C.A.F. Station Goose Bay, Labrador. (3) Assembly at Bluie West One, in south-west Greenland. (4) Preparation: Ferry pilots on track during a seven-day survival course in Labrador. (5) These ferry pilots at St. Hubert, include (standing, l. to r.) F/L. M. Creighton and F/O.s J. H. Hind and F. Vindis. (6) Preparing to take off from Bluie West One. (7) Preparing to touch down in Greenland. (8) Cpl. D. Paterson clears a frosted-up filler cap in Greenland. (9) At 35,000ft over the Greenland ice cap; the pilot is F/L. D. A. Blair. (10 and 11) Grand but uninviting scenery is presented to the pilot over Greenland. (12) Arrival at the Maintenance Unit at R.A.F. Station Kemble, Gloucestershire. Camouflaging and delivery are the next steps.



5



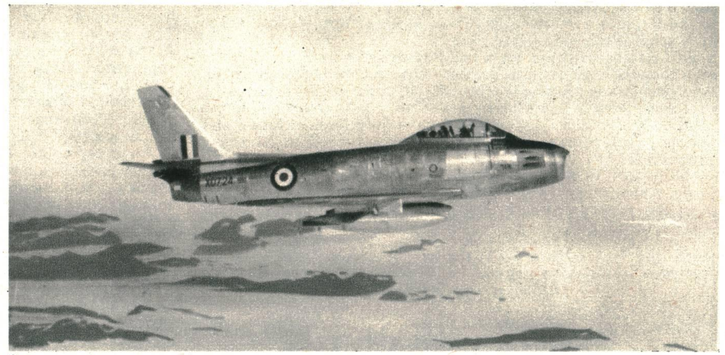
6



7



8



9



10



11



12



"Flight" photographs

What may be described as a definitely positive take-off results from the installation of v.p. D.H. Queen 2s; this in addition to a single-engine performance which is not all downhill. The aircraft is here seen leaving the soft grass airfield at Southampton.

Rapide with Royal Urge

Gipsy Queen 2s give a lively performance to the Series 4 aircraft

By THE EDITOR

ONE of the few bright and sunny days of early November provided an opportunity to refresh somewhat dim memories of piloting a Rapide. But this was a Rapide with a difference: a Series 4, in fact. The only two examples were earlier referred to in a paragraph in our October 30th issue, and the example which was demonstrated for me and which I subsequently flew has been converted for Noon and Pearce Air Charters, Ltd., of Nairobi. The difference lies in the installation of Gipsy Queen 2 engines with constant-speed airscrews; the gain in performance is quite remarkable.

The work of converting the ordinary Rapide into a Series 4 has been carried out by Flightways, Ltd., of Southampton Airport, and it was from Eastleigh that we flew. Mr. Alec Noon has purchased—from Mr. V. H. Bellamy of Flightways—a set of drawings for the conversion, and he expects to convert a number of the Rapides now flying in Africa, in his company's workshops at Nairobi West.

East African Airways use a few Rapides and are likely to make the change of engines as the present units become due for overhaul. Air Madagascar are also interested. (I understood, incidentally, that East African have been unable to put into operation the Macchi 320s which they bought to take over Rapide duties, and that the performance of these aircraft has proved to be below expectations.)

B.E.A. still operate nine Rapides, which they call Islanders, to the Channel, Scilly and Scottish Islands. Some of these services are over very short ranges, but advantages would result from the installation of Queen 2 engines. The Rapide does not match up to modern standards, but it is the only available aircraft which can be licensed to fly commercially into some of the smallest airfields. The Heron, which in many ways comes nearer to being a replacement for the Rapide than does the Dove, is also able to fly in and out of the fields used by the Rapide and with a greater safety margin, but its operation is governed by more stringent post-war regulations.

Rapides are also still used by several charter companies but, as we remarked previously, these aircraft have not much of a future in Europe, if only because there is a marked reluctance on the part of the public (one, we must add, which is quite unjustified, as the safety record of the Rapide confirms) to flying in what they refer to as "rickety old biplanes." For business-work around Europe the Rapide continues to have appeal.

Except for the addition of two airscrew-pitch levers and two boost gauges in the cockpit, there is little difference to be noted. The cowled engine looks the same as ever, although the c.s. airscrew, with its neat polished spinner, definitely enhances the appearance of the installation. New oil tanks containing about three-quarters of a gallon more for each engine are the only other modification of note.

Before conversion Rapide VP-KLL weighed 3,603 lb empty, had an a.u.w. of 5,500 lb and a payload with full tanks of 1,043 lb. The corresponding figures in Series 4 form are now 3,757 lb empty, 6,000 lb a.u.w., payload 1,339 lb.

But perhaps the more significant features of the new performance are the single-engine safety and the increased speed and range. To take an example from Noon and Pearce services, Nairobi to Dar-es-Salaam is 418 miles. Standard ageing Rapides, cruising as they do at 110 m.p.h. for a maximum safe endurance of 3 hr 45 min (10 gall/hr per engine), cannot make this trip without an intermediate stop. The Series 4 machine, however, cruises at 130 I.A.S. at 7,000ft (−3 lb boost and 2,100 r.p.m.) and has a safe endurance of 3½ hours (10½ gall/hr), and so it can tackle the journey non-stop even with a head-wind.

Much of the country over which Rapides fly in Africa is unsettled, so ability to hold height at 6,000ft with 6,000 lb a.u.w. on either engine alone is comforting. An *en route* engine failure at a rather lower weight would leave the pilot in a position to continue his journey at 90 to 100 m.p.h. and to know that he could go round again at his destination if need be. With passengers and half-full tanks at sea level the Series 4 will climb at 250 ft/min on one engine.

It can be confirmed that the Queen 2 overhaul period, at present 750 hours, has been discussed with the A.R.B., and that consideration will be given to raising it to 1,000 hr.

No particular claim is being made regarding take-off run for the Rapide 4. The measured figures for the standard aircraft are considered satisfactory and it is obvious that these are handsomely surpassed.

My own brief experience at the controls was a pleasant one. The pilot's view is, of course, very good from the nose cockpit

Responsible for the conversion of the second Series 4 Rapide were Mr. Alec Noon, the owner (left) and Mr. V. H. Bellamy, whose company, Flightways, Ltd., did the work.



AIRCRAFT INTELLIGENCE



SUBMARINER'S NIGHTMARE: Out at Fort Worth, Texas, the Bell Corporation are getting into full production with the big HSL-1 anti-submarine helicopter. In the foreground the second machine carries out tied resonance tests, while the first prototype approaches in the background. Neither aircraft has the rotor pylons properly faired into the fuselage.

Great Britain

*Boulton Paul Sea Balliol T.*21. In our "Farnborough Report" issue we described the double-extension tailwheel leg developed by Boulton Paul for the carrier-equipped Sea Balliol. Two air-spring oleos, mounted concentrically, permit a ten-inch stroke to be achieved in a compact unit employing small, light forgings. The sketch on this page shows the leg, together with the arrester hook and the articulated cable guard in front of the leg. The Royal Navy now has quite a number of Sea Balliols and deliveries are continuing.

*D.H. Sea Venom F(AW)*20. This fine two-seat, all-weather fighter is coming into service in many Fleet Air Arm squadrons, and deliveries will continue most of next year, at least. After a remarkable number of changes the fin/rudder combination has settled down to the configuration shown in the sketch below. Rubber deck-bumpers are seen beneath the booms, and the elevator mass-balances are now fully faired in to the undersurface of the fixed tailplane.

Hawker Hunter. Reports of a Hunter flying with slipper tanks mounted on the undersides of the wings are incorrect; such a development has not yet been flown. Another report states that the crimson first prototype WB 188 is being rebuilt with a more powerful engine. The Hawker Siddeley Group do not comment upon this, but it is generally expected that fully developed Hunters—and Swifts—might be able to employ an afterburning Avon RA.14, giving considerably more than 10,000 lb thrust and possibly making both aircraft supersonic on the level.

Short S.B.6 Seamew. The distance at which wing downwash can be felt is sometimes remarkable. In the Seamew A.S.1, the combined effect of the high-lift wing and the short tailplane moment arm combine to produce a considerable negative angle of attack on the tailplane, under some conditions. To keep the flow smooth, small fixed slats have been attached to the prototype, as shown in the drawing below, left. It is too early to say whether these will be fitted to production aircraft, or discarded in the light of fuller knowledge. The Prestwick Pioneer 2, of course, has slots built into the tailplane to serve the same purpose.

Supermarine Swift. Although small frontal area is a great help in achieving supersonic flight, most modern American fighters have singularly bulky fuselages, showing that they were designed around a considerable tankage, rather than tailored to fit an axial engine. In the Swift, the fat fuselage and consequent large internal tankage is fortuitous, for it is a direct inheritance from the centrifugal Nene used in the Supermarine 535. From recent speed-record attempts it appears that the Swift has a Mach number about 0.05 below that of the Hunter for equal thrust, but the greater fuselage volume permits larger tankage, and is likely to prove useful in providing for bigger air-ducts and afterburners in future marks. Production Swifts are likely to form at least a token R.A.F. squadron shortly, and the Swift would also appear to be a very useful machine for M.o.S. research establishments and a number of firms in the industry. In the U.S.A. it is not uncommon for as many as 100 fighters to be diverted from squadron service to fill special research rôles.

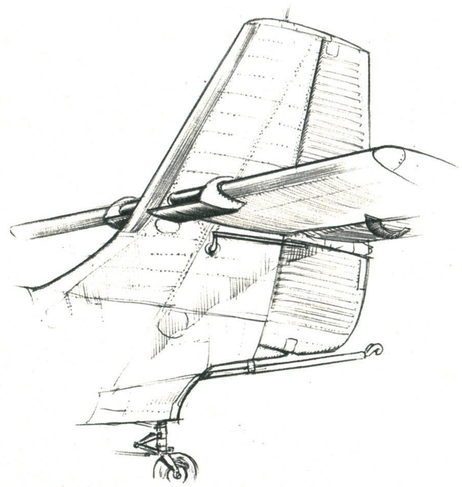
United States

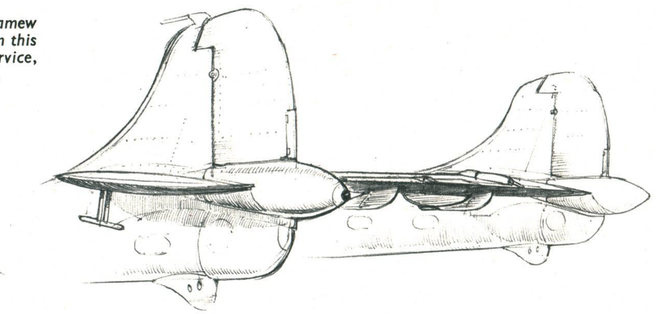
Convair YF-102. The prototype of this Mach 2 automatic manned intercepter made its first flight on October 24th, as we reported two weeks ago. We now learn that the aircraft made an emergency wheels-up landing just off the end of the runway at Edwards A.F.B. early this month, following a reported loss of power from the afterburning Pratt and Whitney J-57-P-11. The aircraft was badly damaged, although the Convair chief project test pilot, Dick Johnson, suffered only minor injuries. The second prototype should fly in about three weeks' time and testing will then continue.

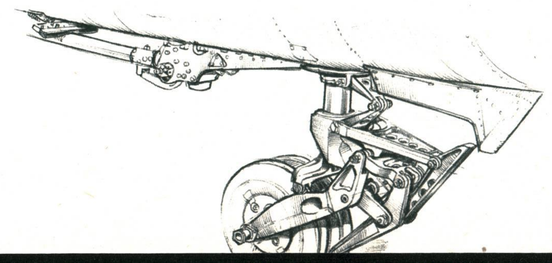
Japan

Fuji Mentor. Fuji Heavy Industries (famous in World War 2 as Nakajima) are expecting an order for Beech T-34 Mentor trainers for the Japanese National Safety Forces. The first order specifies 30 Mentors to be delivered at the rate of about six per month from next May, at a cost of 21m Yen (£20,700) each. Licence negotiations with Beech are under way. The Mentor is a tandem-seat trainer developed from the Bonanza, with a 225 h.p. flat-six engine.

The "Flight" sketches of the Sea Venom F(AW)20 (right), Seamew A.S.1 (below) and Sea Balliol (lower right) are all discussed on this page. All three types are in service, or just entering service, with the Royal Navy for contrasting carrier operations.







THE FIGHTING SERVICES

U.S. Korean Awards

THE *London Gazette* for October 30 announced the award of decorations conferred upon Royal Air Force personnel by the President of the United States of America in recognition of valuable services rendered during operations in Korea. The Queen has given authority for the acceptance, and granted unrestricted permission for the wearing, of these decorations.

Distinguished Flying Cross

Sqn. Ldr. J. R. Baldwin, D.S.O., D.F.C., A.F.C. (missing). During the air fighting in Korea last year, when Sqn. Ldr. Baldwin was leading a flight of four F-86 aircraft which were providing defensive support for fighter bombers, his flight was attacked by a large force of between 16 to 20 enemy MiG-15 aircraft. In the battle which followed, Sqn. Ldr. Baldwin immediately succeeded in gaining the advantage of position and so effectively pressed the attack upon the enemy flight that it was forced to withdraw.

Sqn. Ldr. Baldwin, a leading R.A.F. fighter pilot, was reported missing on March 15, 1952, from a reconnaissance mission in Korea. During the past War he destroyed 16 enemy aircraft and damaged several others. While commander of a wing of Typhoons in France after D-Day. he distinguished himself as leader of a flight of aircraft which shot up a staff car in which Field Marshal Rommel was riding.

Sqn. Ldr. W. Daniel, D.S.O., D.F.C. In April, 1951, while leading a flight of four F-86 aircraft on patrol near the Sinuiju-Yalu River, Sqn. Ldr. Daniel engaged a flight of six enemy MiG-15s at 28,000 ft. He at once succeeded in splitting the enemy and pressed the attack on two of the enemy, severely damaging them before they were chased to the Manchurian border.

Flt. Lt. J. M. Nicholls, D.F.C. During air operations in Korea in August last year, Flt. Lt. Nicholls engaged two enemy MiG-15 fighters whilst leading a flight of F-86s near Sakchu, securing hits on one, and later on two others.

Bronze Star Medal

Sqn. Ldr. V. B. de la Perrelle. Between August and October, 1951, Sqn. Ldr. de la Perrelle provided essential aerial photographic coverage while serving with a reconnaissance squadron of the United Nations forces.

Air Medal

For operational flights in F-86s and Meteors over Korea, the Air Medal has been awarded to Sqn. Ldrs. W. Harbison, R. E. Lelong, D.F.C., Max Scannell, D.F.C., A.F.C., B. J. Spragg, D.F.C.; Flt. Lts. C. I. Blyth, D.F.C., A.F.C., F. Easley, R. Knight, and Sgt. R. L. R. Lamb (deceased). Sgt. Lamb was later killed in a flying accident.

Leaflet Dropping in Malaya

ON Wednesday, October 28, 1953, Lincoln bombers of the Royal Air Force and the Royal Australian Air Force completed the largest leaflet dropping operation to be undertaken in South East Asia since the end of the Japanese War. 20 million leaflets were dropped on over 200 target areas in the Federation in or through which Communist terrorists are known to operate.

Hornets from Butterworth and Tengh also took part in the air side of the operation. The purpose of these leaflets was to encourage a recently noticed tendency amongst the Communists to surrender in small groups rather than individually. They conveyed a new inducement to the junior Communist leaders in whose hands lies the fate of so many of their disillusioned comrades.

The leaflets extends to these leaders the reward of 500 dollars per head to any member of the public who saves the life of a terrorist by helping him to escape from the Communist bosses in the jungle. The leaflets vary slightly according to local requirements but are addressed primarily to junior leaders.

The initial leaflet drops were accompanied by other psychological methods including radio programmes to ensure that the offer was as widely known as possible before the Communist higher command were able to take counter action. It was followed up by local campaigns directed to known groups of Communist terrorists in which leaflets, voice, aircraft, and information services mobile units were all employed.

Twelve Lincoln bombers, comprising six from No. 1 Squadron R.A.A.F. commanded by Wing Commander A. R. Emslie and six from No. 83 Squadron R.A.F. commanded by Squadron Leader W. C. Sinclair, took part in the operation. Some of them were based at Butterworth and others at Kuala Lumpur.

DELIVERY COMPLETE.—The last of the 376 Canadair-built F-86E Sabres supplied to the R.A.F. under the Military Aid programme are on their way across the Atlantic for delivery to operational squadrons. These four are from a 2nd A.T.A.F. unit in Germany.



Lord Kenilworth

JOHN DAVENPORT SIDDELEY, first Baron Kenilworth (created 1937), died in Jersey on November 3.

Although not among the earliest pioneers of aviation, John Siddeley was one of the greatest influences in our air affairs. He was born in 1866, the son of a well-to-do Manchester business man, and in his young days was a prominent member of the great Anfield Bicycle Club. In the 1895 period he came to Coventry to join the Rover Cycle Co. and was in charge of their racing team. Later he joined the Dunlop Co., and then transferred to the Clipper Tyre Co. Thence he graduated, naturally, to motorcars and drove, in 1901, a 6 h.p. Daimler in the 1,000-mile trial.

When "Pa" Austin persuaded the Wolseley Sheepshearing Machine Co. to build Wolseley cars, Jack Siddeley (as he was generally called) persuaded him to make Wolseley-Siddeley cars. Later, after disagreeing from the Wolseley directors, he joined Captain Deasy in Coventry and the Siddeley Deasy car became famous for its quality.

During the 1914-18 War, Frank Halford, R.F.C., designed the B.H.P. (Beardmore-Halford-Pullinger) engine, which turned out so well that it was handed over for quantity production to the Siddeley Motor Co., as it was then called. It became the Siddeley Puma, a notably good straight-six water-cooled engine. Mr. Siddeley was created a C.B.E. in 1918.

After that War a great many engineering firms fell on hard times—among them Sir Wm. Armstrong-Whitworth's, of Newcastle upon Tyne, and Mr. Siddeley was appointed to the committee formed to put its finances to rights. He found that the firm's Aircraft Department, run by Fairbairn-Crawford, with Frits Koolhoven as designer, had been a profit-making concern, so he bought it—hence Sir W. G. Armstrong-Whitworth Aircraft, Ltd., of Baginton and Whitley, near Coventry, also Armstrong Siddeley Motors, Ltd., the Armstrong Siddeley Development Co., Ltd., Armstrong Siddeley Gas Turbine Training School, and eventually the great Hawker-Siddeley Group.

The Siddeley Jaguar engines and the Siddeley Siskin and other aircraft are still inside living memories. Also the acquisition by the Siddeley Co. of A. V. Roe and Co., Ltd., will be remembered. And finally, the whole Siddeley organization was absorbed into the Hawker-Siddeley Group, and Sir John Siddeley (knighted 1932) left to take up public activities in which his particular talents had wider scope. But before that he had been chairman of the S.B.A.C., 1931-33, and of the Engineering and Allied Employers' Federation, 1934-36, and of the Society of Motor Manufacturers and Traders.

Also, in 1933 he had been Master of the Coach Makers and Coach Harness Makers Company. He had persuaded that venerable institution that, with the passing of the horse and coach, the motorcar and the aircraft were in the direct succession of the coachmaker's art.

His public activities and, I may say, his benefits to the people, consisted in being High Sheriff of Warwickshire in 1932 and a J.P. for Coventry and Warwickshire for 1933-1938. Also he was Lord of the Manor of Kenilworth. He retired a year or so ago to Jersey, but until then he took part in many public functions. Lady Siddeley, who was a few years older than he, died a month ago.

He is succeeded in the Peerage by his son Cyril, who in the 1914-18 War became a Lt.-Col., and later Hon. Col., of the 7th Battalion, the Royal Warwickshire Regiment, T.A., and was twice mentioned in dispatches. In the 1939-45 War, he was again mentioned. The new Lord Kenilworth has also been chairman of the Coventry and Warwickshire Hospital and a Deputy Lieutenant of Warwickshire, and Sheriff of the County, 1944-45, and holds other public posts, besides being a director of Armstrong Siddeley Motors. He has a son and daughter.

John Siddeley was always notable for his meticulous neatness in appearance and for his quiet and courteous—almost old-fashioned—manner and speech. But he could be angry on occasion. Those who worked with him rather regarded him as a benevolent despot.

His benevolence is shown by his public gifts, which included £100,000 to the Fairbridge Farm Schools in 1937 and the present of Kenilworth Castle to the nation. I have particular reason to remember his wisdom and tact and kindness in an argument in which the then young AEROPLANE was concerned many years ago.

Besides his son Cyril, he leaves another son and two daughters to whom, in the loss of both their parents, we offer sincere condolences.—C.G.G.

Group Officer C. M. McAlery

FEW among the regular readers of THE AEROPLANE do not know the initials "C.M.McA." which have for years appeared at the end of articles of all sorts—International air exercises, R.A.F. exercises, R.A.F. reviews, Passing-out ceremonies, Athletic meetings and Rugger matches, Criticisms of books, Criticisms of Government policy—in fact, almost anything. The initials belong to Mrs. Cecily Mary McAlery, who died after an operation on November 6 in St. Richard's Hospital, Chichester.

She was born Scott-Holmes, in Norfolk, in 1895, and when quite a young girl, in 1914, plunged into the recruiting office in Norwich, where she specialized on routing out slackers from the Army. Her brother was killed early in the War, which made her the more determined to do her best for the Services. As soon as she was old enough, she joined the Women's Royal Air Force.

A young woman of her breeding and education was at once given a commission, and with her driving force she was soon put in command of a force of factory girls at Beaulieu, in the New Forest, where their job was to pull crashed aeroplanes to pieces and clean up the remnants to be returned to store. In her spare time she flew a great deal, contrary to all regulations, with officers of the training station—where she was naturally known as "Scotty," a name which stuck.

In due course W.R.A.F., H.Q., discovered this dominant young female and she found herself on the staff of one of the senior officers, Miss Douglas-Pennant, about whose administration controversy raged for years after she was dismissed. Bad or good, that spell of Staff work was valuable to "Scotty," if only to show her how things ought not to be done.

When the W.R.A.F. was disbanded, a mutual friend brought her to see me in THE AEROPLANE office, to be a shorthand-typist. Her shorthand was all her own; none could read it, not even herself. But she knew all about the inside of the new R.A.F., and what it thought of its aircraft and of the firms that made them. She typed beautifully, she wrote and spoke classical English and Service slang when needed, and when she had to report a speech or condense an official report or hand-out, her version was always a fraction of the length of, and twice as intelligent as was, the original.

Besides that, she had been brought up by her brother on Rugger, and there were few men who knew the game as well as she did or could criticize it as well. Also, she was just as keen on sports, and as graphic a reporter.

With all that there was nothing to do but make her O.i.C. all R.A.F. affairs in the paper, an appointment which she expanded to take in all the other Services and their Reserves and the Ministries which handled or mishandled them. She had so many friends in, or late of, the R.A.F., all over the World that when she offered an opinion on anything it was always worth having.

She lived, worked, thought and dreamt R.A.F. Once, in early 1934 she took a long holiday to go to see where her husband John McAlery, whom she married soon after the 1914-18 War, had been killed in 1923 in a flying accident. She persuaded Imperial Airways to fly her to Egypt and back. There she called in Cairo on the A.O.C.-in-C. (Air Marshal, now Lord, Newall) who gave her a permit "to use Service transport" for her professional press purposes.

A sample of her wit appears in her account of the trip in THE AEROPLANE for April 4, 1934. The Italians sealed all cameras on aircraft taking off from Brindisi. Scotty remarked, "If they find any lightning sketch artists on board, I suppose they handcuff them."

Then, when the Hitler War loomed up she became deeply involved in the conspiracy for the formation of the Women's Auxiliary Air Force—why the Government could not revive the Women's Royal Air Force with all its fine traditions we could never understand.

She rose to be a Group Officer (a four-striper) and would have gone higher but for her incurable habit of speaking her mind and the truth. She had a tongue that could hurt like a whip-lash and the kindest heart that ever was. I lived for practically 20 years in terror of that tongue and in exquisite enjoyment of the gems of wit and satire and irony that it produced. But I never knew her do anything unkind, unless you can call an action unkind that gets rid of a poisonous person for the good of the community—in her case her beloved R.A.F.

Those of us who knew her are much the better for it, and, I hope, somewhat wiser. And the Royal Air Force owes her a great debt of gratitude for all she did to help in building up during the 20 years of peace, that spirit which carried it through seven years of war to the admiration of the World.

To her mother and sister, all will offer their deep sympathy, and will share with them the pride they have in her work. Scotty was a very great woman.—C.G.G.

FROM ALL QUARTERS



REAL WAR: Every French aircraft in Indo-China is furiously busy, either hauling supplies or hitting the Viet-Minh rebels. In the latter rôle are the Curtiss Helldivers from the carrier "Arromanches," now operating, as seen here, from a P.S.P. strip.

The Royal Homecoming

THE Royal Yacht *Britannia*, with Her Majesty the Queen and the Duke of Edinburgh on board, will be escorted throughout the journey from Gibraltar to the Thames Estuary by Shackletons, Neptunes and Sunderlands of R.A.F. Coastal Command. Up to latitude 41 deg 30 min north, escorts will be provided by Gibraltar squadrons; farther north they will come from England, and be under the control of A. V-M. T. C. Traill, A.O.C., No. 19 Group. During the first day and the last two days of the voyage, two aircraft will act as escorts during daylight and one by night; during the remainder of the time, one aircraft only will be in attendance by night and day. As the royal yacht leaves Gibraltar harbour she will further be escorted by six S-55 Whirlwinds, and aircraft from H.M.S. *Eagle* will fly past in salute.

On Saturday, May 15th, as *Britannia* steams up the Thames Estuary towards Woolwich, a mass formation of 180 jet aircraft will fly past in salute. The formation will consist of 96 Meteors and 24 Sabres of Fighter Command, 24 R.C.A.F. Sabres, and 36 Canberras of Bomber Command; there will be two broad arrowheads each of 72 fighters, followed by the Canberras in two groups of 18. They will pass Woolwich at 12.25 p.m., at 345 m.p.h. and staggered between 1,200ft and 3,000ft. Wings will form up over the East Coast and fly in *via* Clacton and Southend to Woolwich. After flying past the royal yacht they will continue westwards, dispersing over Ealing.

