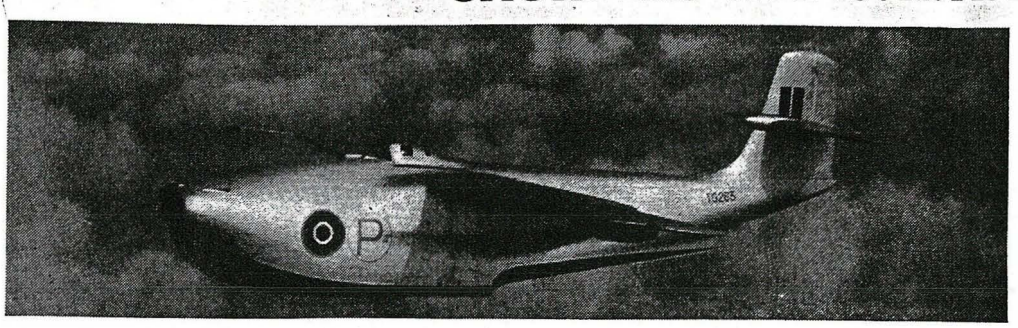
SAUNDERS-ROE S.R.A.1



Single-seat water-based fighter

The Saunders-Roe S.R.A.1 was the world's first jet-powered flying boat. Of rather conventional and well-tested design, the A.1 was built to a specification calling for a twin-jet single-seat water-based fighter. Although not placed in quantity production, this pioneer of high-speed flying boats helped solve several problems that were the main barriers in building water-based jet aircraft that could provide competition to their land-based counterparts. Considerable knowledge was gained for further development of water-based fighter aircraft.

The first prototype S.R.A.1 flew for the first time on July 16, 1947. Its two turbojets were fed via a common nose air intake and exhausted behind and under the wings. It was provided with two retractable underwing floats to increase water stability. Altogether three Saunders-Roe A.1 flying-boat fighters were completed, all powered by versions of the same Metropolitan Vickers Beryl turbojets. The first prototype had two 3250-lb. thrust Metrovick B.1 turbojet engines, while the second and the third machines had 3500 and 3850-lb thrust Metropolitan Vickers Beryl 2 turbojets, respectively. The normal fuel capacity of 425 Imp. gal. could be increased by the addition of jettisonable underwing fuel tanks.

Unsatisfactory performance of the Saunders-Roe A.1 was the main reason for the novel machine's not being placed in quantity production. Maximum speed of the third prototype was about 516 mph, and the initial climb rate only about 4000 ft. per minute. at a time when the majority of the Saro's land-based contemporaries approached the speed of sound (650-plus mph) and climbed at rate of six and seven thousands of feet per minute. Naturally, such "firsts" as the S.R.A.1 fighter flying boat, being revolutionary in concept, frequently cannot measure up to the standards set by the more conventional competitors, but this venture into the unknown was, nevertheless, far from a failure. Undoubtedly the Saro A.1 was invaluable to the development of the future designs of ultra-versatile interceptors and that of high-speed water-based aircraft in general. It laid the foundation and with it most of the "bugs" so frequently encountered in extremely radical types of aircraft could be detected, analyzed and eliminated. And the great value of water-based jet fighters is evident through the realization of the simple fact that approximately ⅔ of the earth's surface represents a landing field for this type of aircraft.

It is likely that a whole family of future fighters, based to a great extent on the A.1, and possessing all the versatility of a flying boat, will evolve to comprise a force equivalent to the aircraft carrier in striking power, but representing a much harder target to destroy. In view of the fact that the vulnerability in this atomic age of large naval vessels such as aircraft carriers has been lately subject to criticism and speculation in regard to the rationality of commissioning such massive and relatively unwieldy ships, it appears that at least a partial solution to this vital problem could be found in water-based interceptors. Mobile, dispersed over a large area, and, most important, unworthy of an atomic bomb, they can be refueled and even re-piloted from submarines and maintained by the use of mobile dry docks to form an aerially impenetrable, inexpensive defense barrier against enemy bombers.