New British Fighters

MENTION can now be made of four new marks of British fighter, the de Havilland Sea Venom F AW.21 and Venom FB.4, and the Hawker/Armstrong Whitworth Sea Hawk F.2 and FB.3. The Venom FB.4 is a single-seat, Ghost-powered fighter/bomber for the Royal Air Force; it is very similar in appearance to the FB.1 and has internal improvements. The Sea Venom F AW.21 is a two-seat all-weather fighter for the Fleet Air Arm; it has improved controls, a power-jettisonable clear-vision canopy and a lengthened nose housing "more extensive" radar than is carried by the Mk 20; it is in production, as is the very similar Sea Venom 53 for the Royal Australian Navy. The new Sea Hawks are both Nene-powered and are in production by Armstrong Whitworth; both have numerous detail improvements about which nothing may yet be published.

French Indo-China Airlifts

AS we go to press the Franco-Vietnamese forces defending the Dien Bien Phu strong-point are still holding out, though the battle has reached a critical stage. By last Saturday the defenders lost all but 600 yards of their airstrip; the enemy claimed to be "in full control of both airfields at Dien Bien Phu."

Air support for the hard-pressed garrison last week became available on an increasing scale. Six C-124 Globemasters of the U.S.A.F. Tactical Air Command took some 820 French troops on board at Orly, Paris, and made an 8,500-mile flight *via* Karachi, Colombo, Bangkok and Saigon, thus avoiding Indian territory, the neutrality of which had been emphasized by Mr. Nehru, the Indian Prime Minister. It was reported that other airlifts were being organized from U.S.A.F. bases in North Africa.

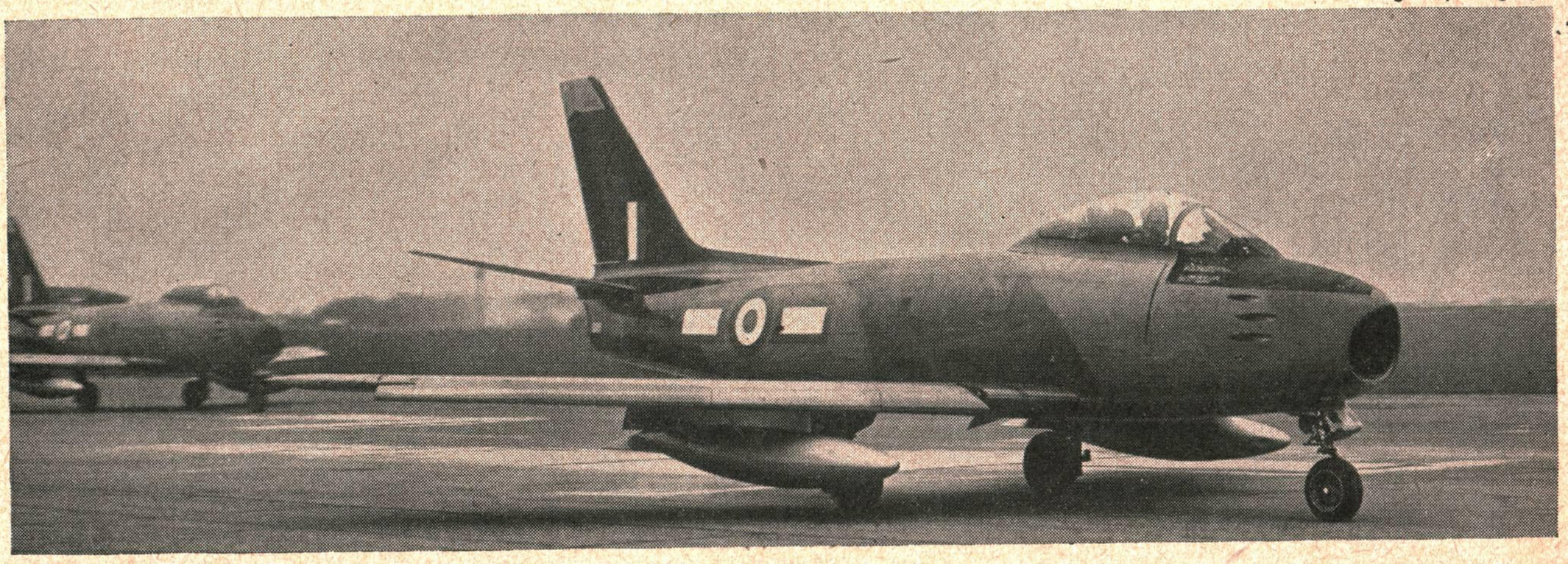
Whereas the Globemasters were to carry the troops to airfields in Indo-China outside the immediate area of the fighting, other aircraft—mainly C-47s supplied by America to the French forces—have been parachuting reinforcements and supplies direct into the beleaguered area. A remarkable fact is that the majority of troops thus lifted had never previously made a parachute descent; though they had received only the most rudimentary training, accidents were reported to be few and volunteers many. The majority of the drops have been made in darkness, and the pilots as well as the troops have had a formidable task, as the area is surrounded by 5,000ft mountains.

In spite of the ferrying-in of a considerable number of B-26s, the French say they are still seriously short of bombers. The whole problem of air support, too, has been complicated by several spells of bad weather, and these have also interfered with operations by the Helldiver squadrons which were disembarked from the French aircraft carrier *Arromanches* to operate from the Red River delta. On Monday last, 25 F4U-7 Corsair fighter/bombers, disembarked from the U.S. carrier *Saipan* on April 18th, went into action for the first time.

The only woman in the beleaguered garrison of Dien Bien Phu is a French Air Force nurse who has been marooned there since March 28th when the helicopter in which she had landed to evacuate wounded was destroyed by Viet Minh shellfire. Her name is Mlle. Geneviève de Galard-Terraube. It will be remembered that Mlle. Valérie André, a doctor and helicopter pilot, carried out similar duties in the same theatre of war.

YORKSHIRE SABRES: When the Canadian C.A.S., Air Marshal C. R. Slemon, visited R.C.A.F. North Luffenham recently (see p. 561)*, a regular Sabre squadron of Fighter Command dropped in on a visit. The aircraft are Sabre F.4s of a famous unit now based at Linton-on-Ouse.*

"Flight" photograph



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and
AIRCRAFT ENGINEER

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Clearing the Air

A CONFERENCE on European air transport, inspired by the Council of Europe and organized by I.C.A.O., is now in progress at Strasbourg. Although it has so far almost escaped public attention, this meeting could produce decisions capable of dominating the future development of air transport—not only in Europe but throughout the world.

Essentially, Strasbourg represents an attempt to solve a global problem on a regional basis. This problem—the multilateral exchange of traffic rights—has defied solution since it was first discussed by representatives of all the nations of the free world at Chicago in 1944.

Fear of aggression has already brought a good measure of unity into European military aviation. But there are economic as well as military reasons for pooling of resources, and the Council of Europe has sought for some years to produce a formula for co-ordinating air transport within their province.

National pride thrives on tradition, and the smallest European countries rightly regard their own airlines as equal in all but size to the big carriers. Despite the isolated precedent set by the Scandinavians in forming S.A.S., the prospects of further large-scale merging of European airlines—however desirable they might be on theoretical grounds—still remain distant.

Some of the larger nations taking part in the Strasbourg discussions are advocating that the Fifth Freedom (the right to carry traffic between foreign countries) should be the general rule rather than the carefully negotiated exception; others oppose this principle or have perhaps entered the conference with an open mind. No fewer than 20 nations are taking part, and, though we hope otherwise, we doubt if May 10th—the day on which the conference is scheduled to end—will bring any final agreement on this fundamental question.

Barriers

There are practical as well as ideological barriers to the degree of co-ordination which the Council of Europe has in mind. One possibility to be discussed at Strasbourg is that of interchangeability of aircraft (now a familiar part of the American airline scene), which is defined for the purpose of the Strasbourg agenda as "the ability of an airline, operating internationally under a government agreement or authorization, to use an aircraft belonging to a foreign airline and registered in a foreign State, with or without the aircraft's crew." Interchange of aircraft brings increased utilization and consequently reduces operating costs and, in turn, fares; but large-scale interchange throughout Europe's complex pattern of route networks would, for several years at least, be restricted by the diversity of types operated by different airlines. There are obvious limits to the extent of co-operation possible between two operators with, for instance, Viscounts and Convairs respectively.

Two other subjects on the agenda promise to provoke useful discussion: the possibility of granting special facilities for non-scheduled flights; and the future of helicopter services. Some agreement for smoothing the path of charter operators, in particular, is long overdue. The advantage of quick international shipment by air is too often nullified by the need to make a written application for landing rights some days in advance of the actual flight.

Apart from the withholding of traffic rights on many routes, there are several other factors which restrict the development of air transport in Europe. The greatest, and in our view the most easily reduced, is the amount of time and money wasted by Customs and immigration procedures based on those of seaports and frontiers. If these obstacles cannot yet be swept away they can at least be adapted to the requirements of the air age. And although Strasbourg may fail to settle the bigger political issues, it can exert a powerful influence in this respect alone.

Progress made at the conference will be reviewed in future issues of *Flight*. Meanwhile, we express a hope that members will find—in the words of Sir George Cribbett, leader of the British delegation—"a freedom which avoids chaos on the one hand and avoidable restrictions on the other."



"Flight" photographs

Canadair-built Sabre 4s from Brüggen. These aircraft have the "slick" wing, with the "6/3" leading edge.

BATTLE ROYAL . . .

both "clutches" may be many miles apart, their work is closely dovetailed. Constant reports keep the Co-ordinated Central Progress Control Section at H.Q. 2nd A.T.A.F. informed of progress, so that the situation in respect of first- and second-phase production can be presented at any hour of the day or night.

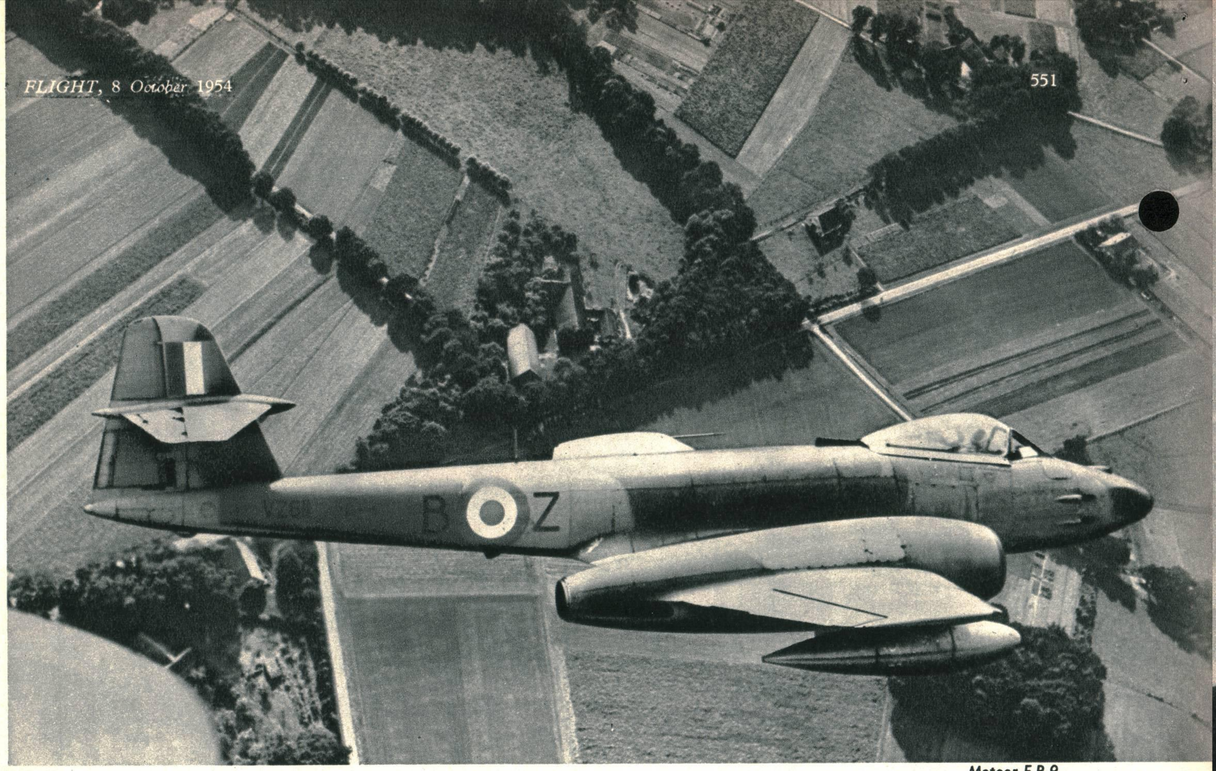
To carry the photographic equipment, generators, water and chemicals for a seven-day operation requires an impressive number of support vehicles, many of which carry nothing but 700 gallons of water to supplement the 200 gallons stored in each of the photographic trailers. There is, additionally, pumping equipment for the utilization of local sources of water.

Two of the vehicles are diesel ten-tonners, each capable of being expanded to an overall area of 500 sq ft. The first of these houses the "mosaicing" tables (on which the mosaic and target maps are made) and the enlargers for scaling prints. The mosaics are re-photographed and distributed to Army and Air Force intelligence and operational staffs. The second ten-tonner contains an 80 × 80 cm copying/enlarging camera, and it is believed that the





Left, one of the Brüggen Sabres breaks off. Above, with G/C. Crawford-Compton the base commander (centre) are some of the Brüggen Sabre pilots.



Meteor F.R.9.

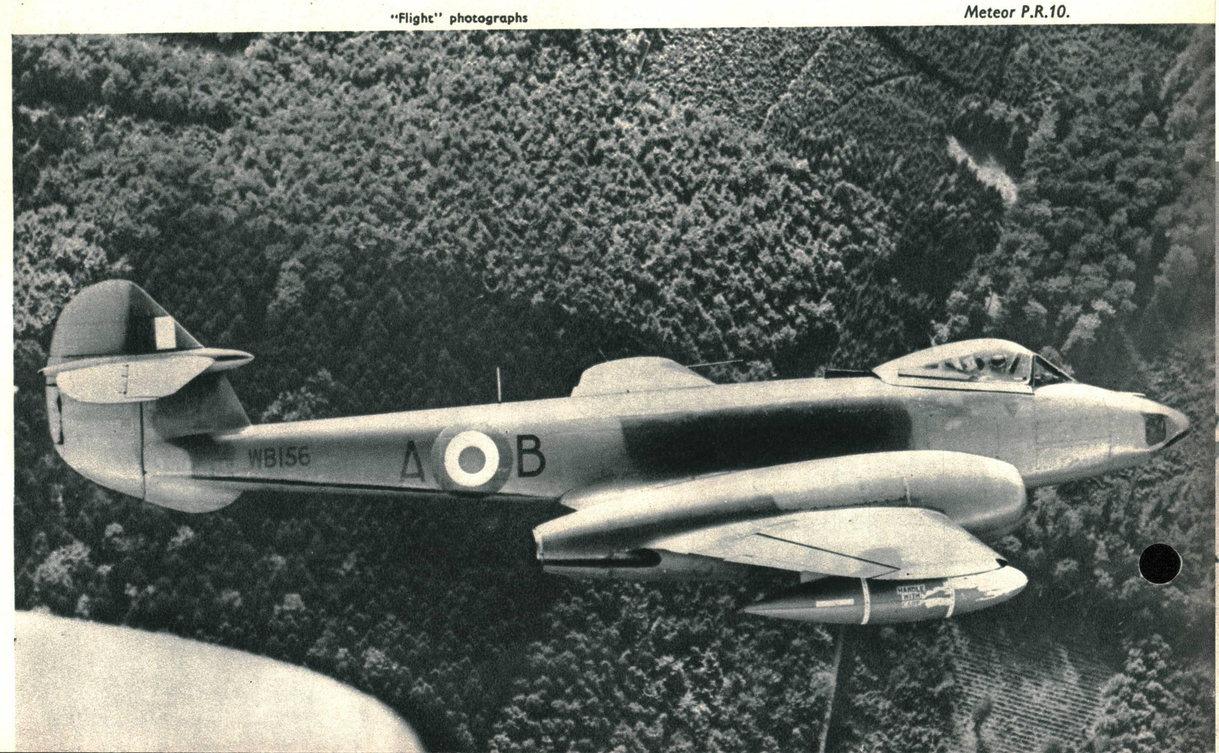
BATTLE ROYAL

PART TWO

IT may be remembered, from Part 1 of this account, last week, that Air Marshal Broadhurst had referred to new ground equipment which, he hoped, would improve the speed and quality of photographic processing and interpretation. He had in mind particularly the new Mobile Photographic Section, which was operating during Battle Royal in the Gutersloh area. Camouflaged and self-supporting, this unit was capable of turning out reconnaissance pictures on a scale never before equalled in any Service. Its development, we were told, had

"Flight" photographs

Meteor P.R.10.





Capt. Goff, U.S.A.F., who commanded the four night-reconnaissance B-26s based at Gutersloh.



W/C. Wintle, wing commander flying, No. 139 Wing (Venom F.B.1s).

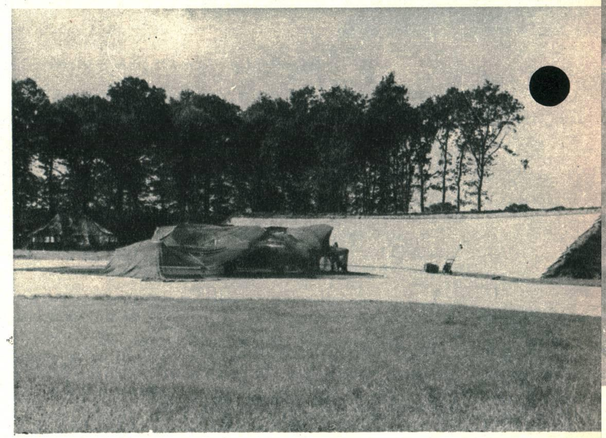
BATTLE ROYAL . . .

proceeded at such speed that virtually five years' work of planning, designing and organizing had been crammed into twelve months. The driving force was S/L. F. H. P. Lewer, who had recognized at the close of last year's Exercise Coronet that, with situations changing from hour to hour, the "huge delays" in getting results of reconnaissance to operational staffs rendered the work almost useless. The new section was having its first real try-out in Battle Royal. Immediately a reconnaissance aircraft landed from a sortie, the film magazine was rushed to a Mobile Field Photographic Section on the airfield. This was the beginning of "Phase 1" of the photographic procedure—a phase involving immediate developing, and the production of a minimum number of prints for "plotting" and for the preparation of immediate intelligence reports. (Plotting involves the numbering of map sections coinciding with the pictures.) While the processes were going forward pilots were in the operations room tracing their "runs," and information which was forthcoming was then forwarded to the Army and the R.A.F. photographic interpretation division, where the prints were scrutinized immediately they became available. Until recently, one gathered, the time taken for pictures to reach the interpreter was sometimes as much as 36 or 40 hours, whereas today they are being produced in under six hours. In the case of Tac.R. films, the aim is to carry out immediate interpretation within 35 minutes of the landing of the aircraft, and most of this may be achieved by direct viewing of the negatives. The entire processing work is done in a mobile unit of some 40 vehicles, attached to the Reconnaissance Wing.

On completion of the interpretation and plotting "Phase 2" comes into effect. This is the mass-production stage, involving the new equipment, of which Air Marshal Broadhurst had spoken, and which can raise print-output to an unprecedented figure. The unit responsible is about twice the size of that involved in Phase 1, and although



The "clutch" of operational vehicles at Norvenich.



Above, a camouflaged Venom F.B.1 in its revetment at Norvenich, and below, a similar machine taxying in at the same strip after a sortie against Northland forces.



"FLIGHT" photographs

Three types of reconnaissance aircraft which operated from Gutersloh: in the lead, a F-84G Thunderjet, with a Gloster Meteor F.R.9 to port and P.R.10 to starboard.

Venom F.B.1 pilots of No. 16 Squadron, which operated under field conditions from the new NATO strip at Norvenich. S/L. de Burgh, the C.O., is sixth from the right.



Another group at Norvenich, composed of pilots of No. 94 Squadron (Venom F.B.1s), with G/C. Mellor, station commander of the Wing's base at Celle, second from left, and S/L. Bower, the C.O., on the extreme left.



With some of his pilots at Norvenich is S/L. Johnson (centre), officer commanding No. 145 Squadron. The Venom F.B.1 is that flown by the squadron leader and bears his own insignia, the squadron badge, flight letter and squadron markings.



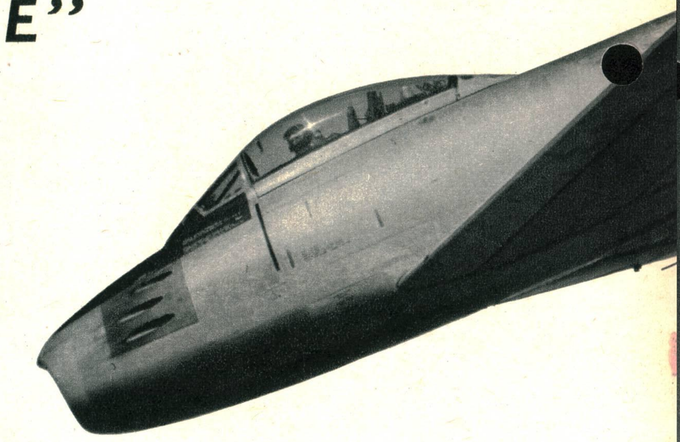
"FIRST LINE OF DEFENCE"

FROM the great NATO bases along the German-Dutch frontier fly Royal Air Force squadrons of Canadair-built North American Sabre F.4s. Readily distinguished from their U.S.A.F. counterparts by their Cellon camouflage finish (green and grey, with blue under-surfaces), they bear, in many instances, gay squadron markings, in addition to squadron badges, national roundels and flashes, and flight letters. The great majority have the so-called "slick," "hard," or "6/3" leading edge, whereby the wing chord is increased by 6in at the root and 3in at the tip, permitting a high rate of turn without buffeting, and thus avoiding the risk of pulling out the slats which the new leading edge displaces. Armament is six 0.5in Browning M-3 guns, and the aircraft operate solely in the fighter rôle, although provision is made under the wings for sixteen rocket projectiles. The pilots, whose morale is sky-high, often have their names stencilled beside the cockpit canopy, and their British "crash hats" frequently exhibit a reproduction of the squadron badge. A member of *Flight's* staff wrote after a visit to one of the Sabre airfields: "These new German bases make an imposing sight, and one that would do more to boost R.A.F. recruiting than could any number of posters. Broadly speaking, the 2nd T.A.F. are looked upon today as Britain's first line of defence; they certainly deserve—and are getting—first-line equipment."



For the stirring picture above, showing the aerobatic team of No. 234 Squadron in action, we are indebted to the squadron itself. Based at Geilenkirchen, the unit has for its crest (we are assured by one of its officers) a dragon rampant, though the creature seen on the Sabres' fins appears to have certain attributes of a lion. On the right, a section of Sabres is breaking formation for landing, disdainfully ignored by another accomplished aeronaut who, a mere twenty years or so ago, brought the Sabre pilots into this noisy world.

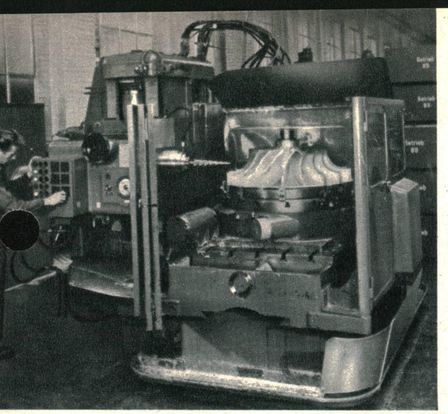


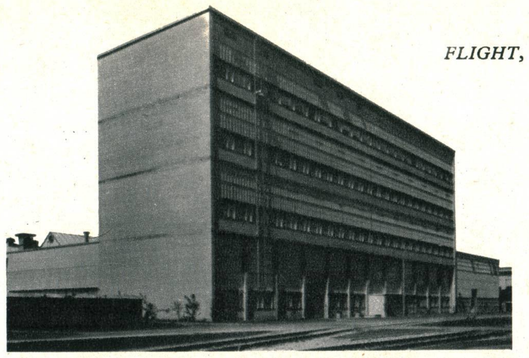




The upper picture is perhaps the closest air-to-air study of a Sabre and its pilot yet printed. Especially well shown are the ports for three of the 0.5in Browning guns and the shapely cockpit canopy.

In the lower of the two above views some nice work is in progress in the rear section of a Sabre fuselage. This section (as was explained in a detailed description of the Sabre in "Flight" of January 30th, 1953) is readily detachable for power-plant maintenance and replacement.

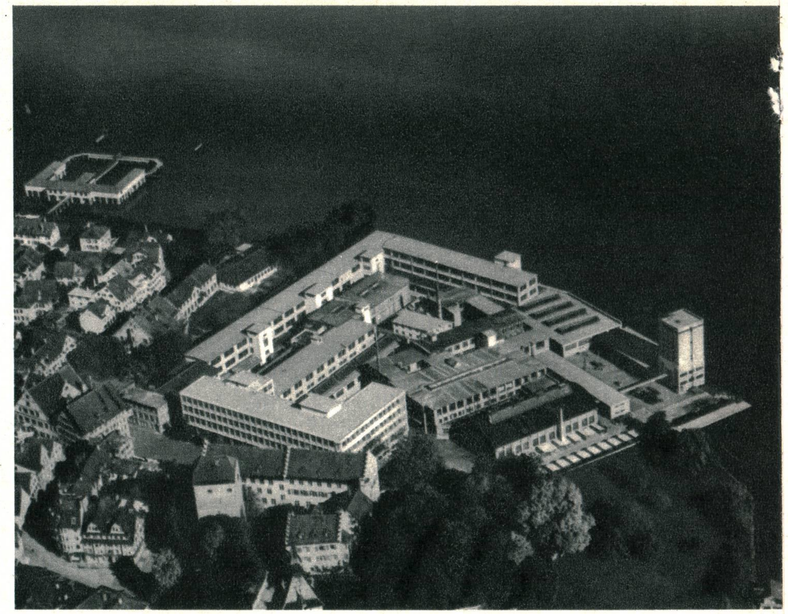


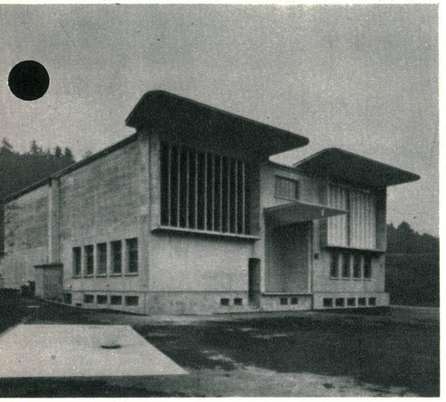


A Ghost compressor wheel (above) being machined on a profile miller in the Sulzer Brothers' factory.