Technical Data refers to the third A.1 prototype.

TECHNICAL DATA – Maximum speed: 516 mph. Range: App. 1000 miles. Ceiling: App. 40,000 ft. Weight: Loaded 16,255 lbs. Engines: Two 3850-lb. thrust Metropolitan Vickers Beryl 1 (M.V.B.2) turbojets. Armament: Four 20-mm. automatic cannon. Wingspan: 46 ft. Length: 50 ft. ■

AVRO CANADA C.102 JETLINER

The C.102 Jetliner possesses the unique distinction of being the first jet-powered transport aircraft to be built in North America, and the first civil jet to fly on that continent. Design work commenced soon after the second World War, in the summer of 1946, and two Rolls-Royce Avon turbojets were initially proposed for installation in this sophisticated design. However, as the Avon engines were not available at that time, four Derwents had to be installed, which necessitated some modification of the initial configuration. The Rolls-Royce Derwent turbines, which at the time of their installation in the C.102 possessed the longest overhaul life of any turbojet extant, were also in the ranks of the world's most powerful turbojet engines, and provided the C.102 with a normal cruising speed of 403 mph at 30,000 ft. This performance, outstanding at its time, was made by J. C. Floyd, Avro designer.

The C.102 was first flown on August 10, 1949, and carried a crew of two with seats for a maximum of 50 passengers. Basically a conventional airliner with straight wings and tail surfaces, the C.102 was nevertheless extremely advanced for its time, particularly as far as its powerplants were concerned. The four Derwent 5 turbojets were slung under the wings, in pairs, close to the center line of the aerodynamically clean fuselage with a stepped cabin windshield. The close proximity of the thrust lines and the fuselage center line would eliminate powerful asymmetric forces in case of a failure of one of the turbojets. The total fuel capacity of 2352 Imp. gals. (this was to be increased to 4000 Imp. gals. on production models) provided the Jetliner with capability to operate over stage-lengths of the order of 1100 miles. All fuel was carried in four integral tanks in the outer wing sections. The maximum climb rate at sea level was 2220 feet per minute.

Being the world's second jet commercial airliner (the British Comet had flown for the first time only 14 days before the Jetliner took off for its maiden flight), the C.102 was expected to be produced in limited quantities if political and military commitments, resulting from the Korean War, had not precluded further development. Although Avro Aircraft Ltd. has studied the possibilities of reviving the development of this early jet airliner and building an advanced version with increased fuel capacity, more powerful engines and improved performance, this machine's commercial potential has been definitely lost as a result of the time lag which rendered it obsolete.

However, be that as it may, the Jetliner has provided considerable service in the form of adding to the store of civil jet operational know-how, a knowledge as invaluable to the progress of aviation as is aerodynamics itself. In particular, the C.102's service as a high-altitude observation platform was of consequence in the development of several versions of the CF-100 all-weather fighter. Having completed a series of trials for research purposes, the Jetliner prototype was scrapped, so that there is no aircraft of this type flying today.

TECHNICAL DATA – Maximum speed: Cruising 458 mph. Range: Normal 1250 miles. Ceiling: App. 40,000 ft. Weight: Loaded 65,000 lbs. Engines: Four 3600-lb. thrust Rolls-Royce Derwent turbojets. Armament: None. Wingspan: 98 ft. 1 in. Length: 82 ft. 9 in. ■