(Above, right) the new four-storey factory at Oberwinterthur was built by the Sulzer company to house the assembly and part of the manufacture of Ghosts. Engine overhaul is also to be done in this works.

The two-bay engine test house, seen below from the intake end, was built specially by Sulzer Brothers for Ghost ground-running.





The Adolphe Saurer factory at Arbon, where some Ghost components are manufactured. Test and assembly of these parts are carried out at another Saurer factory nearby.

SWISS GHOSTS

Production Under D.H. Licence by Famous Engineering Firms

AN agreement signed between the Swiss Government and the de Havilland Aircraft Company in January 1951 covered the production under licence of Venom airframes and Ghost engines. The Swiss Air Force had already put some 75 Vampires into service with ground attack squadrons, and the Venom agreement was designed to provide a replacement, although numbers were not specified. Now, some 60 Ghosts have been produced by Swiss companies, and a 150-hr type test was successfully completed early this year.

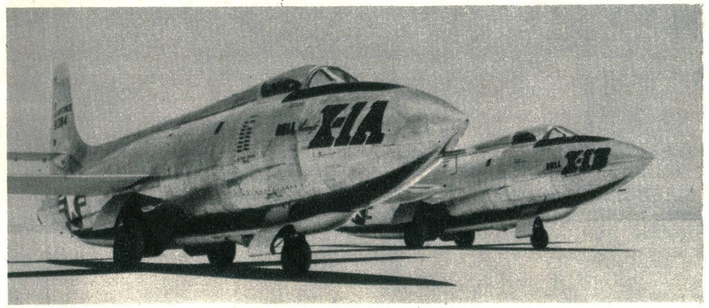
The production licence was in fact acquired by the Service Technique Militaire, a Swiss Government department corresponding to the British Ministry of Supply. Actual production work was then delegated to a number of companies, the principal of which was the famous engineering firm of Sulzer Brothers, of Winterthur. This concern undertakes some of the actual production work and carries out final assembly and test running before delivery. Representatives of the companies concerned and of the Service Technique Militaire came to England to observe Ghost production before work was begun in Switzerland.

The Sulzer company constructed a special new factory at Oberwinterthur for Ghost production, and in early 1952 the company was ready to begin. Other special facilities required included a complete two-bay engine test house with special splitters and Detuners which, in conjunction with surrounding earthworks and woodland, reduced the noise of engine running to a negligible level. It is claimed, in fact, that nearby inhabitants are not yet fully aware that engines are being ground-run.

The main activity of the Sulzer company, which was founded in 1775, is heavy precision engineering, products ranging from 12,000 h.p. marine diesels to locomotive and electric power station units, stationary gas-turbine plants, and high-duty compressors. Beginning in 1947, the company reached an advanced stage in the development of two turbojet engines of its own, but by 1950, at the outbreak of the Korean war, it was decided to go over to foreign equipment in view of the apparent urgency of the situation. Apart from final Ghost assembly, Sulzers manufacture the rotating assembly and the diffuser and discharge-nozzle assemblies.

Another of the companies engaged in the Ghost programme is Adolphe Saurer, S.A., whose factory is at Arbon, on the shore of Lake Constance. This company is a famous producer of road transport diesels and textile machinery. Its contribution to the Ghost is in the machining of the air intake casing and the manu-





(Top) A Lockheed Neptune of the latest P2V-7 sub-type. Modifications include a revised nose, new cockpit canopy and wing-tip containers; among additions are magnetic airborne detection in the "stinger" tail and Westinghouse J34 booster turbojets under the wings. The two Bell supersonic research aircraft are the X-1A (foreground) and X-1B, both still in U.S.A.F. service.

AIRCRAFT INTELLIGENCE

U.S.A.

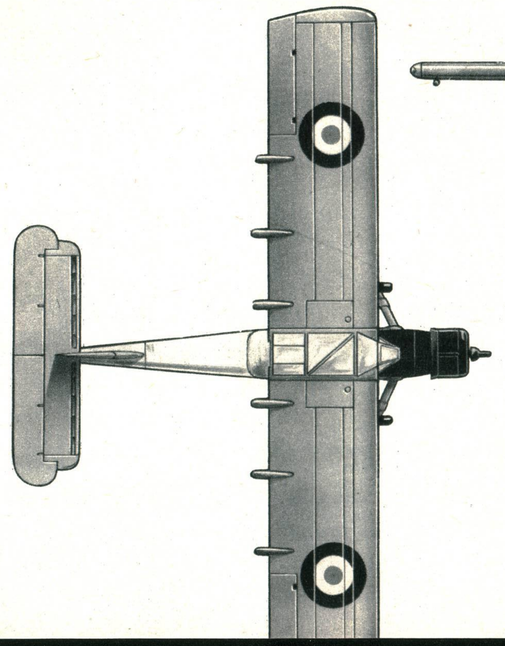
Grumman S2F. Still only unofficially named (both "Hermit" and "Sub-Killer" are popular) the Grumman S2F (two Wright R-1820 Cyclones) is to go into service with the U.S. Navy next year and a similar machine built in Canada (largely by D.H. Canada) should join the R.C.N. in 1956. The S2F is not, as has recently been stated in Canada, the first aircraft to combine the duties of hunting and killing submarines: the Fairey Gannet was flying three years earlier and is already in squadron service. The S2F is reported to meet all a.s.w. requirements, including the carriage of searchlights, electronic countermeasures and magnetic airborne detection equipment. It takes off from a carrier in just over 300ft, has a range of 1,000 miles, an eight-hour endurance and an approach speed of only 75 knots t.a.s. Modifications are at present in hand to permit the aircraft to be stopped by the barrier of an aircraft carrier without danger to the crew.

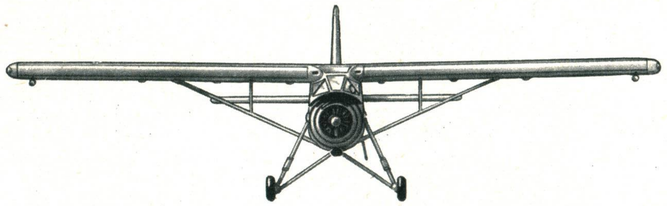
Lockheed C-130. It is reported that the production version of this four-turboprop multi-purpose transport will be known as the Lockheed C-130A Hercules and that the type is considered a good basis from which to develop a tanker. The Tactical Air Command of the U.S.A.F will employ the Hercules as a standard freighter and, for mid-air refuelling purposes, six 400 U.S. gal tanks would be carried on pallets, with a probe-drogue Flight-Refuelling unit. This would, incidentally, be the first use of the probe-drogue method by the United States Air Force.

Northrop F-89D Scorpion. The D-version of the massive Scorpion all-weather fighter is still in production, although newer, and smaller, designs are being prepared by the company (who are also in production with the B-62A Snark pilotless bomber). All Scorpions in service are to be equipped with 15ft-long, 300 U.S. gallon fuel tanks mounted under the wings on electrically de-iced pylons. Another modification is the experimental installation of the T-110 launcher for "Mighty Mouse" 2.75in folding-fin unguided missiles. Each installation consists of a magazine feeding a discharge tube through which the rockets are fired in quick succession. The Scorpion can mount one T-110 on each side of the nose. This is presumably in addition to the 52 "Mighty Mice" which are carried in the front half of each wing-tip fuel tank, and which form the main armament. The original F-89C Scorpion carried no rockets, but mounted six 20mm guns in the nose.

France

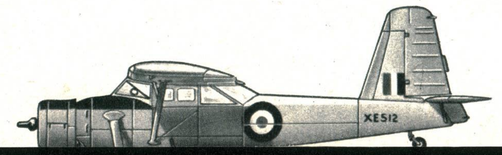
S.F.E.C.M.A.S. Gerfaut The original Gerfaut experimental delta-winged prototype, which was the first aircraft ever to exceed the speed of sound in horizontal flight solely on the power of an unboosted (i.e., no reheat) turbojet, is at present being extensively modified to permit test-flying at higher speeds (up to Mach 1.5, according to one report). The modifications may include a *canard* "nose-tailplane." Work is progressing on the Gerfaut II fighter.





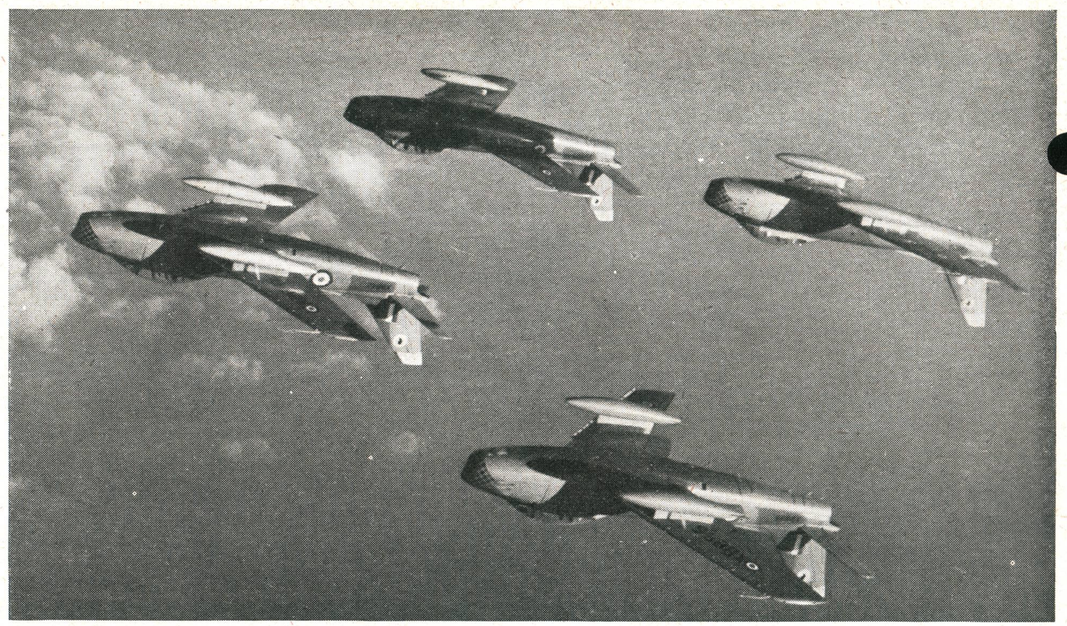
SCOTTISH AVIATION
PRESTWICK PIONEER C.C.2
(Alvis Leonides 501/4 of 550 h.p.)

Span	...	...	...	49ft 9in
Length	...	...	...	34ft 6in





Dragons Rampant in the Sky



No. 234 Squadron is one of a number of R.A.F. units equipped with Canadair-built F-86E Sabre F.4s and serving with the 2nd Allied Tactical Air Force in Germany. These remarkable photographs show the Squadron's aerobatic team in action during a formation loop. On the fins of the aircraft is a dragon rampant, the crest of No. 234 Squadron, which is based at Geilenkirchen.







Annular Combustion for Turbine Engines

In the field of gas turbine technology a large part of the development has been directed towards improving the combustion systems. This article, specially written for us by MR. M. A. STOKES, A.M.I.Mech.E., *who is in charge of the Combustion Department of Armstrong Siddeley Motors, discusses some of the features of the various types of combustion chamber, with particular reference to the annular layout.*

IF one traces back the history of the development of the aircraft gas turbine in this country, the combustion chamber story may be found a little confusing. It will be seen that the original Whittle engine used individual "cans," but soon after this one finds the first engines using axial-flow compressors were fitted with annular combustion chambers. At first sight the reason for this would appear to be obvious—namely, that the axial-flow engine layout was very well suited to the use of an annular chamber.

However, shortly after this engine, designs began to appear both here and abroad in which the axial-flow compressor was used in conjunction with "can" chambers. A stage was thus reached where all engines using the centrifugal compressor were fitted with "can" chambers whilst the development of the "can" and annular chamber proceeded in parallel on engines using axial compressors.

If one now looks at the present situation, it will be seen that all the most up-to-date engines on which information has been published use, almost without exception, the annular combustion chamber in one of two forms. The two types in question are one in which the flame-tube is fully annular and the other in which a number of "can"-type flame-tubes are disposed within an annular air casing. All these engines use axial-flow compressors, so that development on the centrifugal-compressor/"can" chamber combination appears to have ceased.

The purpose of this article is to show the reason for this increasing use of the annular chamber and to discuss some of the problems associated with its development and the techniques used in the solution of these problems.

The first and most obvious reason for the use of an annular combustion chamber is that it will use the whole of the available flow-path area as opposed to the limited proportion of this area that can be occupied with "can" chambers. It will be seen from Figure 1 that under the most favourable conditions only 78.2% of the given area can be utilized when "cans" are used.

In the design stage of an engine the combustion engineer is usually given two limiting diameters within which he must build the combustion system. The larger, or outer, diameter is usually the maximum diameter of the engine which has been fixed either from consideration of the thrust/sq. ft. of frontal area or by compressor and turbine design. The inner diameter is fixed by the size of shaft between the compressor and the turbine, or by the engine structural member, if this type of engine construction is used.

The tendency in modern designs is for the ratio of outer-diameter to inner diameter to be of the order of 0.3 to 0.4. In these circumstances the use of "can" combustion chambers

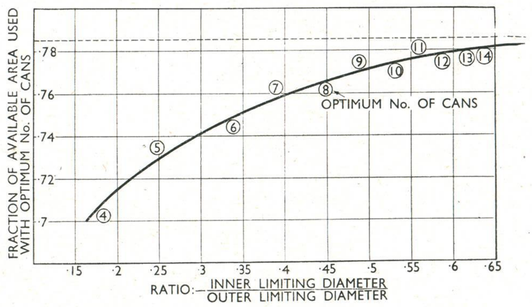


Fig. 1. Graph indicating the area utilization by "can"-type combustion chambers.

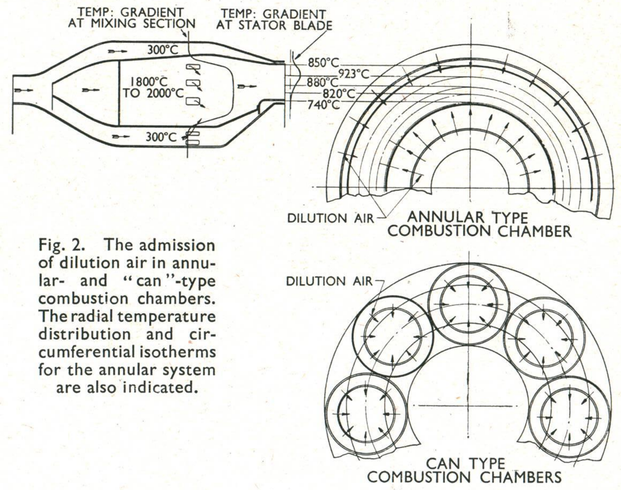


Fig. 2. The admission of dilution air in annular- and "can"-type combustion chambers. The radial temperature distribution and circumferential isotherms for the annular system are also indicated.

shows up unfavourably in comparison with the annular type.

However, if it is possible to use "can" combustion chambers, these may be chosen by reason of their ease of development compared with the annular type. It will be realized that initial testing of any combustion chamber is done on a rig, and under these circumstances the "can" chamber will only require some fraction of the total engine "throughput" for testing purposes.

This advantage was much more important when combustion chamber development was in its infancy, and comparatively little was known of the factors governing carbon formation and methods of flame-tube cooling. It was thus highly desirable to test the combustion chamber under full-density conditions, where such features as flame-tube temperatures and carbon formation would be best shown up.

At the present time, when a great deal of knowledge has been amassed on such subjects, the initial design of the combustion chamber can incorporate the necessary features, based on previous experience, to ensure that running under full-density conditions will be relatively satisfactory. The necessity for rig testing under these conditions, therefore, becomes less acute, and it is usually safe for the first full-density running of a chamber to be made on the engine.

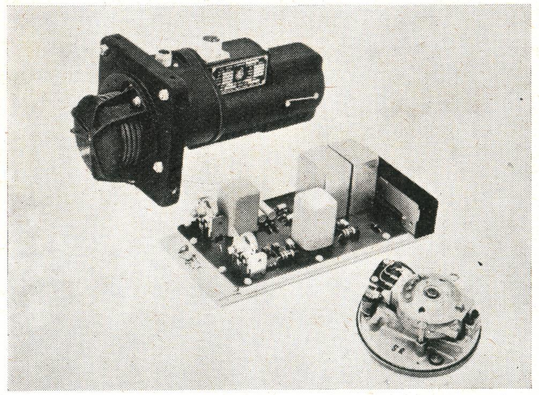
However, one important feature of combustion chamber testing still remains—the problem of testing at low temperature and pressure conditions representative of high-altitude operation of the engine. In this respect the difficulty of providing the necessary air flows to cope with a full annular chamber still remains. Considerable progress has been made in altitude performance prediction by the use of scale models; and this, in conjunction with the use of sectors of an annular combustion chamber, has gone a long way to solving these problems.

Another reason for the use of "can" chambers at the earlier stage of engine development was the ease with which a single chamber could be removed from the engine without disturbing the compressor or turbine. This was an important feature at a time when flame-tube life was relatively short. Obviously, whilst this state of affairs existed, considerable emphasis was placed on the solution of this problem both on "can" and annular chambers, until a stage was reached where combustion chamber life was no longer the factor governing engine overhaul time. Development on the "can"

For Safer Flying

INTENDED for installation in business or privately owned aircraft, a new instrument developed by the LearCal Division of Lear Inc., California, has been designed to assist pilots inexperienced in instrument flying who might be overtaken by bad weather conditions in flight.

Named "Arcon," the new device is intended to be used to keep a small aircraft in straight-line flight and has no effect on



Above, looking from top to bottom of the picture are the three main components of the Lear "Arcon"; the servo actuator driven by an electric motor, the amplifier unit and the rate gyro. Total weight is 12 lb. Right, an interesting feature of the amplifier unit is the use of an etched circuit in which no valves, relays or wiring are employed.

pitch or roll. It is designed to detect any directional change as it occurs and then to apply appropriate force in the rudder control system to cancel out this change.

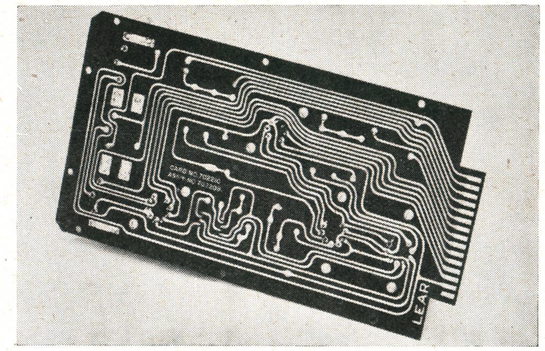
Though it will not return the aircraft to its original flight path, the instrument has the ability to hold it to within a few degrees of the required line of flight. If desired, it can be controlled by a directional gyro.

The "Arcon" may be described as a proportional type of instrument, as the amount of correcting force applied to the rudder is the precise amount required to cancel out the tendency to turn. The advantage of this type of operation is that it is far smoother than the "stop-and-start" instrument which has a tendency to over-control and then reverse itself to correct again from the amount of overshoot. The motor of the "Arcon" runs continuously, but is only called upon to apply corrective forces to the rudder when required.

The three main units are the rate gyro, the servo unit and the amplifier. The gyro is driven by a small AC motor, powered by a small alternator directly coupled to the armature shaft of the DC motor in the servo unit. This DC motor gets its power from the aircraft battery. The gyro operates at about 20,000 r.p.m., its spin axis being placed parallel to the longitudinal axis of the aircraft. It is usually placed on the wing main spar.

The servo unit is installed in the rear fuselage, near the tail, where convenient couplings may be made to the rudder cables. The amplifier may be mounted in any convenient place in the aircraft. It has an etched, or printed, circuit which avoids any possibility of wire breakage and eliminates internal wiring. Magnetic amplifiers are used in place of the more conventional valves which are prone to breakage, burning out, generating heat and short service life because of general debility caused by airframe vibrations.

A master "ON-OFF" switch on the pilot's instrument panel controls use of the "Arcon." Another switch for momentary contact is usually placed under the left thumb position on the control wheel; this is used to turn the instrument off during intentional turns. An over-ride clutch allows the pilot to make



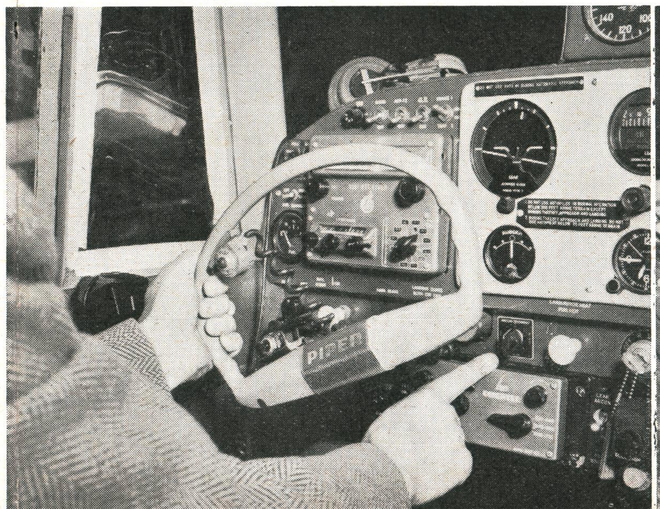
a normal turn with the "Arcon" in the "ON" position, by using slightly greater pressure than usual.

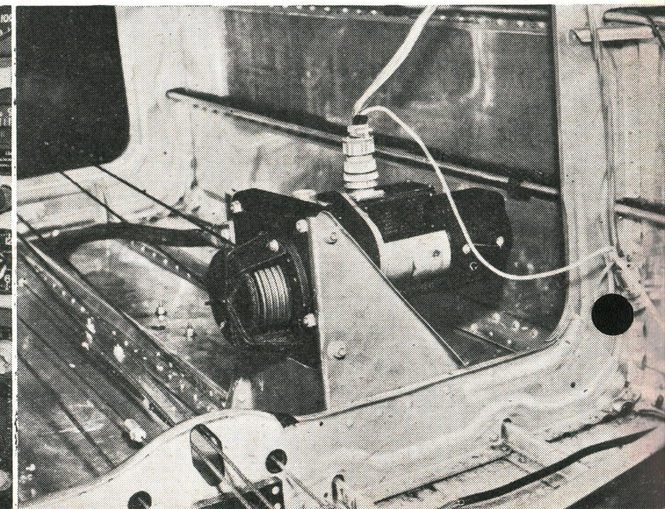
The Lear "Arcon" is now in production, having received C.A.A. certification, and has been fitted by Lear to their Tri-Pacer, Bonanza and Cessna aircraft. Three manufacturers of light aircraft are said to be planning to offer the "Arcon" instrument in their 1955 models.

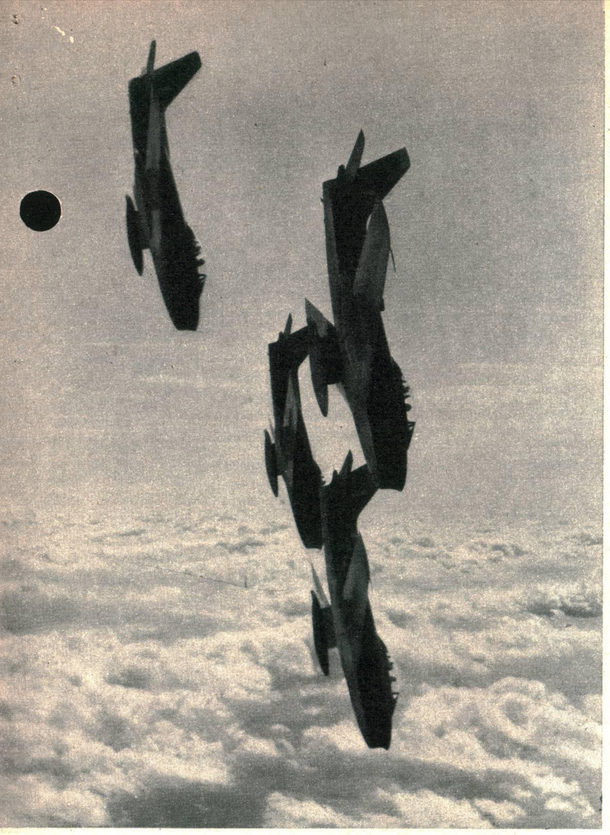
Installation of the Lear "Arcon" is estimated to take approximately eight hours.

Below left, a view of the Piper Tri-Pacer cockpit shows the "Arcon" centring switch in the instrument panel, indicated by the pilot's finger. On the left of the control wheel is the momentary contact switch. Below right, as installed in the Beechcraft Bonanza, the servo unit is mounted on a fuselage frame and is connected to the rudder control circuit.

Howard Levy photographs











FAREWELL TO THE SABRE

THE Sabres of Fighter Command have never been very much in the news; yet for some time they were the only swept-winged fighters in service with the R.A.F. in England. Two squadrons at Linton-on-Ouse, Nos. 66 and 92, were equipped with them in December 1953 and January 1954 respectively and have operated successfully ever since. Many other Sabres went into service with the R.A.F. in Germany, of course, but in this country Nos. 66 and 92 Sqns. were rivalled only by the few Swifts of No. 56 Sqn. until the Hunter went into service with No. 43 Sqn. late in 1954. The Sabres have now done their work and are being pensioned off; and the event was marked by a party at Linton recently. Many old members of both squadrons attended, and No. 92 presented a replica of the squadron badge to Mr. G. G. Eldridge, United Kingdom representative of Canadair, which built the aircraft. Mr. Eldridge gave the squadron a model of the Sabre. Now both squadrons are re-equipping with Hunters and the view above shows No. 66 Squadron's mixed equipment during transition: Sabre, Hunter and standby Meteor—all wearing the white flash which is the unit's distinctive marking. The red and yellow chequerboard of No. 92 Sqn. appears on the fuselages of the other Sabres as they perform some very creditable formation flying. A picture at the top of the page shows some of the pilots of No. 92 Sqn.—from left to right, F/L. D. N. Yates; F/L. V. Woods; S/L. R. W. G. Freer (the C.O.); F/L. A. W. A. Wright; F/L. D. A. Arnott; (kneeling) F/O. R. P. V. Woodward.







The Truth about German Guided Weapons

Reflections on the Recent Munich Symposium

By A. R. WEYL, A.F.R.Ae.S.