Fifty-passenger airliner

USSR

TUPOLEV TU-104

Seventy-passenger airliner

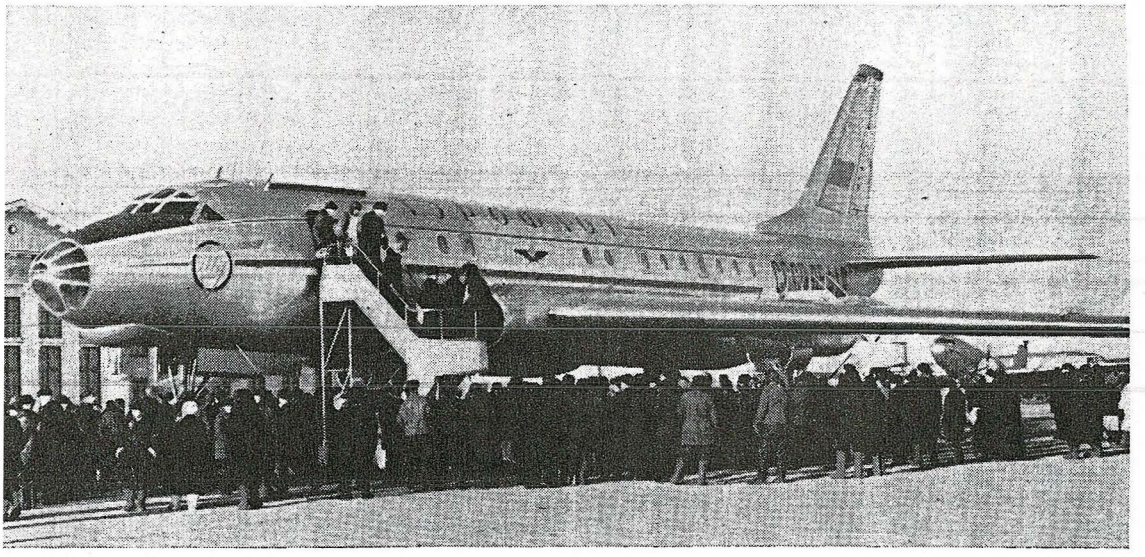
On March 22, 1956, the Tu-104 was revealed to the West in first prototype form when it brought General Serov to London. Apart from being Soviet Union's first jet-propelled commercial transport, it is the only Russian airliner to have appeared in the West since the second world war, besides the well-known Ilyushin-12 and -14 piston-engined aircraft. Several representatives of this new airliner type have subsequently visited various countries in Europe and Asia, and it is currently in service with Aeroflot, the government airline, over U.S.S.R.'s internal routes. Export is contemplated, the machine being a direct competitor to Great Britain's de Havilland Comet IV. Its appearance provides manifest evidence that in the field of commercial aviation the Soviet Union has made great strides.

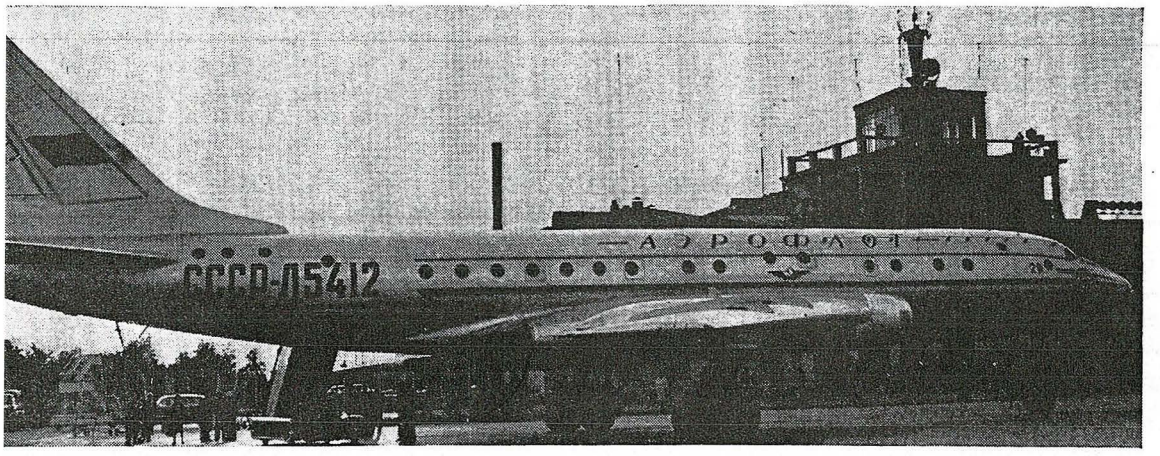
Basically, the Tu-104 is a civil version of the medium bomber known as the Badger in the Western nomenclature system, differing from its military progenitor principally in utilizing a different fuselage configuration – although the plastic visual bomb-aiming nose and the ventral radome have been retained – and wings attached in a low position, as opposed to the mid-mounted planform of the bomber. Both aircraft were made a reality by Andrei Tupolev, the most famous Russian aircraft designer and one of the pioneers of that country's aviation, specializing in bombers. He was awarded a Lenin prize in 1957.