WHEN Hitlerite Germany collapsed eleven years ago, the Allies found a wealth of accomplishment in the guided-weapons field, which was unsuspected even after the evidence of V-1 and V-2. Attempts were made to gather in all this information; but for various reasons, personal and material, the reports into which much of it was condensed were often of little value, incomplete and, occasionally, directly misleading. One cannot do much with an official report describing ballistic experimentation which confounds one with "driving mirror" where the German expert meant "sabot," or with "undernourished bodies" where "slender shapes" are intended! Besides, "Security" clamped down on many reports, thus denying to many workers the information to which they were entitled.

When Western Germany joined NATO a year ago, Professor Dr. Theodore Von Kármán, an eminent scientist and also founder-chairman of the Advisory Group of Aeronautical Research and Development within NATO, proposed to establish, once and for all, the advances which the Germans had made in the guided-weapons field. It is no use denying that, despite immense efforts, the Western powers have produced few, if any, new ideas; nearly all current developments are based upon German work, whatever ministers and publicity departments may assure the public. The work done with so much money and men has produced nothing more than improved manufacture and testing techniques, better detail design with some new features, and a collection of practical experience. There is, therefore, a very good cause for reviewing the German work thoroughly, notwithstanding the fact that it is now at least eleven years old.

Beyond that, Von Kármán intended to promote a get-together of experts on the Western side for a frank and personal exchange of opinions on basic problems (unchanged since 1945). In this respect, too, the symposium was successful, although it was sad to note that, officially, this country had seen fit to despatch only about *three* people, whilst the U.S. contingent was more than ten times as strong. Delegates from Britain, Belgium, Denmark, France, Western Germany, Holland, Italy, Norway, Spain, Switzerland, Turkey and the U.S.A. attended, with the Americans and the Germans forming the majority. "Security" was not in evidence.

Between April 23 and 27 no less than 27 papers were scheduled, all rendered in English, French and German. A paper by Secretary of State Professor L. Brandt, an eager spirit in West German aviation, was not read; Dr. W. Von Braun, too, was missing, but his paper was read for him (according to German dailies, Von Braun had been refused security clearance to attend). Most lecturers, all authorities in their field, came from Germany; seven came from the U.S.A. (mostly from Redstone Arsenal); two from France; one from Britain (R.A.E.); and one from Spain.

Preparations for the symposium had been made by the *Wissenschaftliche Gesellschaft für Luftfahrt* (WGL), the German equivalent of the Royal Aeronautical Society. The organization worked admirably, being smooth and efficient. The few social events—an evening in a beer hall, and a delightful night cruise on the beautiful Starnberger See—were the more enjoyable for being unencumbered by after-dinner orators. Discussions were short, to the point and unafflicted by the liking of some British learned societies for calling upon V.I.P.s to vent their inability to express themselves. A few brief opening addresses were given, among them one by the West German Defence Minister, Herr Theodor Blank, who pointed out that the German war effort should be well exploited to arm NATO.

Projectiles and Aircraft

Dr. Th. Benecke, a Bonn official and an organizer of the meeting, said that guided missiles owed their origin to the blending of projectiles with aircraft. When aerodynamic experience, accomplishment of automatic aircraft control, and modern high-frequency technique came together, practical guided missiles were possible. The V-2 emphasized the projectile, V-1 and Hs293 the aircraft, aspects of such a merger. Related to the controllable glide bomb (SD.1400-X, alias *Fritz-X*, the "X" because of the cross-wing arrangement). Later developments against Allied bombers included weapons such as *Wasserfall, Rheintochter, Enzian, Schmetterling* (Hs117), and "X-4." The first two were supersonic, and the X-4 fighter rocket was wire-guided.

The idea of the V-2 was, originally, scheduled as a replacement for the heavy artillery which the Versailles Treaty prohibited. The decision to develop such a weapon was taken in 1929, but experimentation began in 1932, when Dörnberger and, later, W. Von Braun (as assistant of H. Oberth) were installed at the Kummersdorf proving ground. The first V-2 (more correctly, A.4) reached 56 miles' altitude and 5,000 ft/sec on October 3, 1942, from a vertical ascent—a feat never equalled by any gun in the world. The weapon became operational in September 1944; altogether, 1,115 were fired against England, and another 2,050 against Belgian cities.

Proposals to develop the V-1 flying bomb had originally been turned down because of its poor accuracy. Later, it was taken up as a weapon of retaliation. Within two years, not only had the development been completed but trials and training had been conducted, and mass production was in hand, with 5,000 missiles already in store.

The *Fritz-X* controlled glide-bomb dates from 1938, when the D.V.L. was charged with the problem; the final trials were made in Italy. The wing spoiler control gave a surprisingly high accuracy: 50 per cent hits were obtained inside a 16½ft square, from altitudes between 13,000 and 23,000ft. Operational use brought early successes against Allied warships in the Mediterranean in August 1943. Shortly afterwards, the Hs293, also, became operational. This auxiliary-rocket-propelled glide-bomb had been developed inside 12 months; while *Fritz-X* was for use against armoured warships, the 500 kg mine bomb carried by Hs293 was effective only against vessels with little protection. For ranges up to 7½ miles, accuracy was about the same as that for *Fritz-X*; similar, too, was the maximum speed of 660 ft/sec. Not less than 40 per cent of all operationally launched *Fritz-X* and Hs293 produced hits, despite purely visual guidance.

Enemy interference with the radio control took place, but was entirely ineffective; operational versions of both weapons were prepared with wire-guidance, with ranges up to 11.2 miles, but proved superfluous.

None of the other guided weapons became operational. *Wasserfall*, however, provided the basis for the American *Nike* development.

In the discussion, the present writer (at one time in charge of G.W. development) briefly surveyed work done before the period covered by the lecturer. Reference was made to the efforts of Werner Siemens and Wilhelm v. Siemens which culminated during the First World War in full-scale trials from airships and aeroplanes with nearly 90 wire-guided glide bombs and airborne marine-torpedoes. Since 1910 Christian Wirth had demonstrated the coded radio-control of boats and airship models. The developments by the *Reichswehr* and Navy during 1925 and 1929 had anticipated some of the more recent achievements.

Dr. Herbert Wagner (Van Nuys, California) described the Henschel missile development for which he had been responsible. He was asked in 1940 to design a steerable glide-bomb against shipping. Emphasis was laid upon a simple method for the control of such a bomb from a launching aircraft. It was thought practical to neglect the phugoid and rely solely upon damping the short-amplitude incidence oscillation. Thus, longitudinally, automatic stabilization was unnecessary. The rudder was omitted. Air-brakes behind the wing tips prevented speeds exceeding M = 0.85, and care was taken to avoid inaccuracies in production. The first trials suffered from frequent electronic-valve failures and red guide flares with less smoke had to be adopted.

The Hs293C and the larger Hs294 were torpedo-carrying glide bombs. They released marine torpedoes upon entering the water. A supersonic (M = 1.5) guided missile, the *Zitterochen*, was under development.

The Hs117 *Schmetterling* of 1943 remained the only guided weapon for which production orders had been given before the war ended. It was a swept-winged high-subsonic anti-aircraft missile. Two booster rockets launched it, the lower rocket being fired somewhat in advance of the upper. Radio-control was on 40 cm waves; Wagner admitted that enemy jamming might soon have rendered it operationally useless. An infra-red homing head was to be incorporated.

Control Systems

Dr. Max Kramer (now in California) gave a lively account of the development of his *Fritz-X*, X-4 and X-7 with their spoiler control. Dr. E. B. Fischel (Caldwell, U.S.A.) had been working on automatic pilots for Siemens before taking over the telecontrol development of the Deutsche Forschungsanstalt für Segelflugzeug between 1941 and 1945. This work reached from the mathematics of pursuit curves to the design and testing of guidance and stabilization apparatus. It was, so he claimed, so important that his laboratories at Ainring had been exempted from bombing by the Allies so as to keep his files and equipment intact.

Fischel developed simulator training-devices. Three guidance control groups were considered: three-point aiming by optically aligning the missile and target; television guidance; and beam-rider guidance. The final simulator could suit subsonic and supersonic missiles, as well as those with plane wings and cross-wings (cartesian and polar controlled) by using electronic computors. He had also worked on the guidance of a turbojet-propelled V-1 of improved accuracy, essentially with beam-guidance for initial direction. A command transmission of ultra-violet-ray impulses was immune to interference but was ineffective when the sun was shining upon the photocell. The problem of a gyro-stabilized telescope for bomb aimers could not be solved, neither could the preparation of an infra-red homing head for night effects.

Dipl. Ing. H. Temme read a paper on the V-1 control. A maximum (50 per cent) dispersion of ±2.8 miles at 140 miles range was demanded. Considerable difficulties were caused during trials, by the vibration from the pulsejet.

Dipl.-Ing G. Ernst (now in France) discussed the spoiler control of missiles with Max Kramer on the X-missiles. He pointed out that spoilers had small control forces, but suffered from lag.

Dr. Hermann H. Kurzweg (formerly Peenemünde's chief aerodynamicist, now chief of the Aeroballistic Research Department of the U.S. Navy Ordnance Laboratory) described the supersonic research at Peenemünde for V-2 and *Wasserfall*. The latter was more difficult aerodynamically because its flight was subsonic as well as supersonic; the German experimenters often had to adopt inferior solutions to avoid interfering with production.

Dr.-Ing. Otto Müller (now in France) described the controls of the V-2 rocket. The correct instant of burn-out (for control of range) was determined by radio signal using the Döppler effect; alternatively, the acceleration was integrated internally. For this, either the precession of a gyroscope under acceleration or an electrically fettered pendulum was used, in combination with the charging of an electrolytic cell. The Döppler method proved at first more accurate; later, however, the integration method yielded slightly reduced dispersion (values of about the same order as those quoted for V-1). To compensate the course



Introduced at the 12th annual forum of the American Helicopter Society in Washington, the Omega S3-12 is claimed to be the lightest helicopter, in relation to its payload, yet developed. With a basic weight of 2,850 lb the S3-12 can carry 1,020 lb as well as a pilot and two hours' petrol. Power is provided by two Franklin flat-six piston engines.

AIRCRAFT INTELLIGENCE

Australia

Schneider Trainer. It is reported from Adelaide that the firm of E. Schneider, Ltd., plan to market three versions of a two-seat light training aircraft of German design. The largest variant will have a span of 49ft and will be "powered by a Volkswagen engine which can be switched off in flight so that the aircraft can be used for gliding." The other two models will have a 33ft wing and will use Porsche engines. Prototypes are reported to be on test in Germany, and Schneider expect to import kits and to have the first examples flying in Australia later this year.

U.S.A.

Beech D50 Twin Bonanza. The U.S. Army has placed an order for six more Beech D50s, demanding immediate delivery of two of them. The remainder, to a total cost of $500,000 (about £178,570) will be delivered by June 30th. The aircraft are being taken direct and unaltered from the civil production line, and will retain civil furnishings and radio equipment. The D50 has two 295 h.p. Lycoming engines which give it a cruising speed of 203 m.p.h., a service ceiling of 20,000ft and a range, on standard tankage, of 1,230 miles. The Army will use the aircraft for command transport and courier work.

Chance Vought F8U Crusader. The first prototype XF8U-1 recently completed its 200th flight. Two weeks ago a production F8U-1 was lost, the pilot baling out unhurt. This was the second Crusader lost.

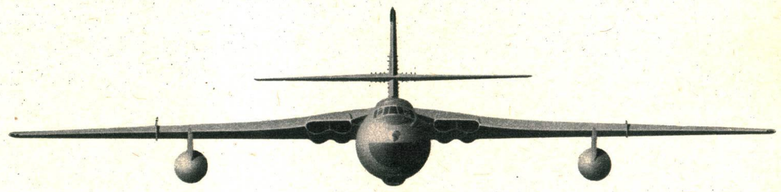
Sikorsky HR2S. Production versions of the twin-engined Sikorsky S-56 helicopter (chiefly the HR2S-1 for the U.S. Marine Corps and the H-37 for the U.S. Army) differ from the numerous prototype and pre-production machines. Each main undercarriage unit has twin wheels; the Double Wasp powerplants have large cooling vents and twin exhaust stacks; the horizontal tail is an all-moving slab; and a large fairing has been added behind the main rotor head.

France

Dassault Progress. Phase I flight trials of the Marcel Dassault M.D.550 *Mirage* (two Dassault Viper turbojets) is now complete. The third powerplant, an S.E.P.R. acid/JP-4 rocket of very high thrust, is now being installed, preparatory to high-supersonic flying in Phase II. Two more *Mirage* prototypes are in the works at St. Cloud. Meanwhile, the prototype Mystère XXIV is nearing completion at Bordeaux-Merignac. Powered by an Atar turbojet, the XXIV is a light intercepter, with an airframe generally similar to that of the Mystère XXII (Orpheus) and XXVI (two Gabizo).

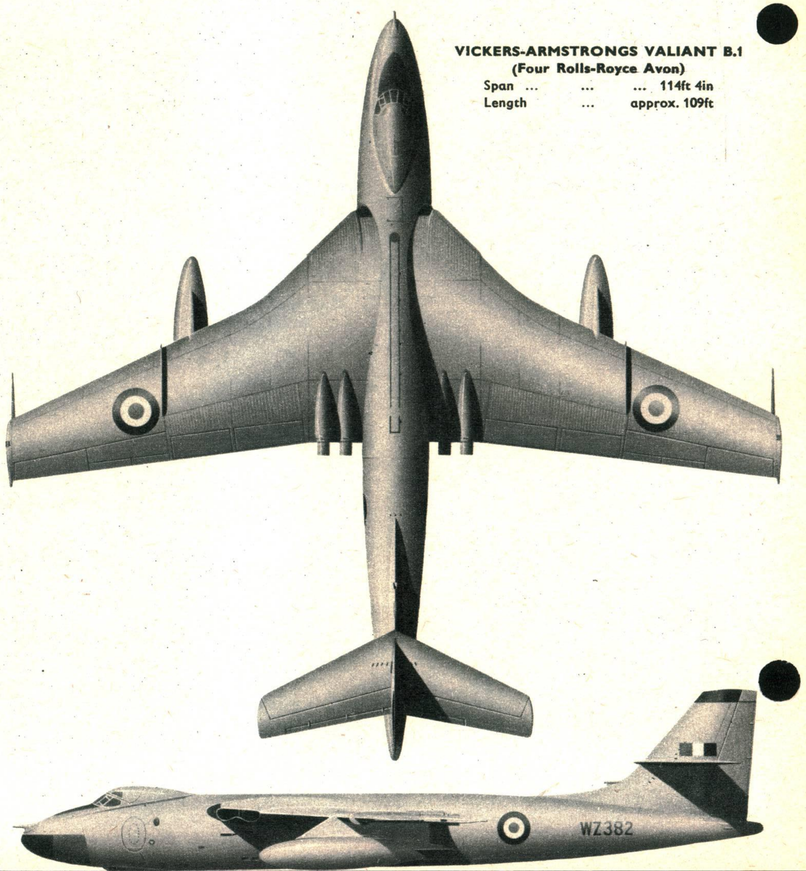
S.O. 1221 Djinn. Examples of this helicopter are touring the Far East and Latin America. The machine recently demonstrated at Sydney has been taken to Bangkok and another example has been shown in San Domingo, Caracas, Bogota, and San Salvador and is to go to Mexico and Cuba.

Wassmer glider. A new single-seat glider designed by Maurice Collard and intended to replace the Nord 2000 and Air 102 is being built by Wassmer, and will soon make its first flight. With a span of 52ft 9in and a length of 23ft 2in, it has an aspect ratio of 17. Minimum rate of sink is 166ft/min at 50 m.p.h., empty weight is 452 lb, maximum weight 695 lb and wing loading 4.18 lb/sq ft. The fuselage is made of welded tubes and the wing of wood, fabric covered. Structural simplicity, it is claimed, has permitted cost and production time to be 50 per cent lower than for the usual glider of this type.



VICKERS-ARMSTRONGS VALIANT B.1
(Four Rolls-Royce Avon)

Span	...	... 114ft 4in
Length	...	approx. 109ft



DETAILED STENCIL MARKINGS

FROM RCAF

OPERATING & MAINTENANCE MANUALS

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ROYAL CANADIAN AIR FORCE

AIRCRAFT OPERATING INSTRUCTIONS

SABRE 6

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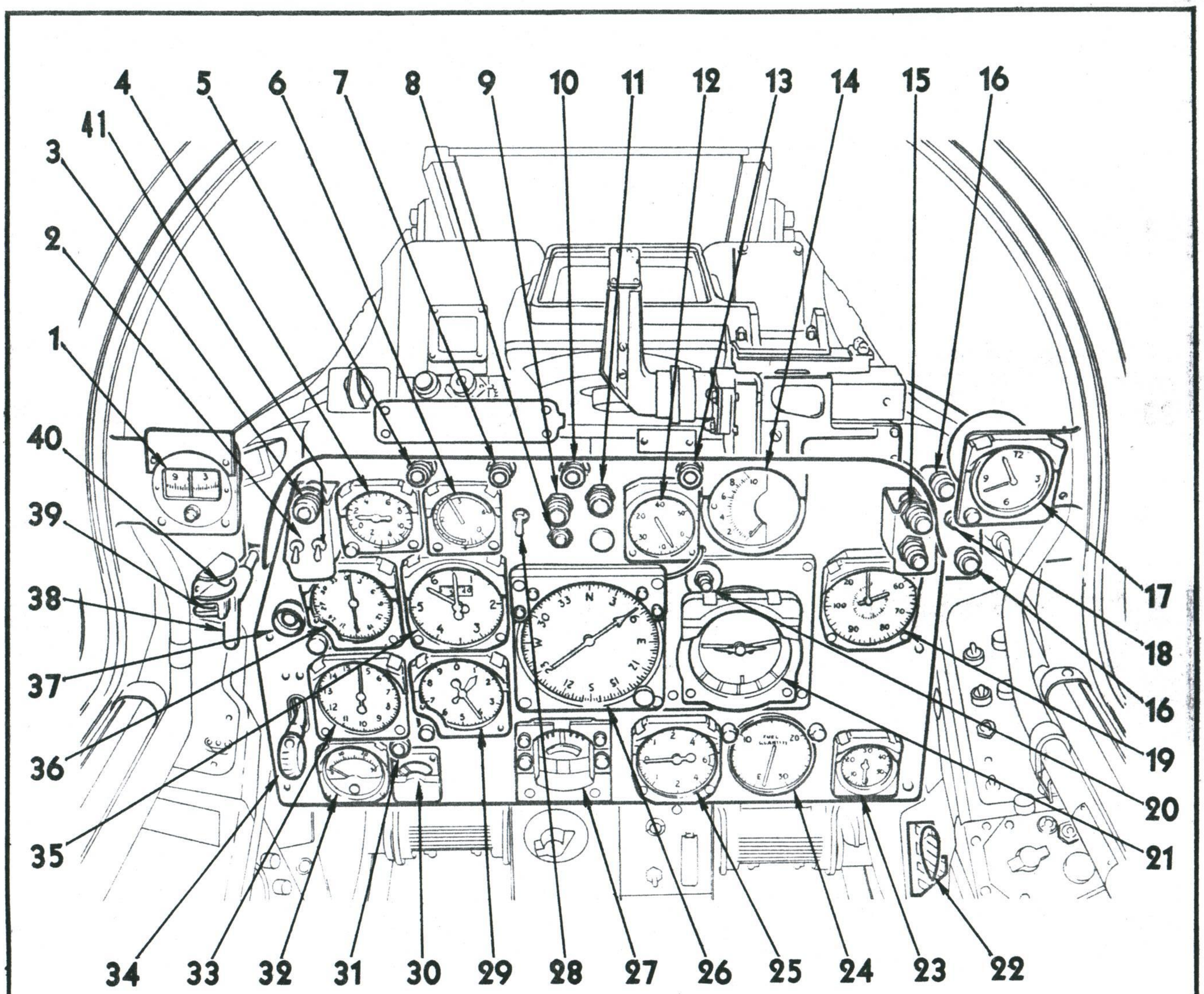
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20 JUL 62

Revised 3 Jun 63



1 STANDBY MAGNETIC COMPASS
2 EMERGENCY FUEL CONTROL SWITCH
3 EMERGENCY FUEL CONTROL WARNING LIGHT
4 ACCELEROMETER
5 MAIN INSTRUMENT INVERTER WARNING LIGHT
6 HYDRAULIC PRESSURE GAUGE
7 BOTH INSTRUMENT INVERTERS WARNING LIGHT
8 GYRO COMPASS FAST SLAVING BUTTON
9 FLIGHT CONTROL ALTERNATE-ON LIGHT
10 MAIN RADAR INVERTER WARNING LIGHT
11 LOW FUEL PRESSURE WARNING LIGHT
12 OIL PRESSURE GAUGE
13 TAKE-OFF TRIM POSITION INDICATOR LIGHT
14 JET PIPE TEMPERATURE INDICATOR
15 DROP TANKS EMPTY WARNING LIGHTS
16 FIRE WARNING LIGHTS
17 CLOCK
18 FIRE WARNING LIGHT TEST BUTTON
19 TACHOMETER
20 ARTIFICIAL HORIZON FAST ERECTION BUTTON
21 ARTIFICIAL HORIZON
22 ALTERNATE CANOPY JETTISON RELEASE
23 CABIN ALTIMETER
24 FUEL QUANTITY GAUGE
25 VERTICAL SPEED INDICATOR
26 GYRO COMPASS
27 TURN AND BANK INDICATOR
28 HYDRAULIC PRESSURE GAUGE SELECTOR SWITCH
29 ALTIMETER
30 LOADMETER
31 GENERATOR WARNING LIGHT
32 VOLTMETER
33 MACHMETER
34 LANDING GEAR SELECTOR HANDLE
35 AIRSPEED INDICATOR
36 RADIO COMPASS
37 LANDING GEAR EMERGENCY UP BUTTON
38 PARKING BRAKE HANDLE
39 TOW TARGET JETTISON SWITCH (On aircraft so equipped.)
40 CANOPY ACTUATING SWITCH
41 EMERGENCY AIR START SWITCH

Figure 1-2 Cockpit - Forward View

illuminates. This indicates that all equipment powered by the secondary bus is inoperative and that all non-essential electrical equipment should be turned off, as the electrical system is operating solely on the battery.

OVERVOLTAGE PROTECTION

36 The overvoltage protection system consists of an overvoltage relay, a generator field control relay and a red warning light. If generator voltage exceeds 31 volts, the overvoltage relay will electrically trip the generator field control relay, disconnecting the generator from the system and illuminating the generator warning light on the instrument panel. The generator field control relay may be reset by momentarily holding the generator control switch at RESET. If the generator warning light goes out, a temporary overvoltage existed and is now rectified or is back to normal. The generator switch may then be placed in the ON position.

VOLTAGE REGULATOR

37 The voltage regulator is adjusted on the ground. With engine rpm above 45%, voltmeter readings should be 28 (±0.5) volts.

CIRCUIT-BREAKERS

38 Most of the dc electrical circuits are protected by push-to-reset circuit-breakers or circuit-breaker switches. Circuit-breaker panels are located on each side of the cockpit and two panels are located on the nose section. All ac circuits are protected by fuses which are not replaceable in flight.

NOTE

On aircraft so modified, charts will be found on the canopy sill to assist in locating the circuit-breakers in an emergency.

EXTERNAL POWER RECEPTACLES

39 Two external power receptacles are located on the left side of the fuselage, above and aft of the trailing edge of the wing. The external power source must be connected to the #1 receptacle to make power available to all buses. If the #2 receptacle only is connected, power is supplied only to the primary bus. Both external power receptacles must be connected for engine starting.

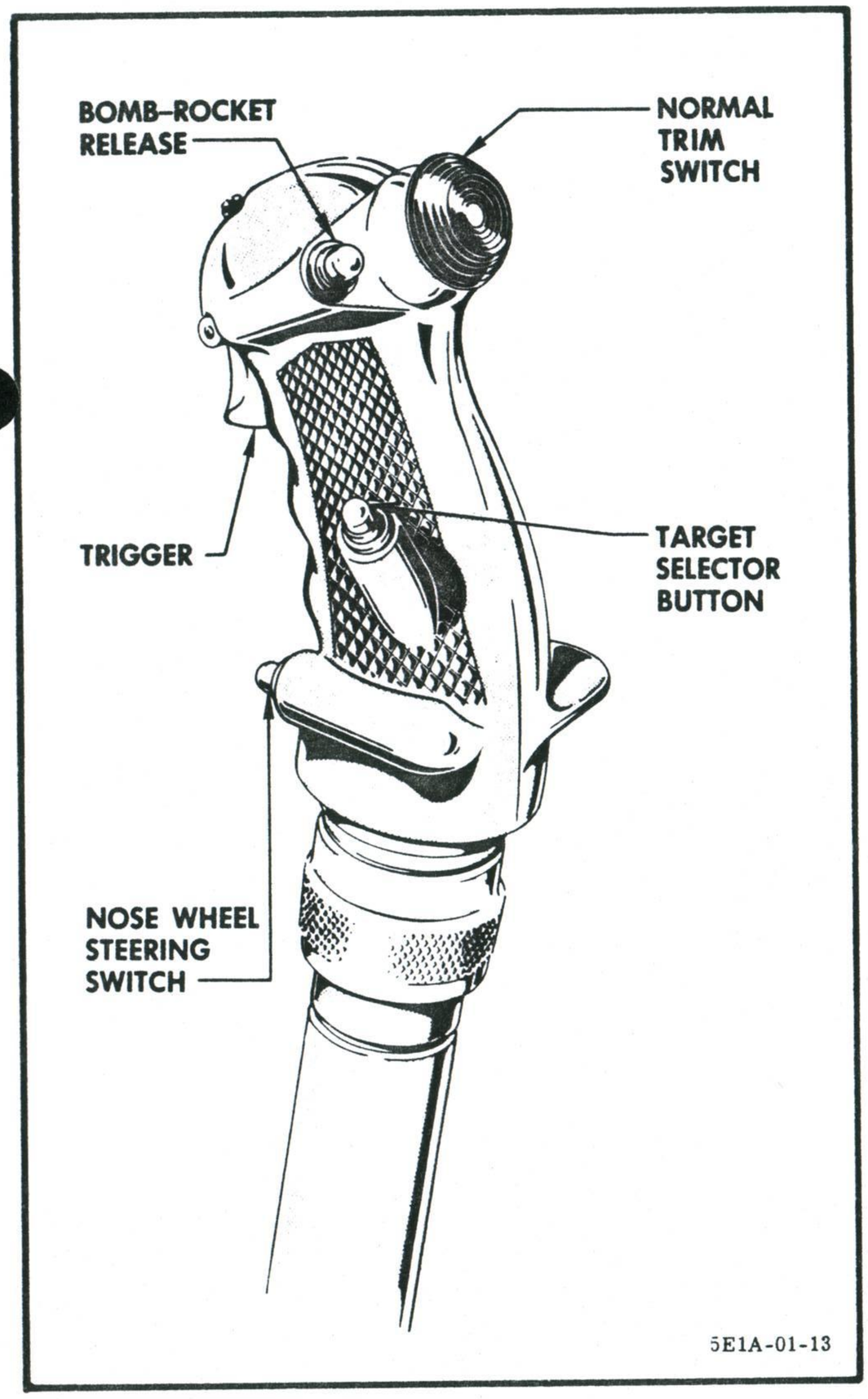


Figure 1-8 Stick Grip

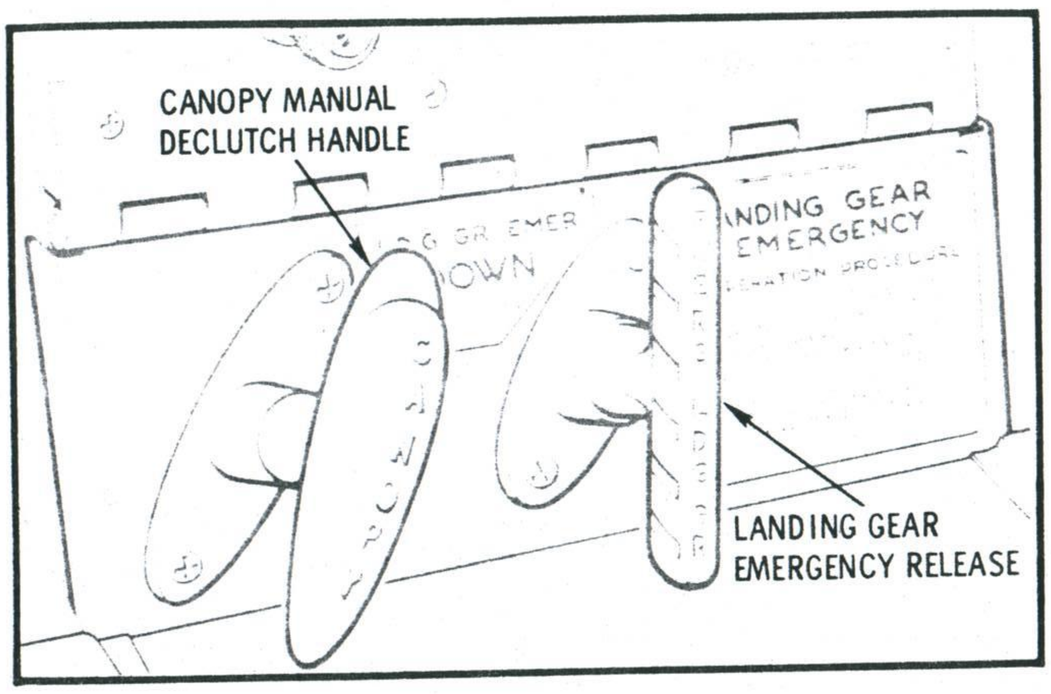
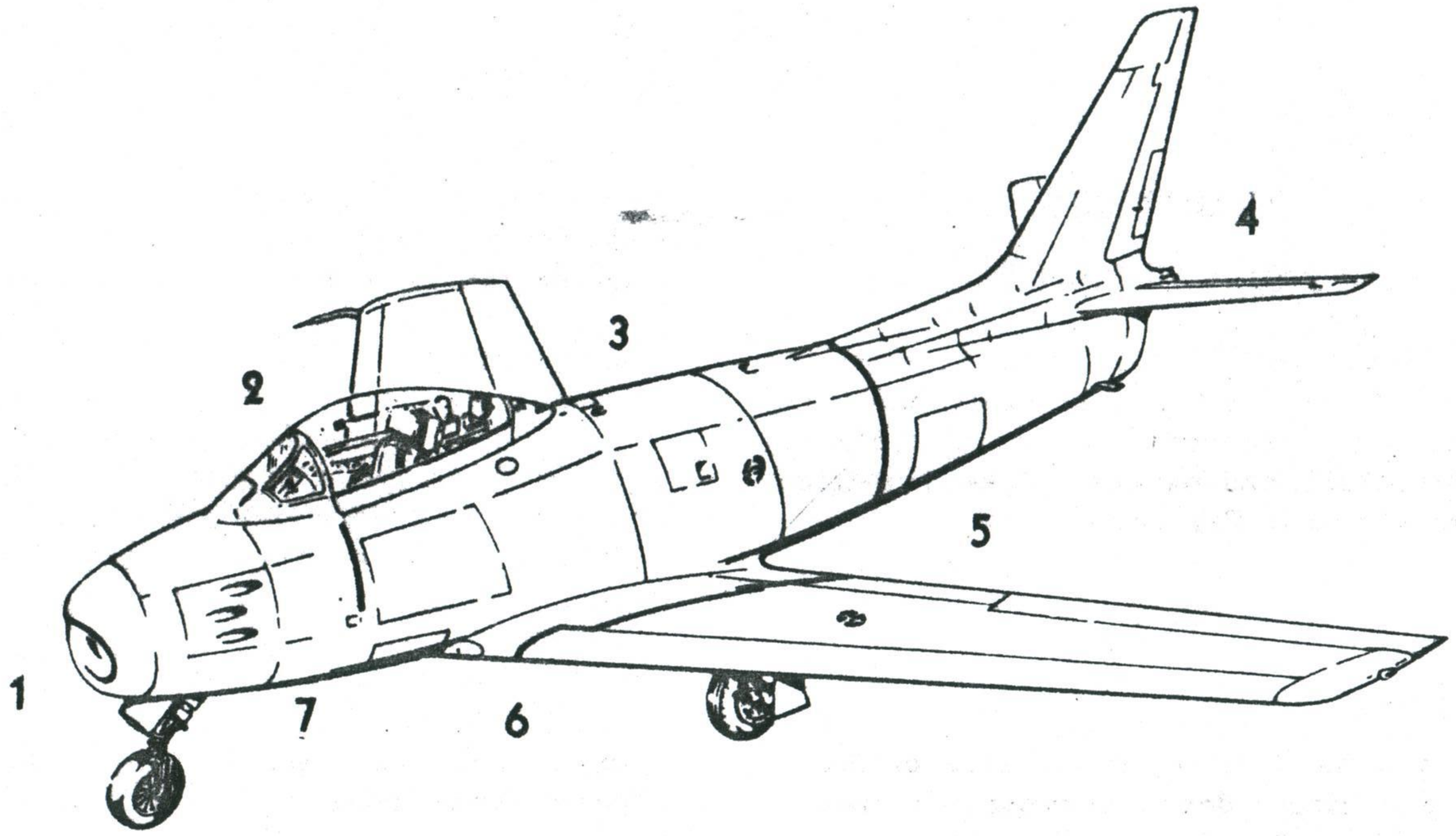


Figure 1-9 Lower Centre Pedestal



Starting at nose of aircraft, make following checks:

1 NOSE

Nose gear ground safety lock removed.
Tow pin safety cap tight.
Nose gear emergency extension accumulator air pressure 1200 psi. (Gauge in nose wheel well.)
Nose gear oleo strut extension.
Check tire for creep and proper inflation.
Check for hydraulic fluid leaks.
Intake duct pitot head uncovered.

2 FORWARD FUSELAGE AND RIGHT WING LEADING EDGE

Armament door secured.
Fuel caps, (wing and fuselage), secured.
Oil and hydraulic tank access doors secured.
Drop tank sway braces for looseness and alignment of retaining lugs.
Pitot head uncovered. Navigation light.
Check slat operation.

3 RIGHT WING TRAILING EDGE AND AFT FUSELAGE

Aileron and flap for loose rivets, etc.
Gear door position.
Gear strut extension.
Hydraulic leaks.
Check brakes and brake lines for leaks.
Check tire for creep and proper inflation.
Wheel chocked.
All access doors secured.
Compensator pin extension.
Flight control alternate hydraulic accumulator pressure 600 psi (in speed brake well).

4 EMPENNAGE

Tail surfaces for condition.
Navigation lights.
Tail-pipe cover removed.
Tail-pipe for cracks or excessive distortion.
Check tail-pipe for sufficient play and movement.

5 AFT FUSELAGE AND LEFT WING TRAILING EDGE

All applicable items in check on right wing trailing edge and aft fuselage.
Compensator pin extension.
Normal flight control system accumulator air pressure 600 psi (in wheel well).
Emergency flight control circuit-breaker in.
Check undercarriage door switches and microswitch in port wheel well.
Wheel chocked.

6 LEFT WING LEADING EDGE AND FORWARD FUSELAGE

Make same checks as on right wing on all applicable items.

7 CANOPY (From cockpit level.)

Cracks or crazing in canopy.
Canopy alignment pointers coincide. (2).

Figure 2-1 Exterior Inspection

A4

EO 05-5E-2

ROYAL CANADIAN AIR FORCE

DESCRIPTION AND MAINTENANCE INSTRUCTIONS SABRE 5, 5A AND 6

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ISSUED ON AUTHORITY OF THE CHIEF OF THE DEFENCE STAFF

24 JAN 58

Revised 16 May 66

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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.

AIRCRAFT 23001 TO 23610 INCLUSIVE

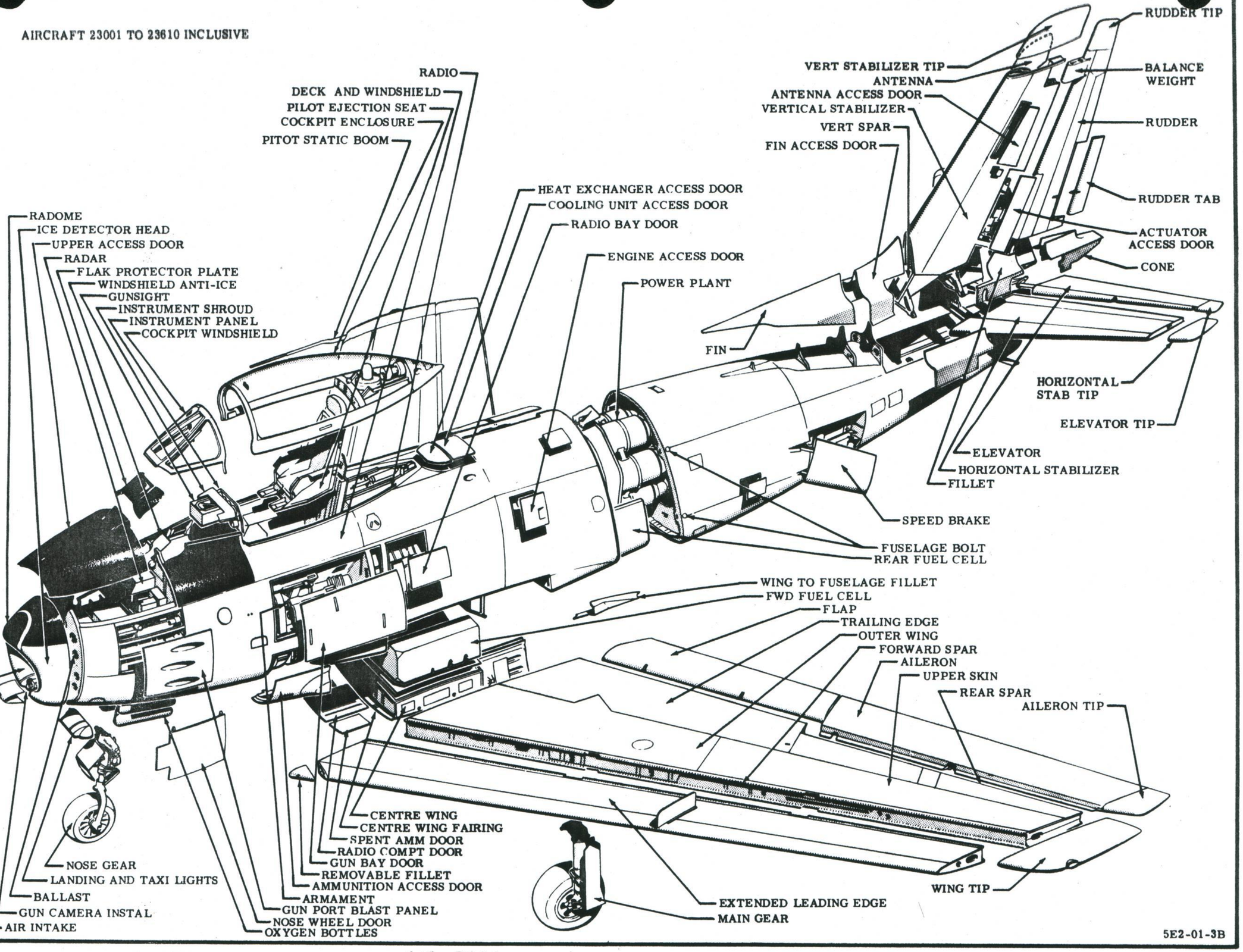


Figure 1-1 (Sheet 1 of 2) Exploded View of Aircraft

AIRCRAFT 23611 AND SUBSEQUENT

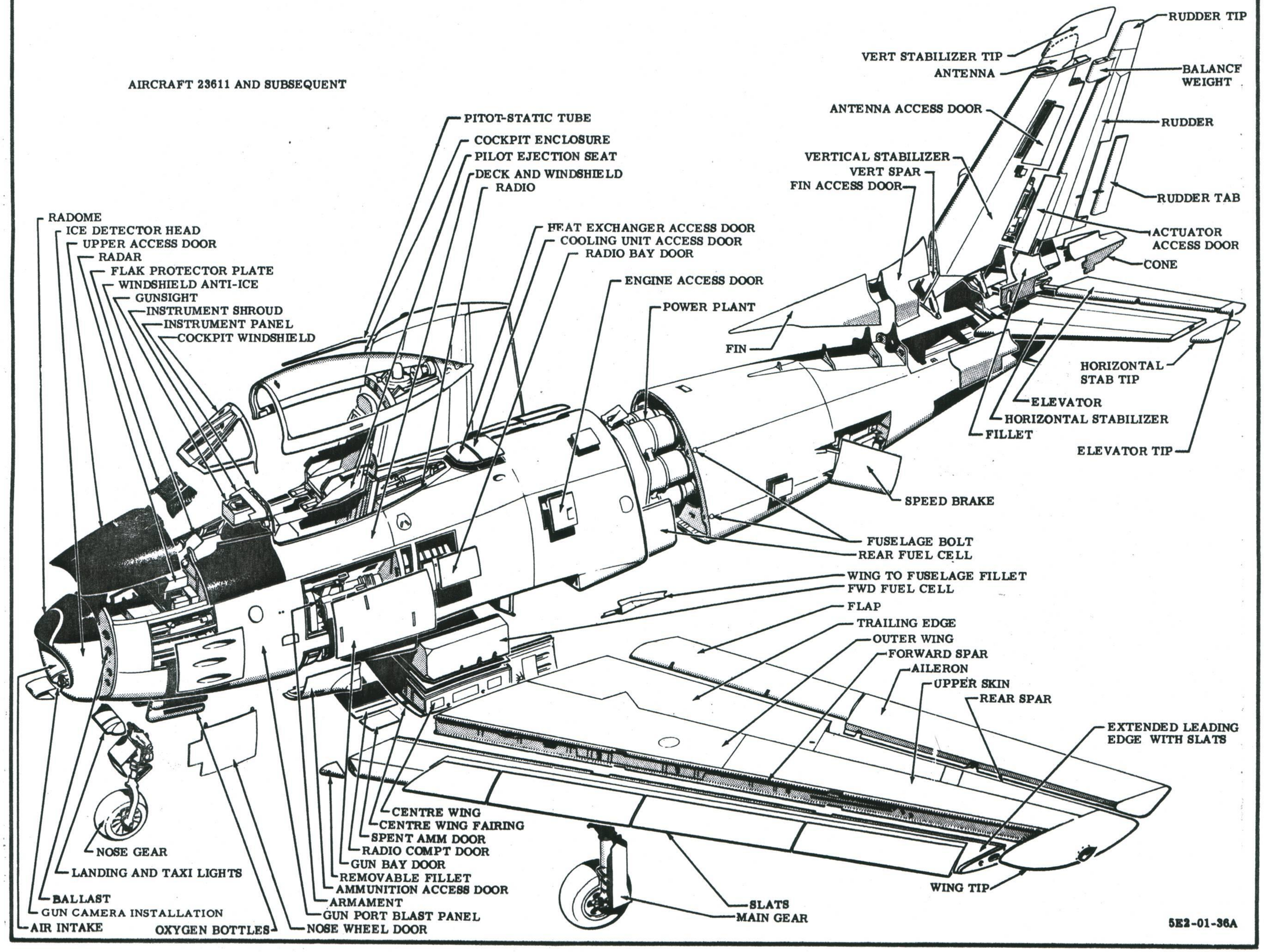


Figure 1-1 (Sheet 2 of 2) Exploded View of Aircraft

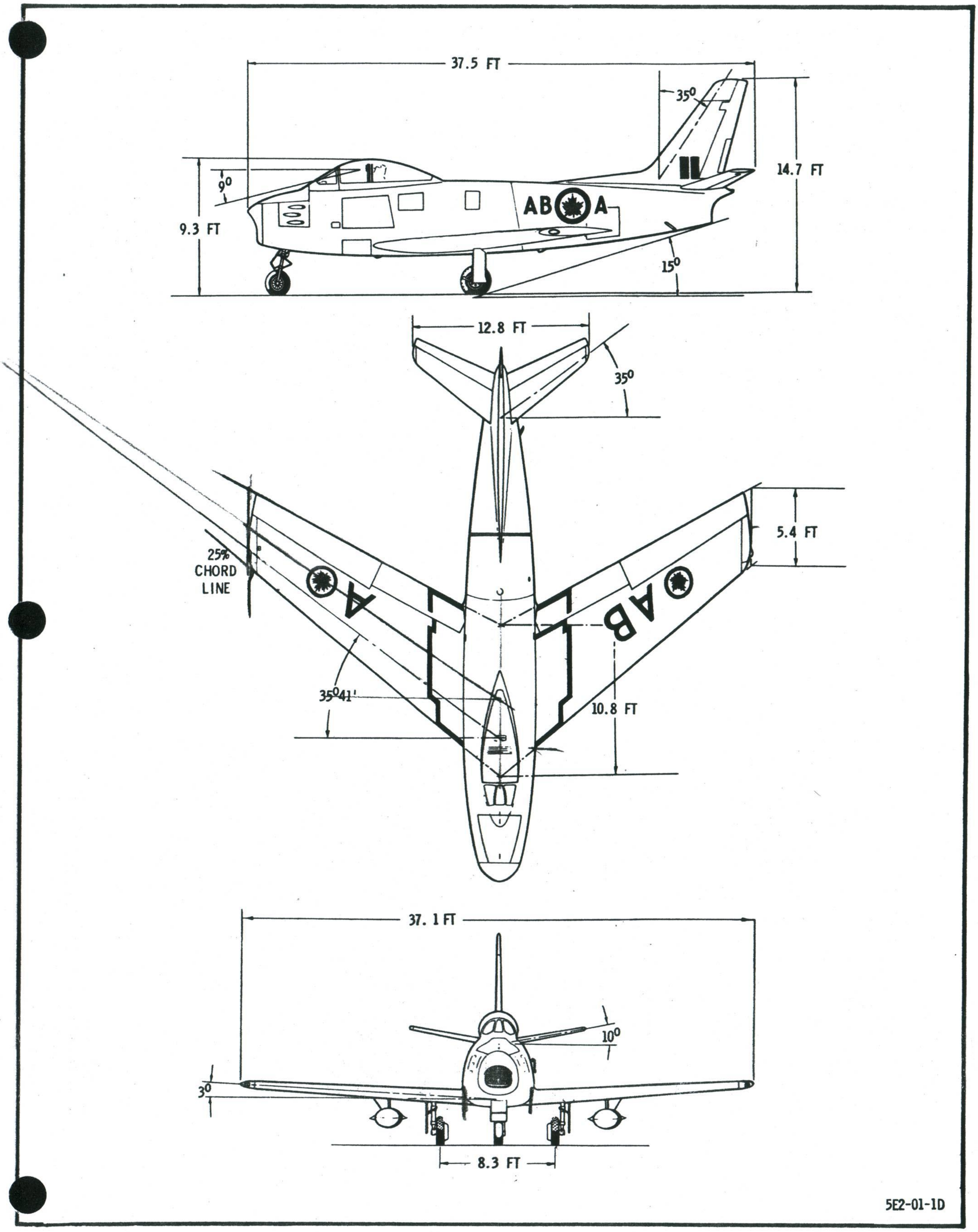


Figure 1-2 Aircraft Dimensions

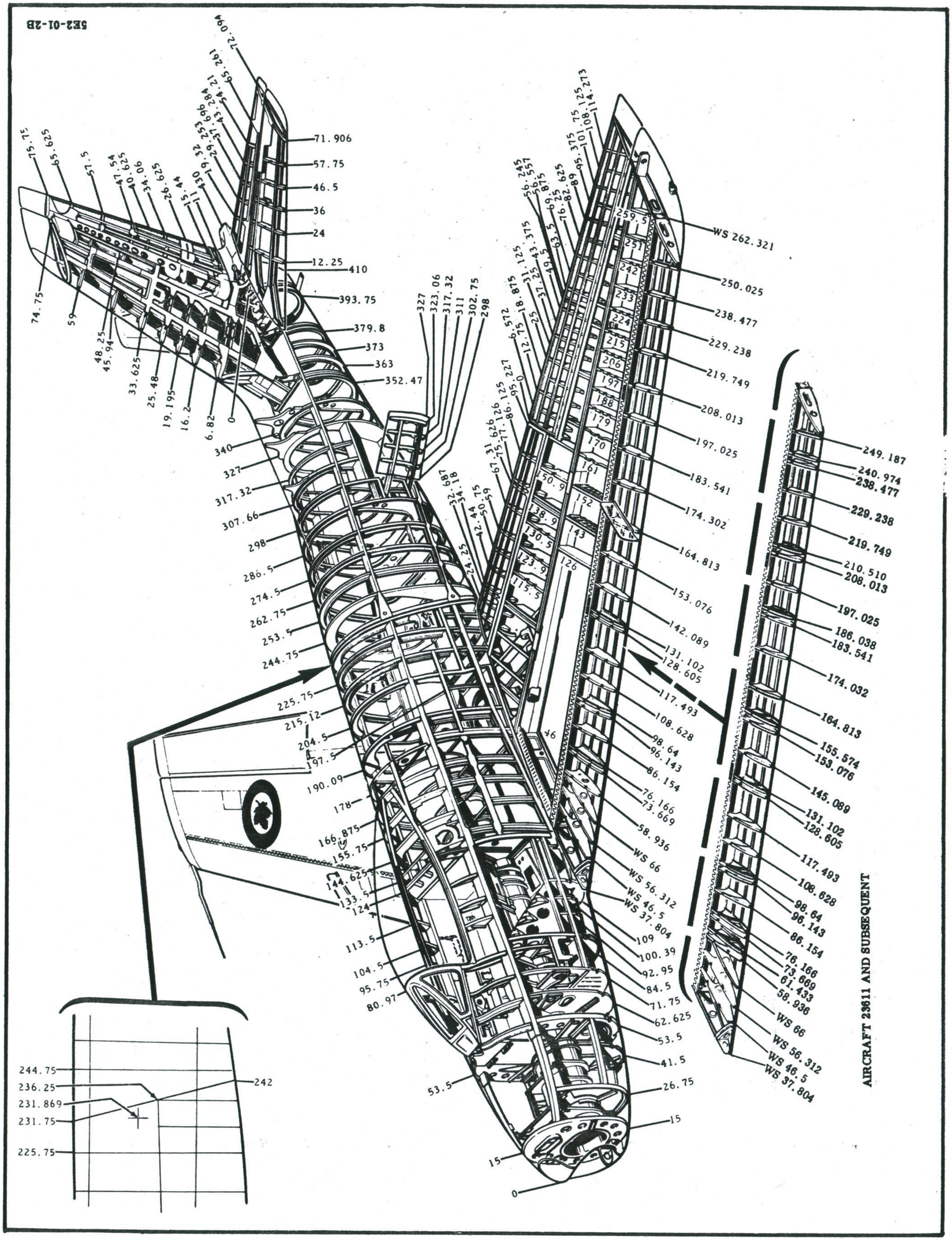
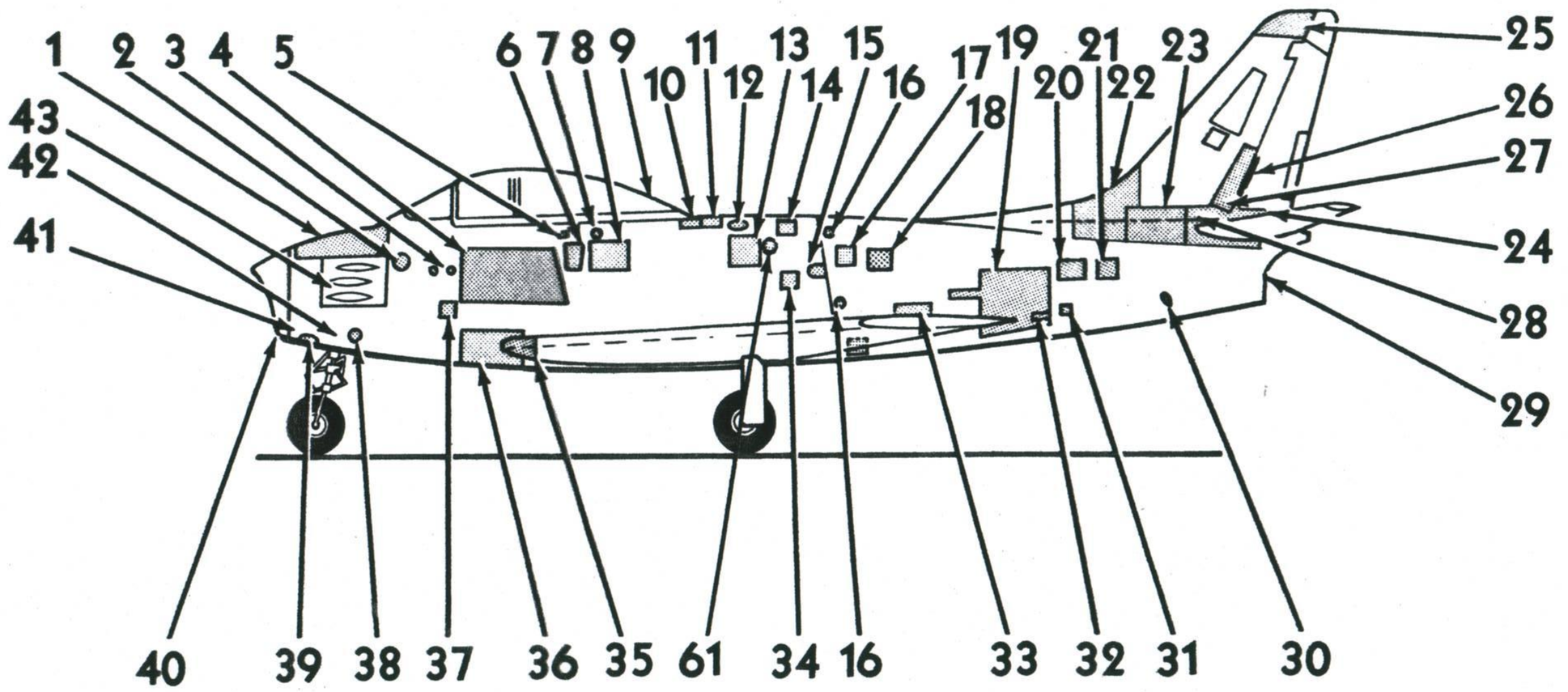


Figure 1-3 Aircraft Stations



1 RADAR, BATTERY AND GUNSIGHT ACCESS. RADAR SCOPE ANTENNA. VOLTAGE REGULATOR, SIGHT AMPLIFIER, RELAY AND BREAKER PANELS, VOLTAGE TEST TERMINALS AND COMPUTER. ICE DETECTOR SWITCH.