Employing a generally conventional design planform, this first Soviet jet airliner accommodates 50 first-class and 70 tourist passengers in a fully pressurized cabin. Individual oxygen supply is provided for each seat. The crew comprises a pilot and a co-pilot, seated side-by-side, a navigator in the nose section, a radio operator facing to the rear behind the co-pilot, a flight engineer (without a panel) and a stewardess. The location of the entry door is at variance with the established Soviet tradition, it being located on the port side of the fuselage, as is the case with Western airliners, instead of the starboard. The wings, of a limited "crescent" variety, are swept back at 35 degrees at quarter-chord, with the two large engine nacelles mounted in close proximity to the fuselage, thus eliminating powerful asymmetric forces in case of a failure of one of the engines. The 104's turbojet powerplants are probably the most noteworthy features of this airliner. Exceptionally powerful, they provide the machine with similar characteristics, in terms of performance, to the British

Comet, which is propelled by four turbojet units. The M-209 turbojets of the Tu-104 are installed in the rear of the 40-ft. nacelles, the latter having been designed for the longer powerplants of the Badger bomber. All landing gear retracts rearwards, the nosewheel into the fuselage and main members into streamlined trailing-edge fairings.

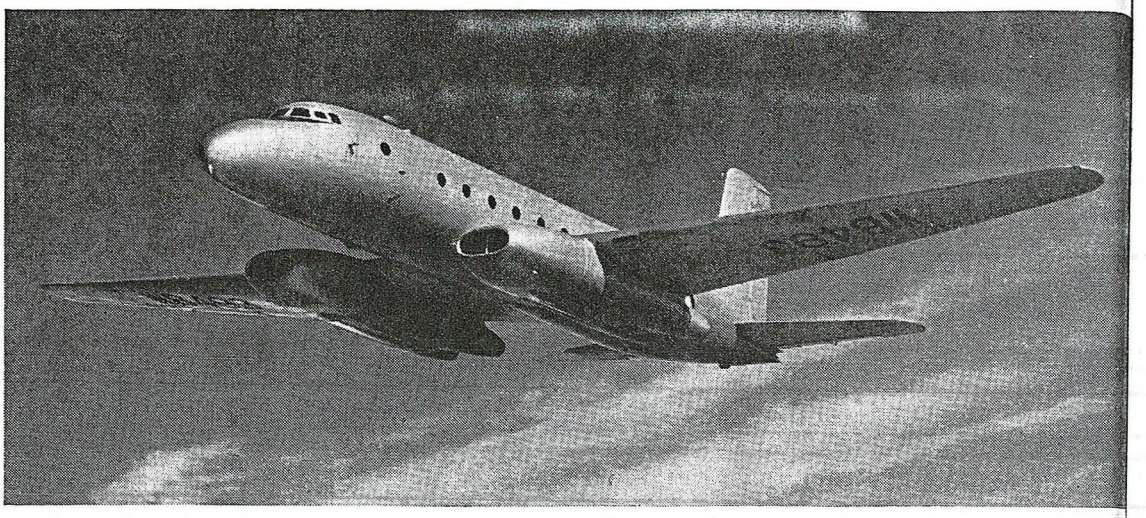
TECHNICAL DATA – Maximum speed: Cruising 497 mph. Range: Stage length 1990 miles. Ceiling: Operating altitude 33,000 ft. Weight: 156,000 lbs. Engines: Two 14,850-lb. thrust Mikulin M-209 turbojets. Armament: None. Wingspan: Approximately 120 ft. Length of aircraft: Approximately 125 feet.





GREAT BRITAIN

AVRO TYPE 711 ASHTON



Five-seat research aircraft

Remarkable because it is one of the very few multi-seat jet aircraft built expressly for research purposes, the Ashton series of low-wing monoplanes were manufactured for the British Ministry of Supply, the first one flying for the first time on September 1, 1950. The design of the Type 711 was adapted from the earlier propeller-driven Avro Tudor 2, and six Ashtons were built, each intended for high-altitude research of a separate matter. To man the extensive recording and testing equipment, a crew of five is carried

The following is a brief summing-up of the research duties carried out by each of the six Avro 711 Ashton aircraft that were completed: the Ashton WB490 (code marking) was employed in the field of jet engine research. It was fitted with a special auto-pilot installation and external wing fuel tanks. Refrigeration, pressurization, temperature control and humidification of an aircraft were studied in the Ashton bearing the marking WB491. It too is now converted to jet engine testing by the Napier Co. At the 1955 annual aircraft display at Farnborough in England, this machine appeared with a 13,000-lb. thrust Rolls Royce Company by-pass turbojet engine. Installed in a pod under the fuselage, this turbine is one of the latest to be flight-tested with the Ashton. The pod is offset by one foot to the port of the Ashton's centre line in order to provide clearance between the engine air intake and the crew escape chute. The Ashton WB492 is used for radar bombing research and has wing installations for either bomb nacelles or long-range fuel tanks. Earlier employed for research of brush wear at high altitudes, the WB493 has for some time been flight-testing the "re-heat" Olympus turbojet engine. The Ashton WB494 had a pressurized bombardier's compartment with a belly "pannier" for visual bombing research, while the Ashton code-marked WE670 was used for bomb ballistics research. It was recently transferred to testing of the R.A.14 turbojet for the Rolls-Royce to the vitally necessary occupation of turbojet engine testing.

Searching the depths of the complex fields of aircraft electronics and turbojet engines. which are rapidly becoming two of the most competitive areas in the world today, the Ashton series of large research planes have provided the British aircraft industry with much data acquired from the long hours they spent in the air, exploring every useful detail of the equipment they were loaded with.

TECHNICAL DATA – Maximum speed: 439 mph at 35,000 ft. Range: 1725 miles. Ceiling: App. 55,000 ft. Weight: Max. take-off: 72,000 lbs. Engines: Four 5000-lb. thrust Rolls-Royce Nene turbojets. Armament: None. Wingspan: 120 ft. Length: 89 ft. 6½ in. ■

NEWS ROUNDUP

National Soaring Champ

Gordon Oates, last year's winner of the Canadian National Soaring Contest, made it a repeat performance in 1958. It was the tenth annual renewal of the Canadian classic for sailplanes, and was again run at the Southern Ontario Soaring Association's Brantford airfield. Oates, an Avro Aircraft stress engineer, was flying his own British-built Skylark 3.

At the end of the two week competition held in August, the four top contenders were: Mario Overhoff, of Quebec, winner of the first week; Gordon Oates, winner of the second week; Charlie Yeates, and Jack Ames. Although the fly-off was scheduled as the best of three events, bad weather precluded more than one. According to a rule agreed upon previous to the fly-off, in event of bad weather the winner of those events flown would be declared champion.