2 HYDRAULIC BRAKE CYLINDER AND PARKING BRAKE ACTUATOR.

3 CANOPY OPENING AND CLOSING BUTTONS.

4 GUN BAY. CHARGING UNITS, BORESIGHT FIXTURE, DROP TANK PRESSURE REGULATOR, CABIN PRESSURE TEST AND DUMP RECEPTACLES, G SUIT SUIT PRESSURE CHECK VALVE, MECHANICAL BOMB RELEASE AND ARMING SAFETY SWITCH.

5 LIFTING LUG ACCESS.

6 STICK STOP ACCESS. FUEL LINES.

7 EMERGENCY CANOPY RELEASE.

8 RADIO BAY. VOLTAGE REGULATOR, SPEED BRAKE DUMP VALVE, THERMAL RELIEF VALVES; TRANSPONDER, RADIO COMPASS RECEIVER, THREE PHASE INVERTER, STATIC CONVERTER; WINDSHIELD DE-ICING CHECK VALVE, CANOPY ACTUATOR MOTOR; RELAY AND FUSE PANELS, A.C. POWER UNIT AND RELAYS, WING FLAP SEQUENCE SWITCHES A.C. TRANSFORMER AND TRANSFER RELAYS; IFF DESTRUCTOR BOX, CANOPY SEAL REGULATOR AND SOLENOID VALVE. COLOUR CODE CHART.

9 CANOPY.

10 CABIN COOLING UNIT.

11 TURBINE

12 OIL PRESSURE TRANSMITTER, TACHOMETER GENERATOR, ENGINE CONTROL AND THROTTLE WARNING HORN ACCESS.

13 ENGINE ACCESSORIES, ALCOHOL TANK, BORESIGHT FIXTURE, AND DE-ICING DIFFERENTIAL SWITCH.

14 HYDRAULIC AND CABLE QUICK-DISCONNECTS, FUEL PUMP.

15 ENGINE MOUNT ACCESS.

16 REAR SECTION ATTACHING BOLTS ACCESS.

17 IGNITER PLUG ACCESS.

18 WIRING DISCONNECT ACCESS.

19 SPEED BRAKE WELL ACTUATOR, ALTERNATE FLIGHT CONTROL SWITCHES, RESERVOIR, SIGHT GLASS AND RELIEF VALVES.

20 ALTERNATE HYDRAULIC CONTROL SYSTEM COMPENSATOR.

21 TAIL PIPE SUPPORTS.

22 EMPENNAGE CONTROLS.

23 STABILIZER BELL-CRANK AND STOPS, LINKAGE AND RUDDER TRIM QUICK-DISCONNECT.

24 STABILIZER CONTROL ACCESS

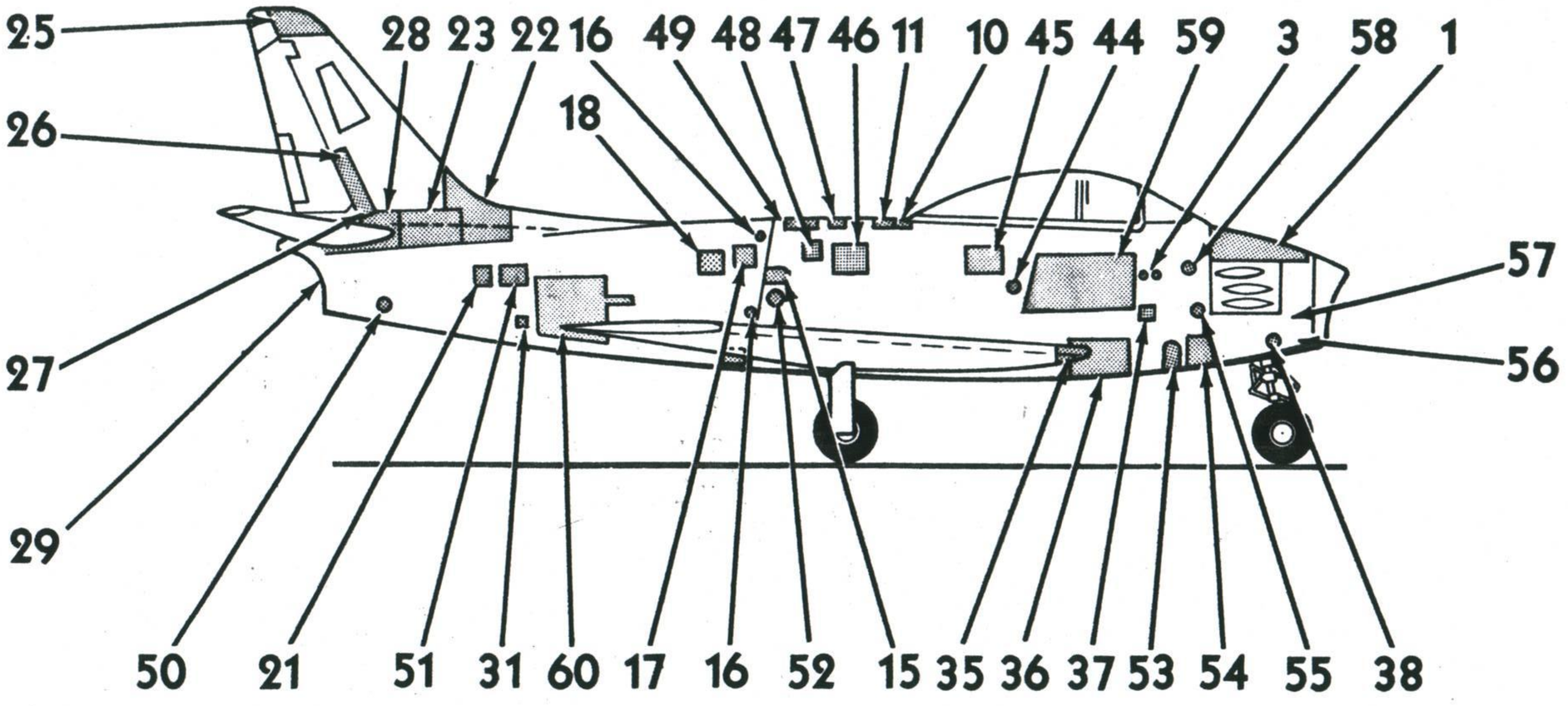
25 ANTENNA.

26 RUDDER TRIM TAB ACTUATOR.

27 STABILIZER TRIM ACCESS.

5E2-01-4A

Figure 1-4 (Sheet 1 of 4) (M) Access and Inspection Provisions



28 STABILIZER CONTROL ACTUATOR ACCESS.

29 TAIL PIPE, DRAINS AND RESTRICTOR SEGMENTS.

30 FUEL VENT CLAPPER VALVE.

31 COMPENSATOR, HYDRAULIC FLUID LEVEL INDICATOR.

32 SPEED BRAKE DOOR LATCH LOCATION.

33 GROUND FIRE FIGHTING DOOR, DATA CASE AND EMERGENCY HYDRAULIC MOTOR AND PUMP.

34 EXTERNAL ELECTRICAL POWER CONNECTIONS.

35 LEADING EDGE FAIRING ACCESS TO AMMUNITION DOOR.

36 AMMUNITION BOXES, HEAT THERMAL SWITCHES, LOWER DOOR FOR STEP.

37 KICK STEP.

38 OXYGEN BOTTLE AND TRUNNION PIN ACCESS.

39 LANDING LIGHTS.

40 CAMERA ACCESS DOOR.

41 CAMERA FILM LOADING ACCESS.

42 NOSE GEAR SHOCK STRUT, SOLENOID SHUT-OFF VALVE AND STEERING ADJUSTMENTS.

43 GUN BLAST TUBES, OXYGEN BOTTLE, PARKING VALVE, COMPENSATOR AND GUN CHARGER RELAYS.

44 FUEL FILLER CAP.

45 RADIO BAY AND HYDRAULIC RESERVOIR

46 ELECTRICAL DISCONNECTS, HYDRAULIC TEST CONNECTIONS AND NORMAL FLIGHT RESERVOIR AND SIGHT GAUGE.

47 HYDRAULIC PUMP AND UPPER ENGINE MOUNT

48 OIL FILLER AND DIP STICK.

49 ENGINE ACCESSORIES, CONTROLS AND HYDRAULIC QUICK DISCONNECTS.

50 ENGINE WASTE AIR VENT.

51 NORMAL HYDRAULIC CONTROL COMPENSATOR.

52 FUEL FILLER.

53 AIR BOTTLE

54 AIR COMPRESSOR AND GAUGE, RESET HANDLE (NOSE GEAR SELECTOR VALVE).

55 OXYGEN CHARGING VALVE.

56 FUEL REGULATOR PITOT.

57 ICE DETECTOR HEAD.

58 BRAKE CYLINDER AND EMERGENCY RESERVOIR.

59 GUN BAY; CHARGING UNITS, BOOSTER MOTORS, RELAY PANEL AND MANUAL CHARGING.

60 SPEED BRAKE WELL. ALTERNATE HYDRAULIC ACCUMULATOR, ACTUATOR, AIR FILLERS AND PRESSURE GAUGES, RELIEF VALVE, PRESSURE SWITCHES.

61 FUEL AND OIL PRESSURE TRANSMITTERS.

5E2-01-5A

Figure 1-4 (Sheet 2 of 4) Access and Inspection Provisions

(1) Aircraft 23001 to 23210 inclusive.

(2) Aircraft 23211 and subsequent.

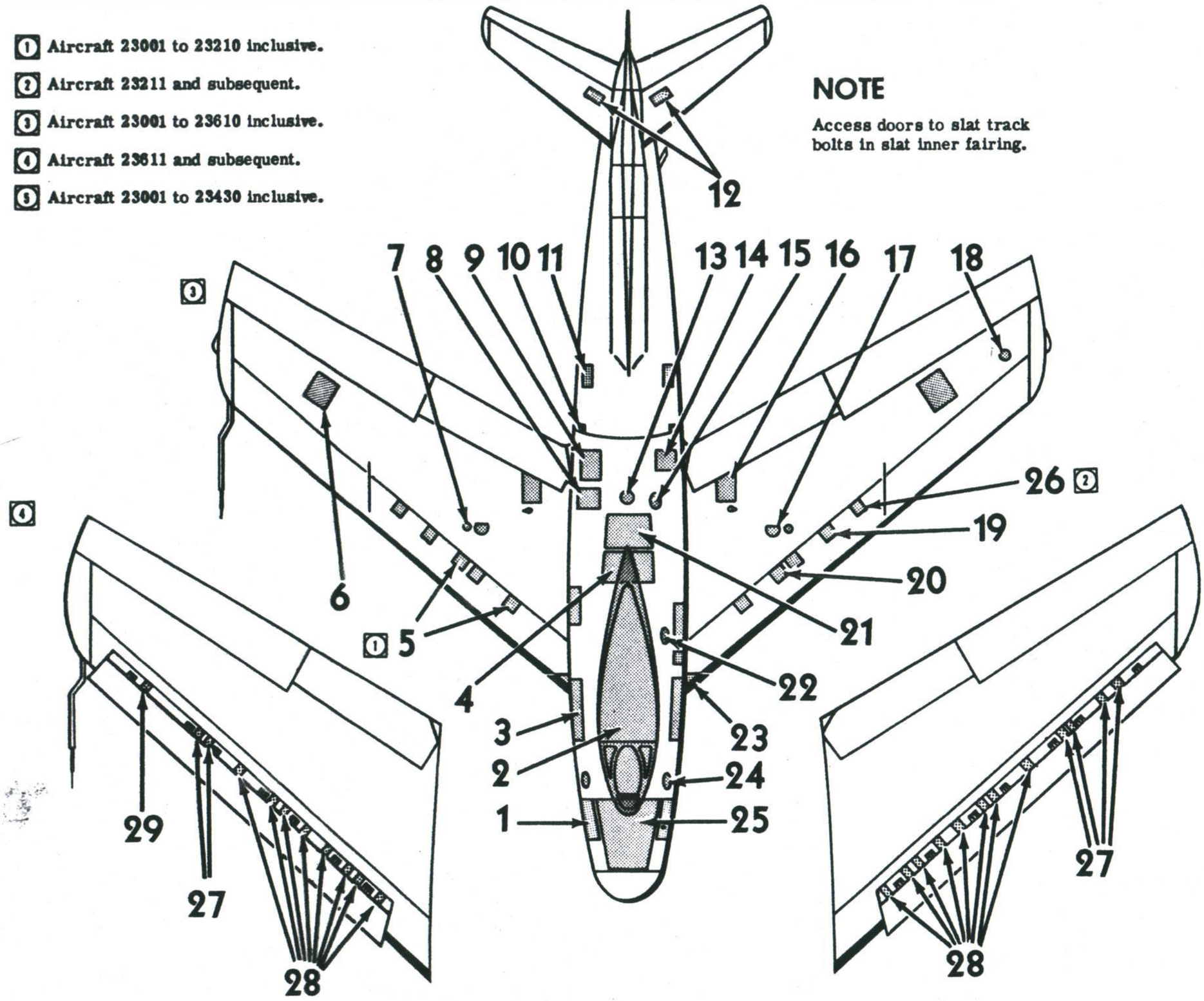
(3) Aircraft 23001 to 23610 inclusive.

(4) Aircraft 23611 and subsequent.

(5) Aircraft 23001 to 23430 inclusive.

NOTE

Access doors to slat track bolts in slat inner fairing.



1 GUN BLAST TUBES AND OXYGEN BOTTLE ACCESS - RH AND LH

2 CANOPY

3 GUN BAY - RH AND LH

4 CABIN COOLING UNIT AND AIR MIXING VALVE ACCESS

5 JETTISON MECHANISM - RH AND LH (1)

6 AILERON HYDRAULIC ACTUATOR ACCESS - RH AND LH

7 GROUNDING PLUG ACCESS

8 UPPER ENGINE BAY AND UPPER ENGINE MOUNT ACCESS

9 ENGINE ACCESSORIES

10 REAR SECTION ATTACHING BOLT ACCESS - RH AND LH

11 SPARK PLUG ACCESS - RH AND LH

12 PANEL SECURING SCREWS ACCESS - RH AND LH

13 UPPER ENGINE MOUNT ACCESS

14 CONTROL CABLES AND HYDRAULIC LINES QUICK-DISCONNECTS - FUEL PUMP ACCESS - TARGET TOW MANUAL RELEASE DISCONNECT (5)

15 UPPER ENGINE CONTROL ACCESS

16 UNDERCARRIAGE DOWNLOCK AND TRUNNION PIN AND LOCKING BOLT ACCESS - RH AND LH

17 FUEL FILLER CAP ACCESS - RH AND LH

18 GYROSYN COMPASS TRANSMITTER ACCESS

19 AILERON CABLES AND HYDRAULIC LINES UNIONS - RH AND LH

20 DROP TANK CONNECTION ACCESS - RH AND LH

21 TURBINE ACCESS - HEAT AND VENT SYSTEM

22 EMERGENCY CANOPY RELEASE ACCESS

23 LEADING EDGE ACCESS TO AMMUNITION BAY - LH AND RH

24 BRAKE CYLINDER ACCESS - RH AND LH

25 RADAR ACCESS

26 DROP TANK FUEL FLOW INDICATOR ACCESS

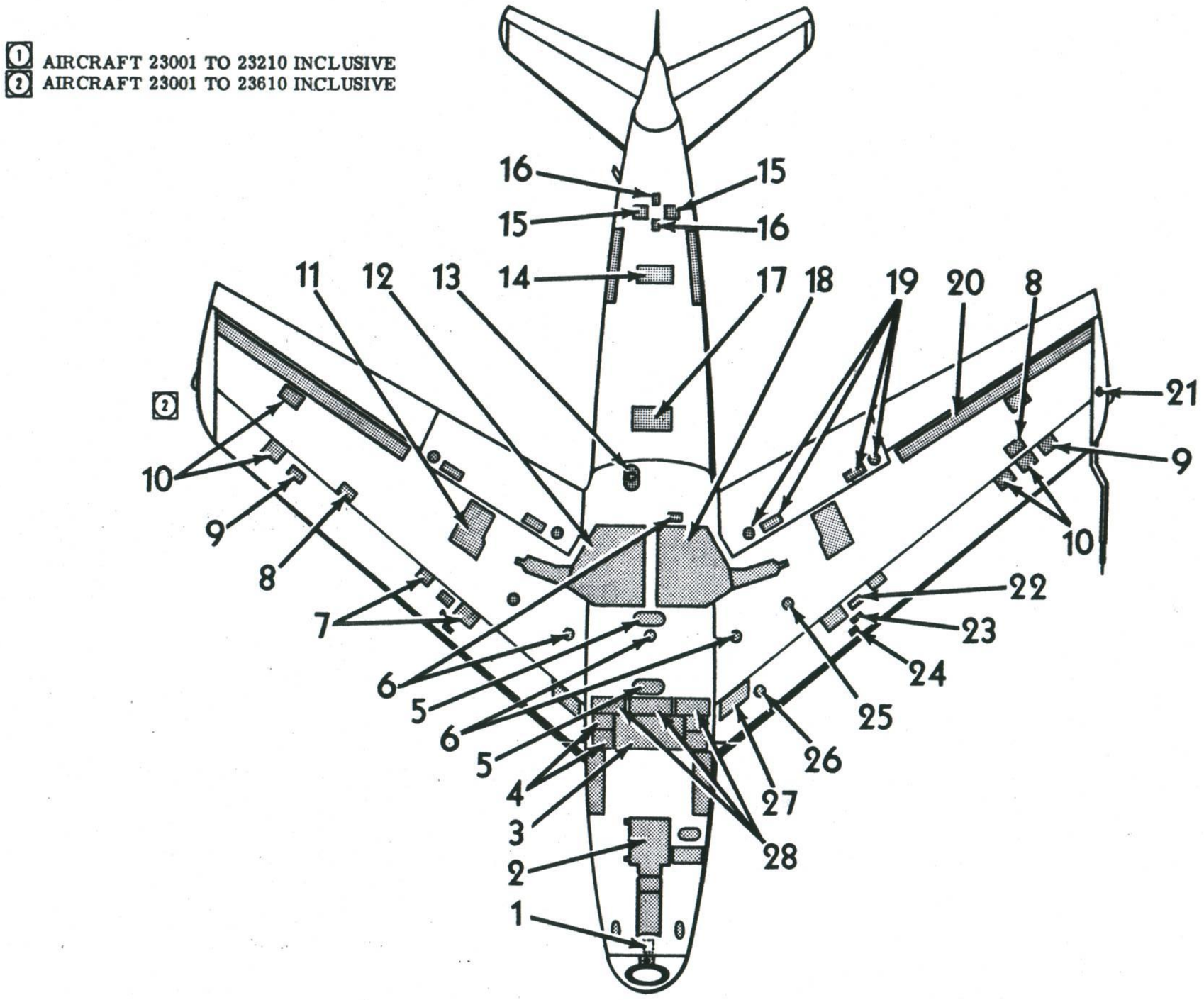
27 HYDRAULIC LINES ACCESS

28 SURFACE CONTROLS ACCESS

29 ELECTRIC CONNECTIONS ACCESS

5E2-01-6D

Figure 1-4 (Sheet 3 of 4) Access and Inspection Provisions



1 ELECTRICAL PRESSURIZED DISCONNECT (AIR INTAKE UPPER SKIN).

2 NOSE GEAR WELL. AIRCRAFT LEVELLING PADS, EMERGENCY HYDRAULIC ACCUMULATOR GAUGE AND AIR CHARGING VALVE.

3 COMMAND RADIO.

4 EXPENDED AMMUNITION ACCESS, L AND R.

5 FUEL BOOSTER PUMPS ACCESS.

6 FUEL DRAIN ACCESS.

7 MANUAL JETTISON MECHANISMS, L AND R.

8 AILERON CABLES AND HYDRAULIC UNIONS, L AND R.

9 HYDRAULIC RELIEF VALVE, L AND R.

10 HYDRAULIC LINE UNIONS, L AND R.

11 FLAP ACTUATOR ACCESS, L AND R.

12 LH WHEEL WELL. HEAT AND VENT SHUT-OFF VALVE, SPEED BRAKE CONTROL VALVE, NORMAL SYSTEM ACCUMULATOR AND RESERVOIR, BOOSTER PUMP TEST SWITCHES.

13 FUEL TRANSFER PUMP AND DRAIN ACCESS.

14 TAIL PIPE CLAMP ACCESS.

15 HYDRAULIC SYSTEMS FILLER CONNECTIONS.

16 GROUND CONNECTIONS.

17 ENGINE WASTE AIR VENT CONNECTION ACCESS.

18 RH WHEEL WELL. SPEED BRAKES ACCUMULATOR, HYDRAULIC SELECTOR VALVES, HYDRAULIC AND OIL SYSTEM DRAINS, FLAP FLEXIBLE DRIVE.

19 FLAP ROLLERS SECURING BOLTS ACCESS, L AND R.

20 AILERON SEAL ACCESS, L AND R.

21 PITOT LINE UNIONS.

22 BOMB RACK ELECTRICAL DISCONNECT, L AND R.

23 DROP TANK FUEL CONNECTION, L AND R.

24 DROP TANK PRESSURE CONNECTION, L AND R.

25 WING FUEL CELL TENSION-COMPRESSION POST, L AND R.

26 PITOT-STATIC DRAIN ACCESS.

27 AILERON BELL CRANK RIG PIN HOLES AND FUEL DRAIN, L AND R.

28 AILERON BUNGEE AND BELLCRANK, HYDRAULIC PRESSURE TRANSMITTERS, AILERON TRIM ACTUATOR AND NORMAL SYSTEM SOLENOID AND RELIEF VALVE.

5E2-01-7B

Figure 1-4 (Sheet 4 of 4) Access and Inspection Provisions

FUSELAGE

6 Dimensions are as follows:

(a)	Width (maximum)	5.0 ft.
(b)	Height (to top of canopy)	6.6 ft.
(c)	Length (without empennage)	35.9 ft.

AREAS

7 Areas are as follows:

(a)	Wings including ailerons, flaps and 49.9 sq. ft. covered by fuselage.	
	(Aircraft 23001 to 23610 incl)	302.3 sq.ft.
	(Aircraft 23611 and subsequent)	313.0 sq.ft.
(b)	Ailerons (total)	32.8 sq.ft.
(c)	Flaps (total)	32.5 sq.ft.
(d)	Stabilizer (including 1.2 sq.ft. covered by vertical fin)	24.9 sq.ft.
(e)	Elevators (two)	8.2 sq.ft.
(f)	Fin (including 0.9 sq.ft. blanketed fuse)	25.3 sq.ft.
(g)	Rudder (including tab)	8.1 sq.ft.
(h)	Rudder trim tab	0.9 sq.ft.
(j)	Speed brakes	10.98 sq.ft.

ACCESS AND INSPECTION PROVISIONS

GENERAL

8 Access and inspection provisions are shown in Figure 1-4. Engine removal is accomplished by separating the fuselage at station 236. Access to the engine plumbing is gained through the covers provided in each main gear wheel well and through access doors on each side of the fuselage.

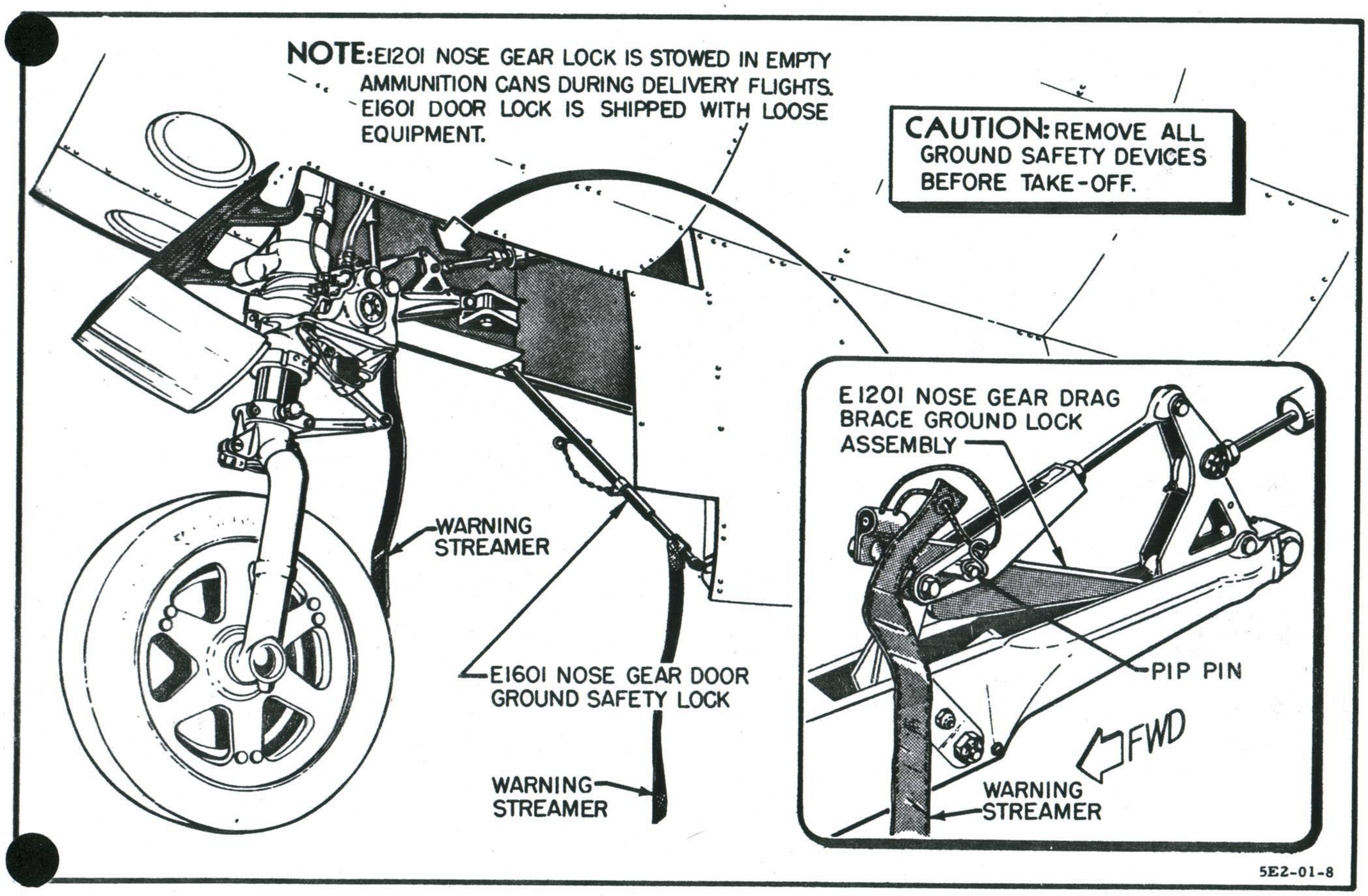


Figure 1-5 Ground Safety Devices

PART 1 - SECTION 2

SERVICING, LUBRICATING AND SPECIAL TOOLS

SERVICING INSTRUCTIONS

GENERAL

1 Capacities are as follows:

(a)	Fuel (usable)	
(1)	Outer wing cells (2)	Aircraft 23001 to 23006 inclusive. 56 Imp. (67.2 U.S.) Gal. each. Aircraft 23007 and subsequent. 57 Imp. (68.4 U.S.) Gal. each.
(2)	Wing centre section cell (1)	61 Imp. (73.2 U.S.) Gal.
(3)	Front fuselage cell (1)	102 Imp. (122.4 U.S.) Gal.
(4)	Rear fuselage cell (1)	80 Imp. (96.0 U.S.) Gal.
(5)	Droppable tanks	166.5 Imp. (200 U.S.) Gal. each.
(6)	Usable fuel, total	Aircraft 23001 to 23006 inclusive. 688 Imp. (826 U.S.) Gal. each. Aircraft 23007 and subsequent. 690 Imp. (828.6 U.S.) Gal.
(7)	Front fuselage cell expansion space	12 Imp. (14.4 U.S.) Gal.

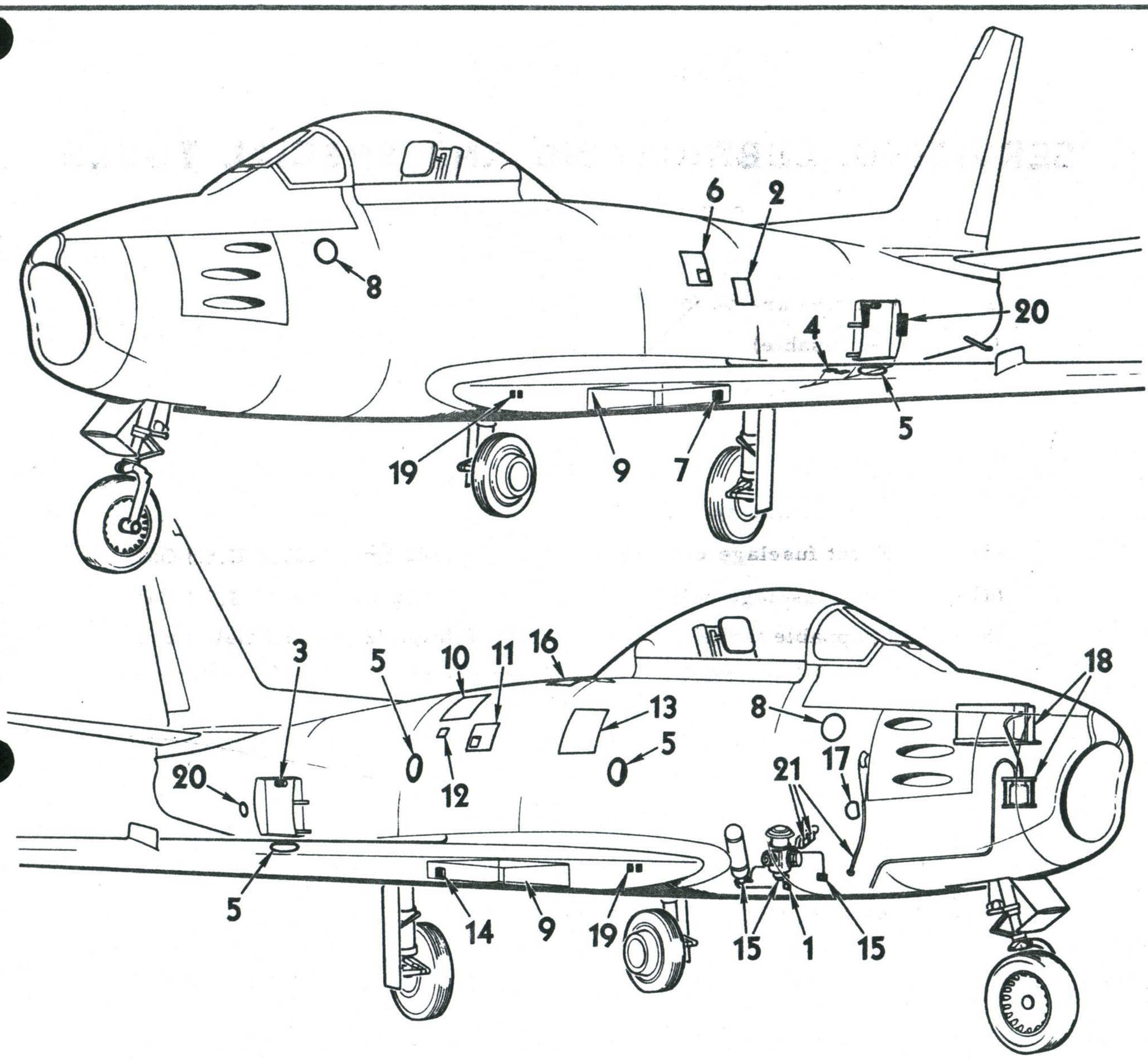
NOTE

With 100 Imp. (120 U.S.) Gal. droppable tanks (2) the total usable fuel is 557 Imp. (669 U.S.) Gal.

NOTE

The fuel required to fill the fuel lines, etc., in the entire system is known as residual fuel. In the Sabre 5 and 6 aircraft, with or without external fuel tanks, this quantity is 3.7 Imperial (4.2 U.S.) gallons.

(b)	Oil	
(1)	Tank usable capacity	2.9 Imp. (3.5 U.S.) Gal.
(2)	Expansion space	0.8 Imp. (1.0 U.S.) Gal.
(c)	Hydraulic fluid	
(1)	System reservoir fluid capacity	1.66 Imp. (2 U.S.) Gal.
(2)	System reservoir air space	0.23 Imp. (0.28 U.S.) Gal.
(d)	Fuel de-icing alcohol (Aircraft 23001 to 23210 inclusive)	
(1)	Tank capacity, fuel filter de-icing	0.83 Imp. (1.0 U.S.) Gal.
(e)	Oxygen Cylinders	
(1)	Four Type D-2, low-pressure	425 psi max.



1 GUN CHARGER ACCUMULATOR AIR GAUGE AND AIR FILLER

2 EXTERNAL ELECTRICAL POWER RECEPTACLE

3 FLIGHT CONTROL HYDRAULIC ACCUMULATOR AIR FILLERS AND PRESSURE GAUGES IN RH SPEED BRAKE WELL

4 NORMAL AND ALTERNATE FLIGHT CONTROL HYDRAULIC SYSTEM FILLERS (ON BOTTOM FUSELAGE)

5 FUEL FILLER (WING TANKS)

6 FUEL FILTER DE-ICING TANK FILLER

7 NORMAL FLIGHT CONTROL HYDRAULIC ACCUMULATOR AIR FILLER

8 HYDRAULIC BRAKE EQUIPMENT

9 MAIN GEAR SHOCK STRUT SERVICING (ACCESS BOTH WHEEL WELLS)

10 HYDRAULIC DISCONNECTS

11 HYDRAULIC TEST STAND CONNECTIONS

12 ENGINE OIL TANK FILLER

13 HYDRAULIC UTILITY SYSTEM RESERVOIR FILLER

14 SPEED BRAKES HYDRAULIC SYSTEM ACCUMULATOR AIR FILLER

15 GUN CHARGER AIR COMPRESSOR OIL AND AIR FILLERS

16 AIR COOLING UNIT TURBINE ACCESS

17 OXYGEN FILLER VALVE

18 BATTERY AND SUMP JAR (SERVICED THROUGH RADAR DOOR)

19 DRAINS, DROP TANK LINES

20 FLIGHT CONTROL SYSTEM HYDRAULIC COMPENSATORS (AFT OF SPEED BRAKE WELLS)

21 EMERGENCY NOSE GEAR ACCUMULATOR, DUMP VALVE, PRESSURE GAUGE, AIR FILLER AND RESET MECHANISM

5E2-01-18D

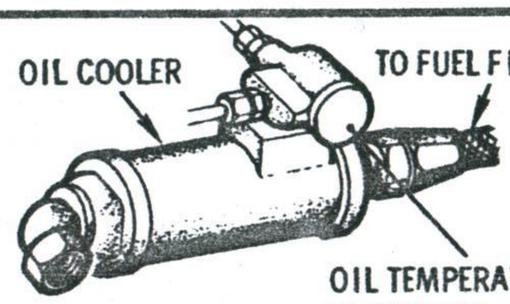
Figure 1-15 (M) Servicing Aircraft

FUEL TANK SUMP DRAIN (Typical.)

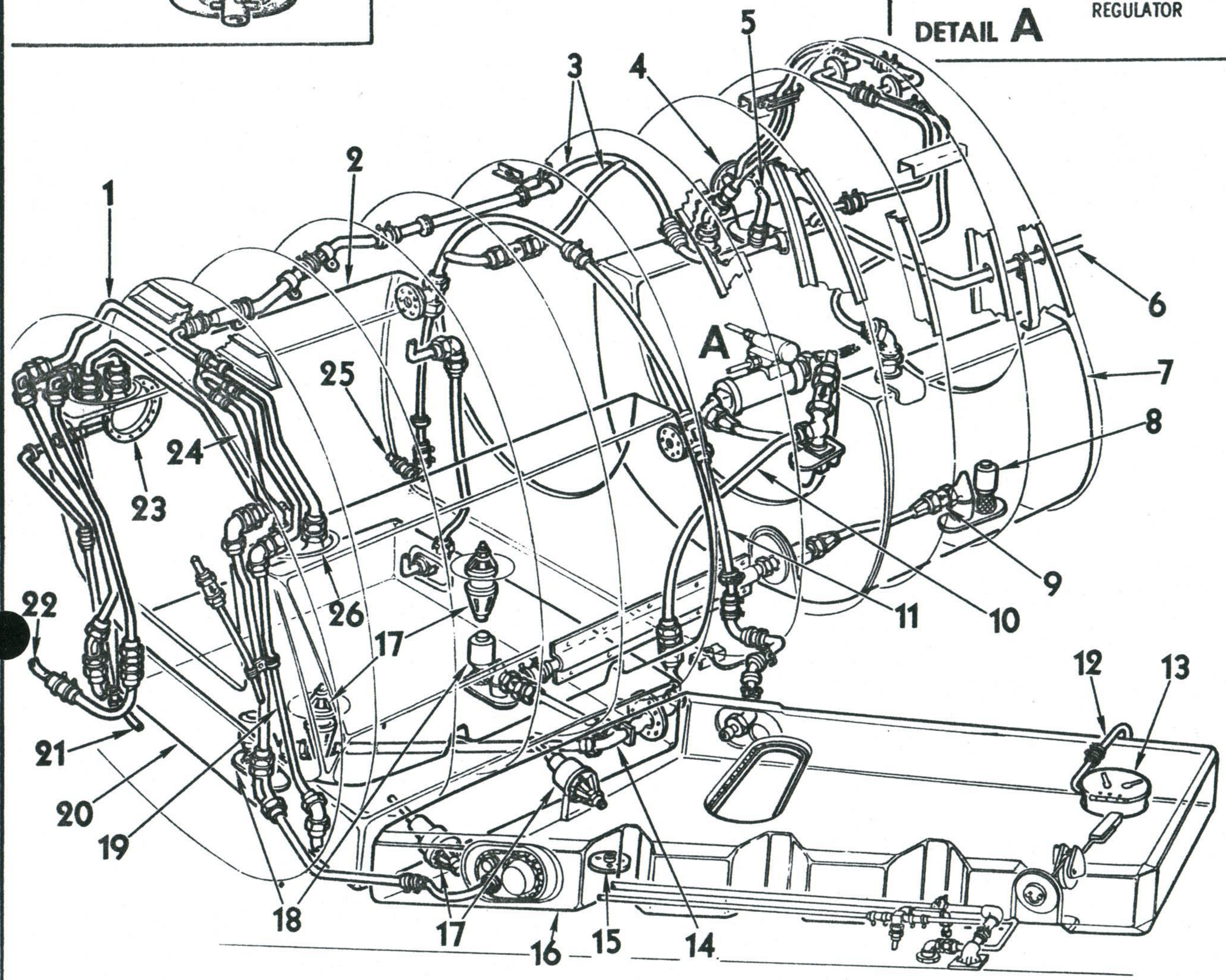


NOTE

To drain fuel system, disconnect line at engine inlet end, and open fuel shut-off valve.



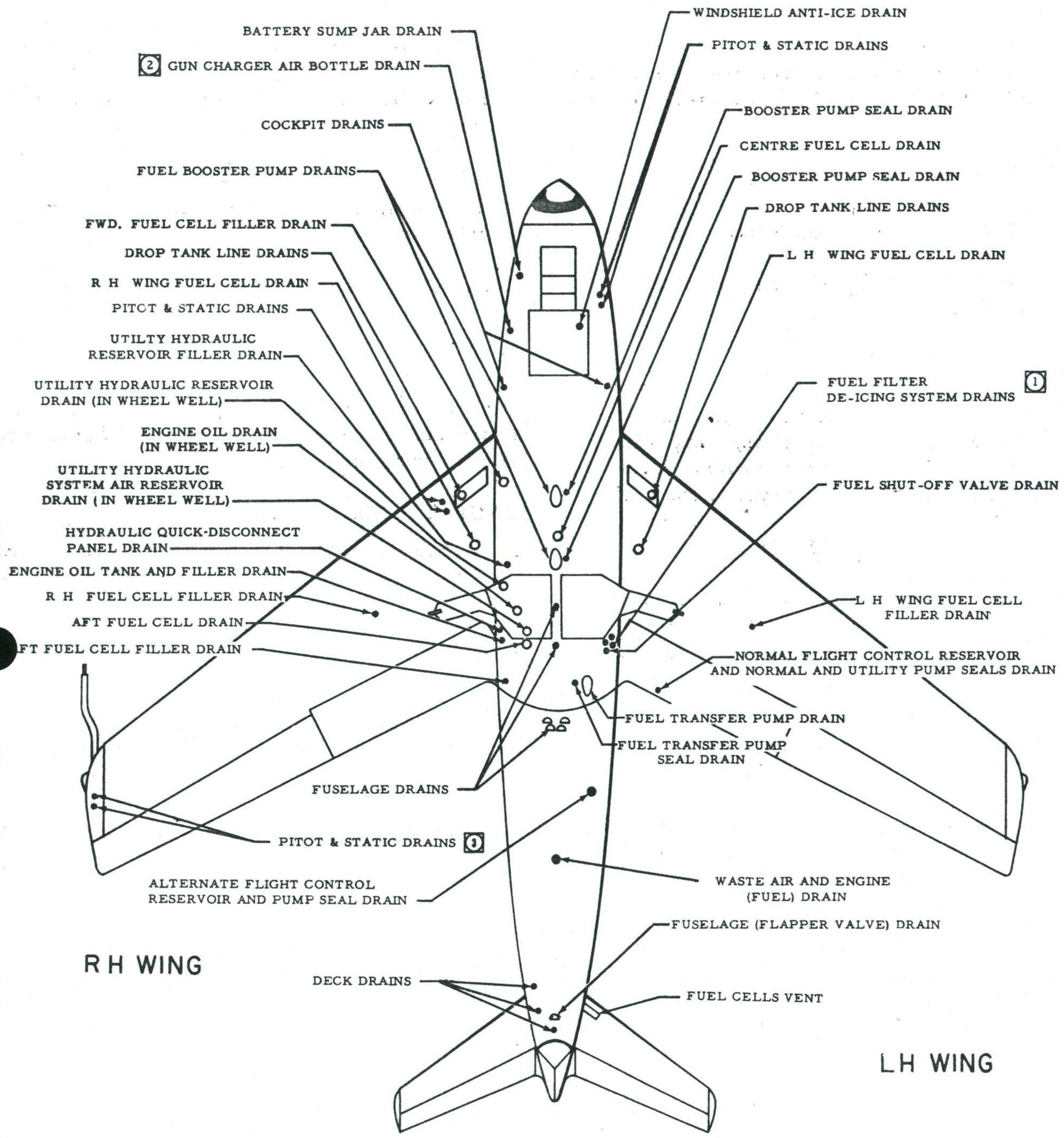
DETAIL A



1 FROM RH DROP TANK
2 FORWARD FUSELAGE CELL
3 VENT LINES
4 FILLER CAP
5 OVERBOARD DRAIN
6 TO VENT OUTLET
7 AFT FUSELAGE CELL
8 TRANSFER PUMP
9 TO CENTRE WING CELL
10 BOOSTER PUMP TO SHUT-OFF VALVE
11 CELL VENT LINE
12 OVERBOARD DRAIN
13 FILLER CAP
14 SUCTION FEED LINE
15 DRAIN SUMP ADAPTER
16 LEFT WING CELL
17 CELL INTERCONNECTORS
18 BOOSTER PUMPS
19 FROM LH DROP TANK
20 CENTRE WING FUEL CELL
21 OVERBOARD DRAIN
22 FROM RIGHT WING CELL
23 FILLER CAP
24 TO CONTROL VALVE
25 FROM RIGHT WING CELL VENT
26 FUEL LEVEL CONTROL VALVE

5E2-01-19C

Figure 1-16 Fuel System Fillers, Drains and Vents



[1] AIRCRAFT 23001 TO 23210 INCLUSIVE

[2] AIRCRAFT 23001 TO 23300 INCLUSIVE

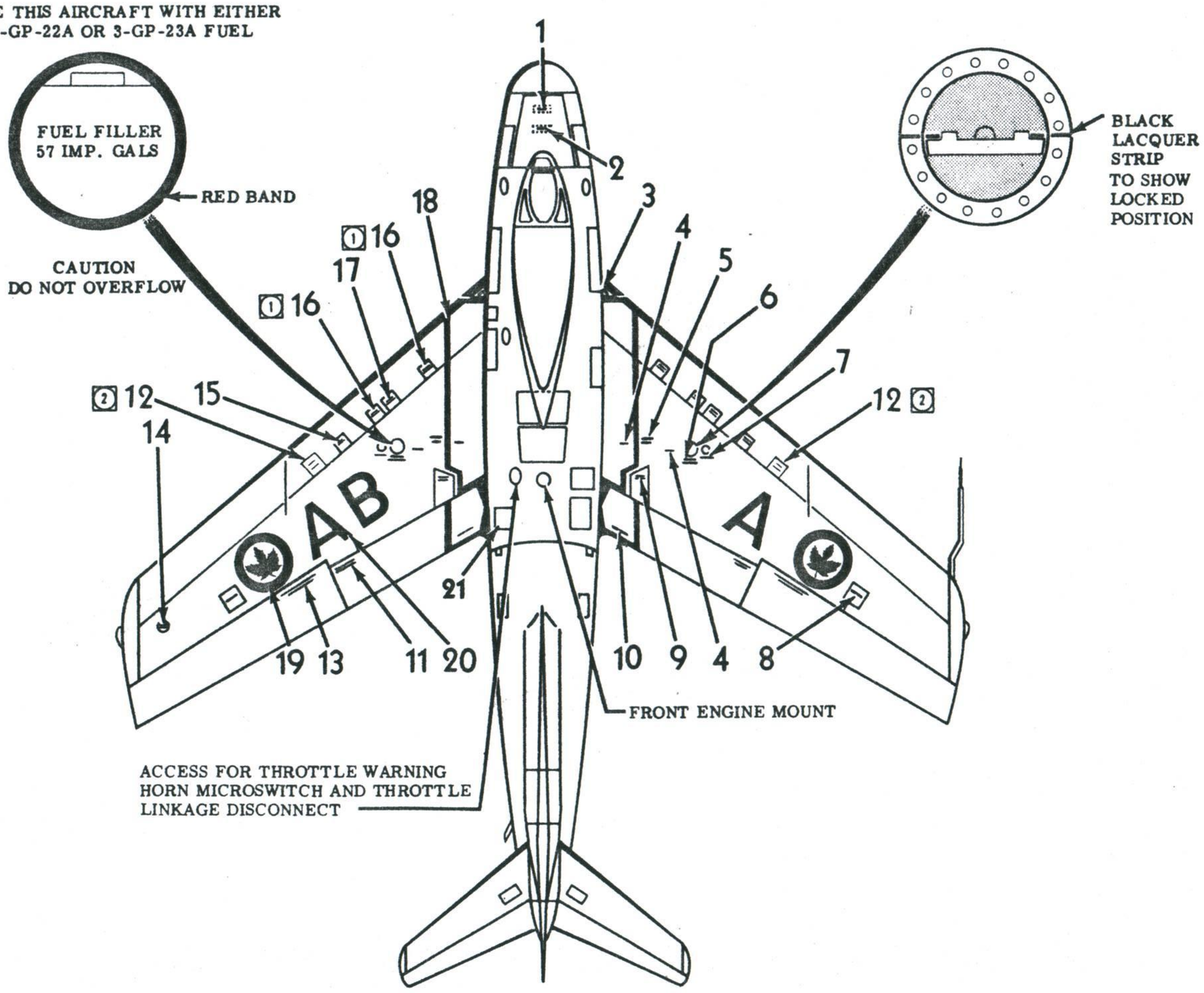
[3] AIRCRAFT 23001 TO 23610 INCLUSIVE

WARNING

WHENEVER THE ENGINE FUEL SYSTEM HAS BEEN OPENED FOR DRAINING OR ANY OTHER PURPOSE, ALL AIR MUST BE BLED FROM THE SYSTEM. REFER TO PART 5 FOR PROCEDURE.

5E2-01-20B

Figure 1-17 Draining Provisions



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

ROYAL CANADIAN AIR FORCE

EO 05-5E-2
24 Jan 58

ADVANCE REVISION

Serial #89 dated 20 Dec 60
(Sheet 1 of 1)

The sheet of this Advance Revision is to be inserted in the EO as follows:-

Sheet 1 facing page 49

Part 1, Section 2, page 49.

Figure 1-24, sheet 2 of 4, External Markings.

Delete top RH sketch.

Add new sketch and the following.

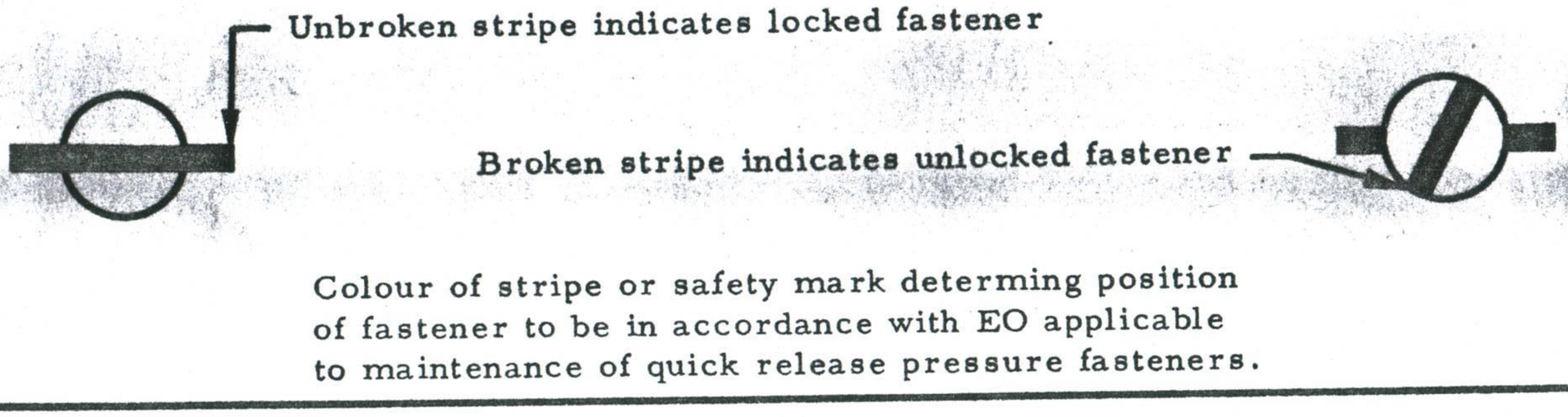
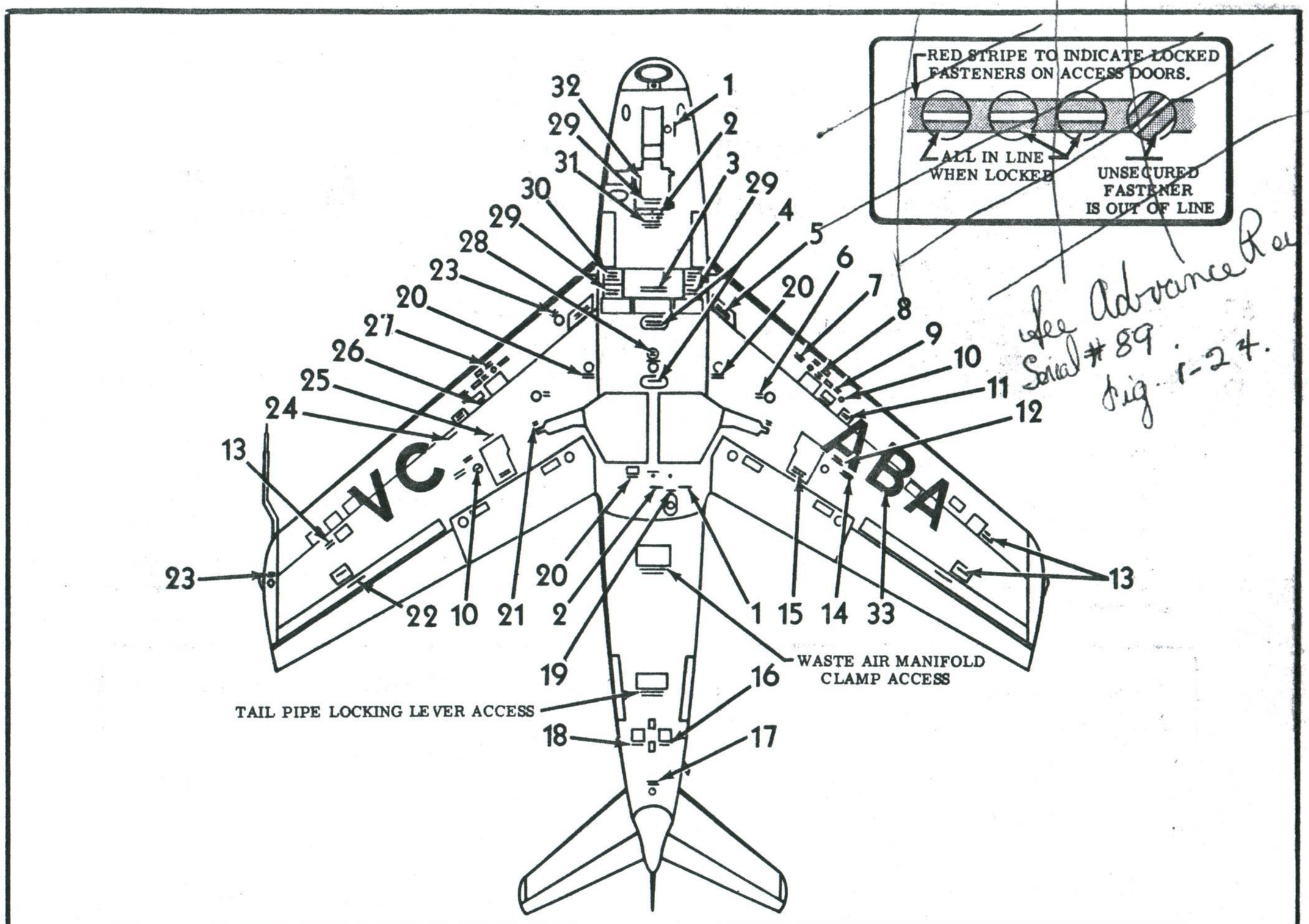


Figure 1-24

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF



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

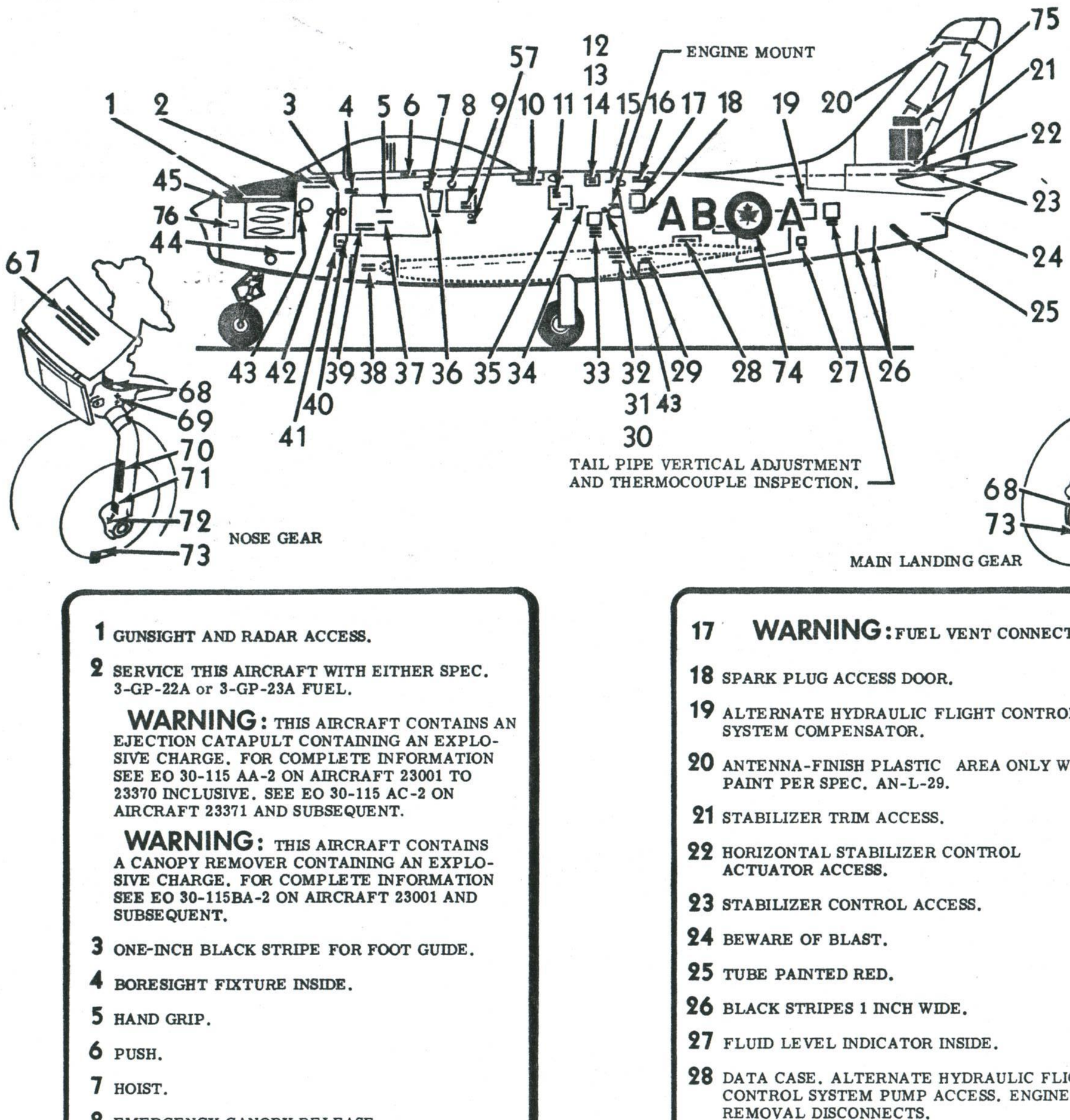
32 LEVELING PROVISION INSIDE.

33 IDENTIFICATION

AIRCRAFT 23001 TO 23610 INCLUSIVE

5E2-01-33B

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



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.

5E2-01-34C

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

Figure 1-24 (Sheet 4 of 4), page 51.

Item 46

After "Warning" delete the following:-

This aircraft contains an ejection catapult containing an explosive charge. For complete information see EO 30-115AA-2 on aircraft 23001 to 23370 inclusive. See EO 30-115AC -2 on aircraft 23371 and subsequent.

After "Warning" add the following:-

This aircraft contains an ejection catapult (M5) containing an explosive charge. For complete information see EO 30-115AD-2.

After "Warning" delete the following:-

This aircraft contains a canopy remover containing an explosive charge. For complete information see EO 30-115BA-2 on aircraft 23001 and subsequent.

After "Warning" add the following:-

This aircraft contains a canopy remover (M1A1) containing an explosive charge. For complete information see EO 30-115BB-2.

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

ADVANCE REVISION

Serial #81 dated 22 Sep 60
(Sheet 1 of 2)

The sheets of this Advance Revision are to be inserted in the EO as follows:-

Sheet 1 facing page 50
Sheet 2 facing page 51

Figure 1-24 (Sheet 3 of 4), External markings, page 50.

Item 2

After "Warning" delete the following:-

> This aircraft contains an ejection catapult containing an explosive charge. For complete information see EO 30-115AA-2 on Aircraft 23001 to 23370 inclusive. See EO 30-115AC -2 on Aircraft 23371 and subsequent.

After "Warning" add the following:-

> This aircraft contains an ejection catapult (M5) containing an explosive charge. For complete information see EO 30-115AD-2.

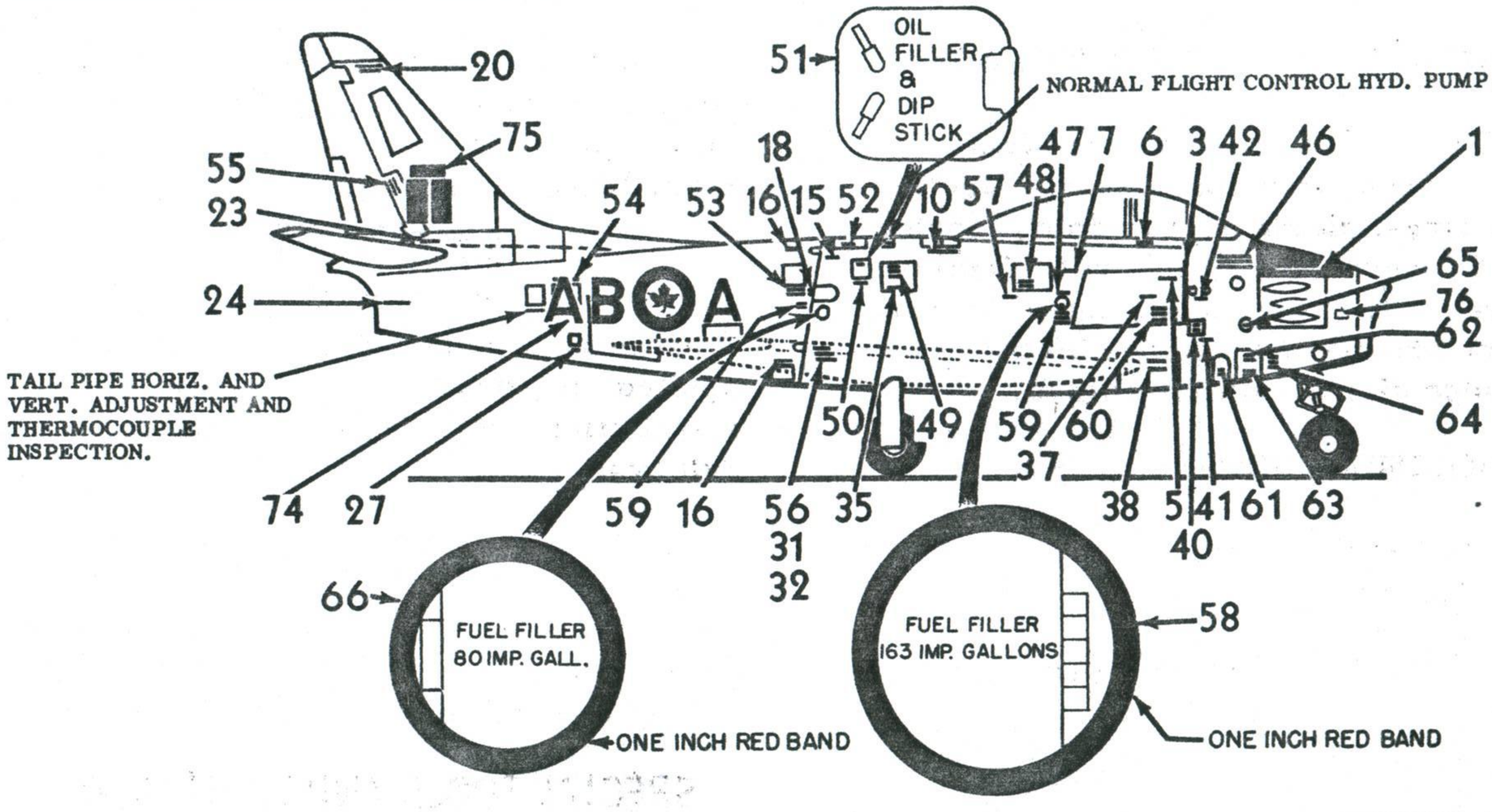
After "Warning" delete the following.

> This aircraft contains a canopy remover containing an explosive charge. For complete information see EO 30-115BA-2 on Aircraft 23001 and subsequent.

After "Warning" add the following:-

> This aircraft contains a canopy remover (M1A1) containing an explosive charge. For complete information see EO 30-115BB-2.

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF



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

EXTINGUISHING FIRE IN AFT FUSELAGE

42 Introduce CO_2 or dry chemical fire extinguishing agent into the fuselage section through the fire-fighting access door, located on the left forward side of the rear fuselage section. Direct the extinguishing agent into the compartment around the engine. Do not allow CO_2 to impinge directly on the engine.

FIRE EXTINGUISHER DOOR

42A For fire extinguisher door rigging procedure, see Figure 1-24A.

LUBRICATION REQUIREMENTS

GENERAL

43 Parts requiring periodic lubrication are shown in Figure 1-22. Remove all foreign matter from joints, fittings or bearing surfaces immediately prior to application of lubricant. Use a clean cloth saturated with cleaning solvent, Specification 3-GP-8 (latest issue). Apply lubricants sparingly to prevent accumulation of contaminants. When applying lubricants through pressure-type fittings, be certain that lubricant has emerged around bushing. Wipe off excess.

CAUTION

Anti-seize compound should be lightly applied to drain plug threads before installation to facilitate subsequent removal.

NOTE

Do not use oil or grease on flap tracks, as a permanent lubrication is provided during manufacture.

SPECIAL TOOLS AND EQUIPMENT

GENERAL

44 Special tools and equipment (see Figure 1-23) are supplied for general maintenance and overhaul. For further information, refer to EO 05-5E-4.

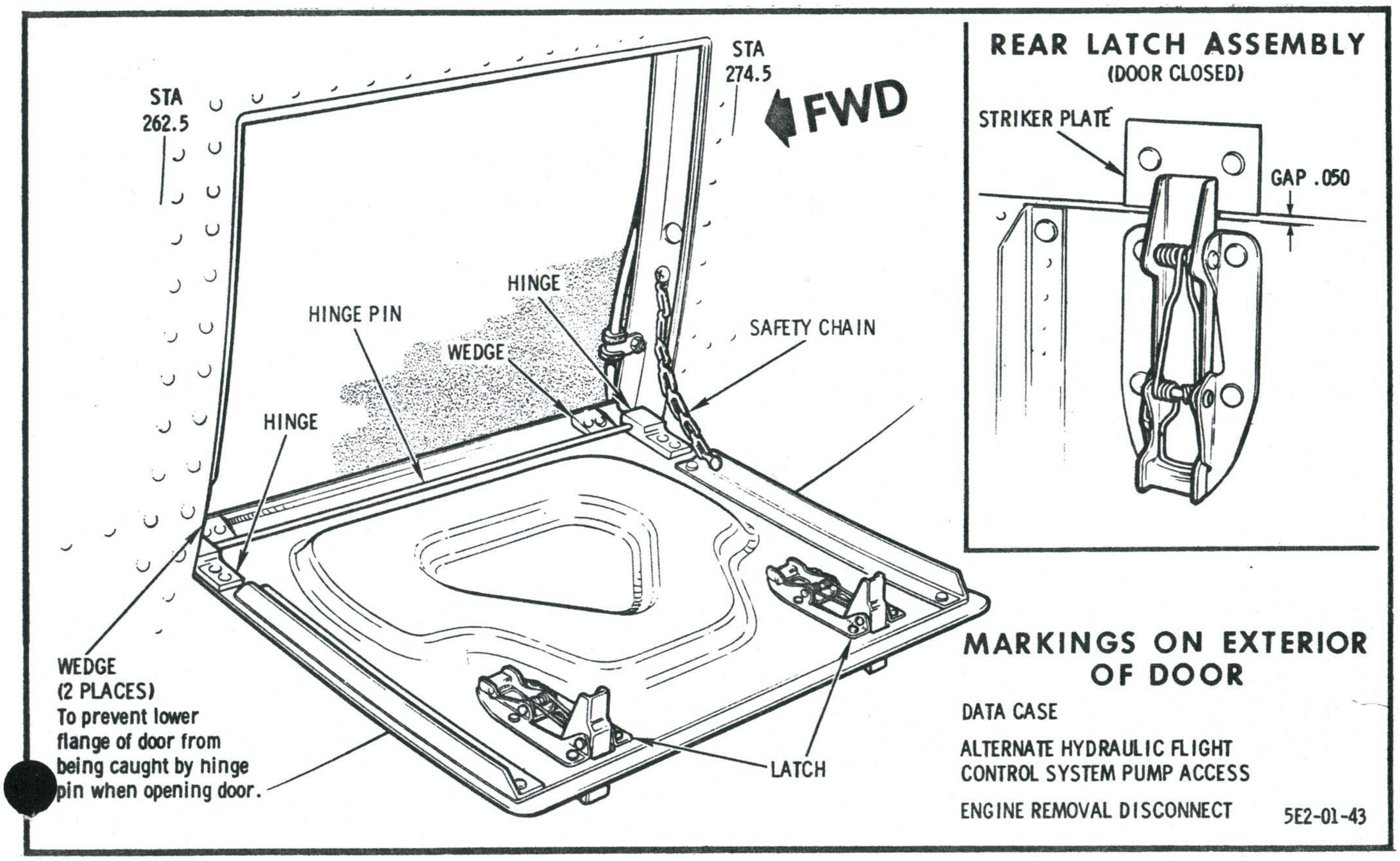


Figure 1-24A Fire Extinguisher Door Rigging Procedure

EXTERNAL MARKINGS

GENERAL

45 External markings and instructions (see Figure 1-24) should be kept in a clear, legible and up-to-date condition.

STORAGE

GENERAL

46 For storage instructions, refer to EO 05-5E-9.

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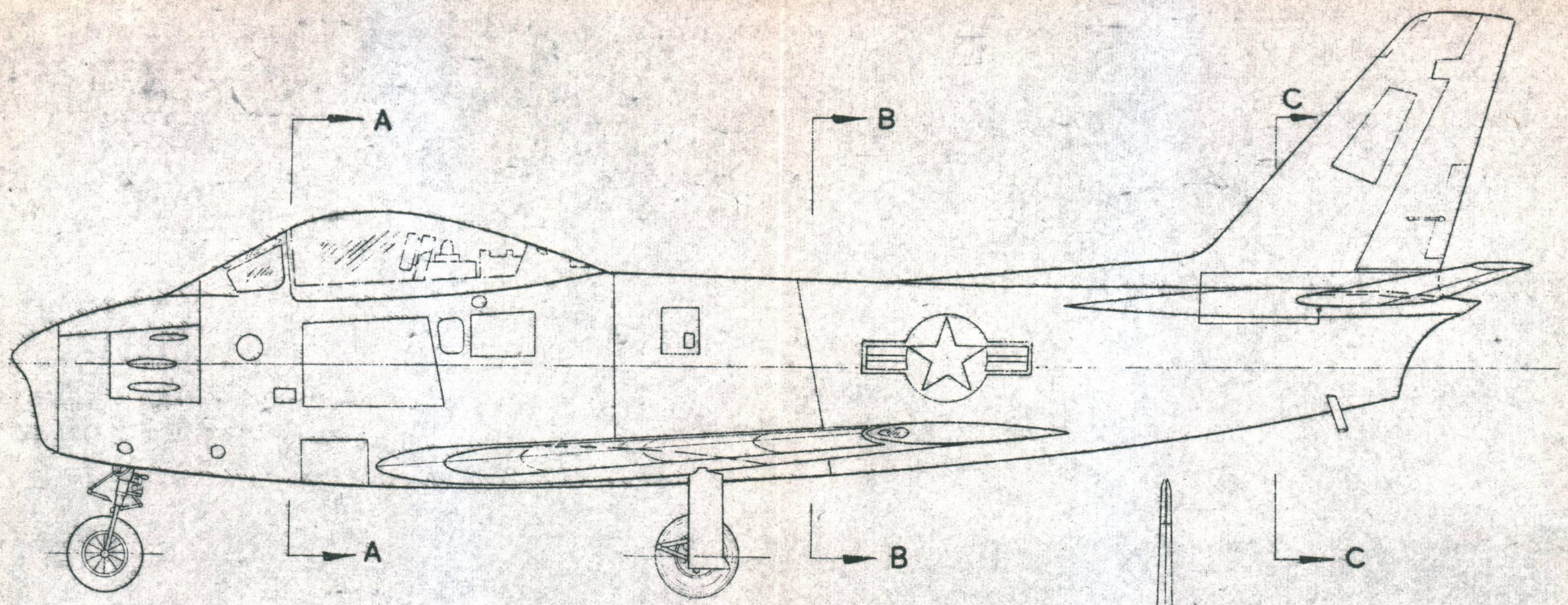
IF UNDELIVERABLE RETURN TO

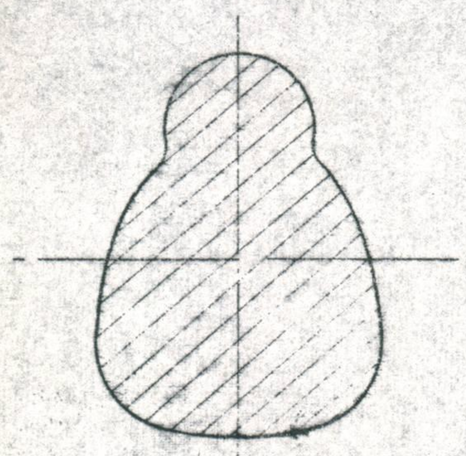
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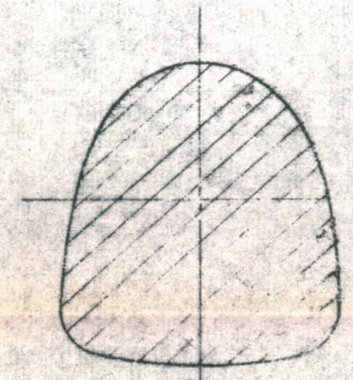
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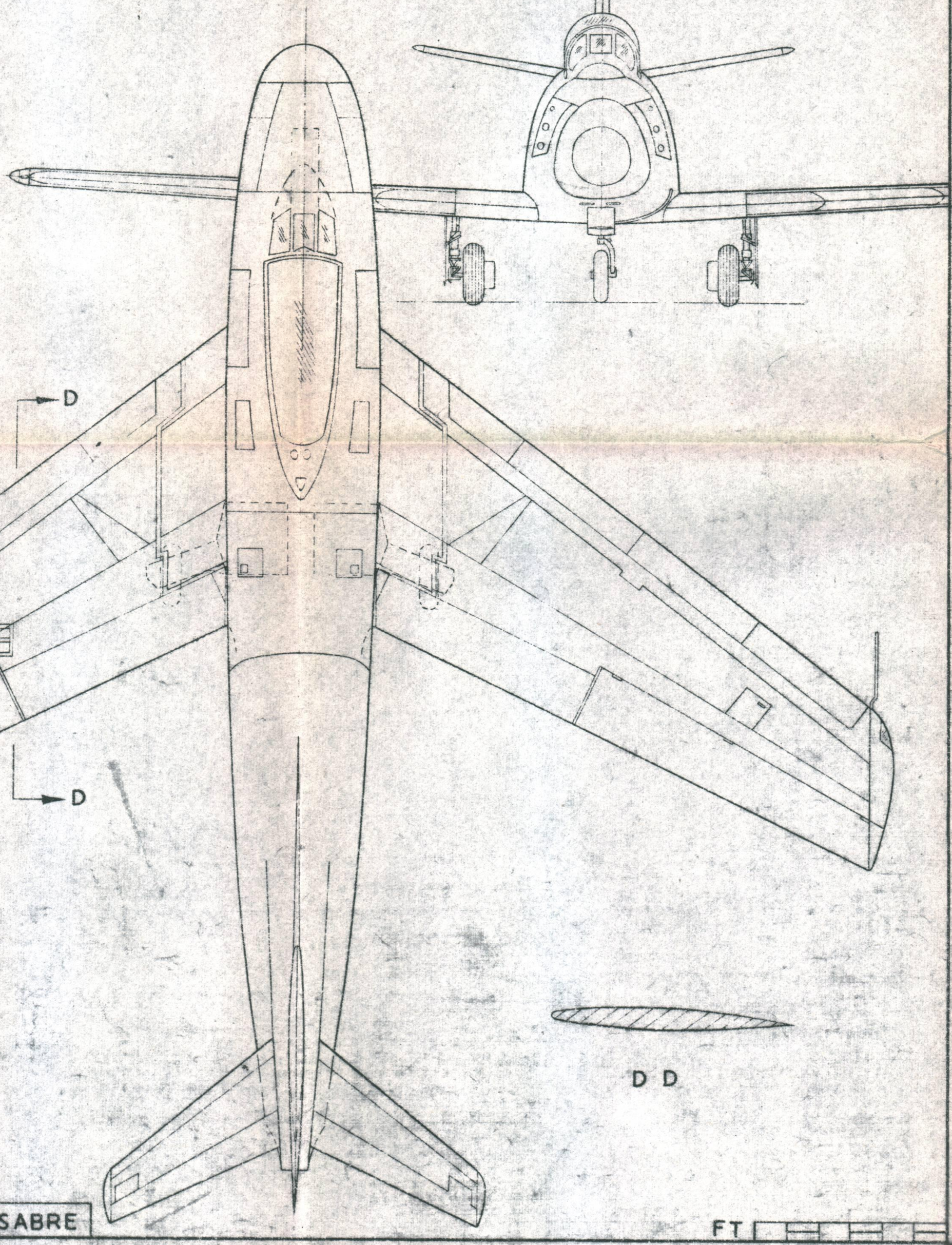
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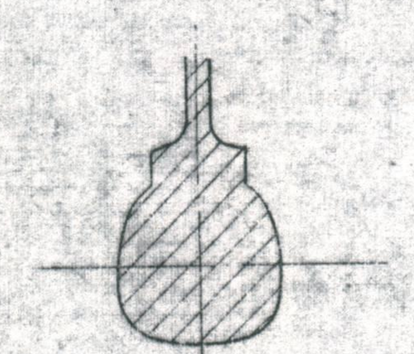
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NORTH AMERICAN F-86E SABRE

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