On August 18, Gordon Oates missed becoming the first Canadian to achieve soaring's most coveted rating, the Diamond C, by 6 miles. A two-Diamond holder now, (it is necessary to attain Diamond qualification in three different task events), Oates landed some 306 miles away from his Brantford starting point. His third Diamond requirement is a free distance flight of 312 miles. While competing at the world gliding championships at Leszno, Poland, this year, he made a flight of 296 miles, only 16 miles short of the required distance.

Lifesavers

Lund Aviation (Canada) Ltd. has been appointed exclusive Canadian distributor of the Winslow Self-Inflating Air-Sea Rescue Life Raft, described as being light, compact and inexpensive, and designed for use in aircraft or boats. The raft is made by The Winslow Co., Venice, Florida.

Canadian Fighters Sold

Nearly 100 ex-RCAF and RCN fighters have been sold by the Crown Assets Corp. to J. H. DeFuria and F. J. Ritts, of Dewitt, N.Y., for an undisclosed sum. The deal covered some 60 Mustangs and 40 Sea Furies which, in their time, were the fastest piston-driven fighters in the world.

The Mustangs were flown by RCAF Reserve fighter squadrons up until late 1956, while the Sea Furies came out of active service with the RCN about the same time.

Eventual destination of the fighters is a closely held secret, but speculation has it that some will be going to the Middle East, while others will wind up in South America.

New Whittaker Office

E. E. Whittaker, electronics manufacturers representative, Arnprior, Ont., has announced the opening of an office to serve central and western Ontario. The office will be under the management of J. F. Scammell, 12 Glenmorris Drive, Dundas, Ont. Mr. Scammell has spent several years with CGE on the Pinetree project, and latterly with Canadian Westinghouse.

A Legal Murder?

A Toronto aviation lawyer, A. R. Paterson, speaking at the Canadian Bar Association's recent annual convention posed the question: If someone committed a murder aboard a Canadian airliner over the high seas, could he be brought to justice by Canadian law, or could he escape the hangman's noose?

Since the Criminal Code of Canada does not apply to crimes committed in Canadian aircraft while they are crossing the oceans of the world, Mr. Paterson says: "I believe the killer would get off scot-free."

He proposed the resolution to the CBA's air law section: ". . . that the Criminal Code of Canada be extended to apply to Canadian planes while they are over the high seas, or territory that is not claimed by any other country; such as parts of the Antarctic."

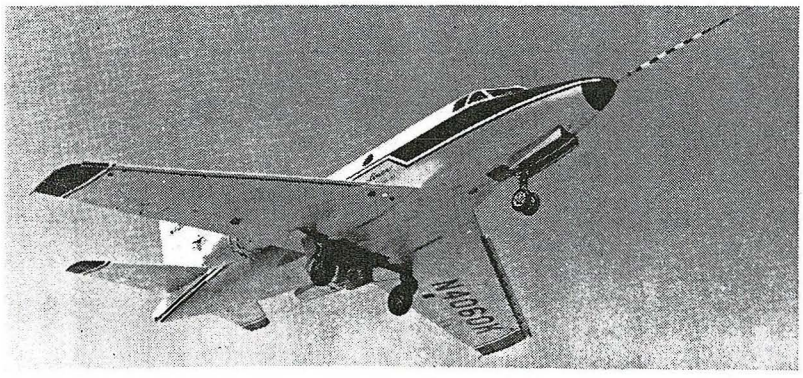
At the present time, Canadian laws apply only to Canadian aircraft when they are flying over land where Canada has sovereignty. Even a simple case of theft of a wallet could be a knotty legal problem for the authorities if it was stolen over the ocean. The speaker also suggested that aircraft captains be given the same powers of arrest as sea captains.

Lake Erie Survey Complete

Final maps were delivered recently for the first Shoran-controlled offshore airborne magnetometer survey to be made in Canada. The survey was made by Canadian Aero Service Ltd., on behalf of Canadian Kewanee Ltd., who are currently exploring for oil and gas beneath the waters of Lake Erie. The aerial survey was completed early in 1958 and covered an area of 1100 square miles.

Aircraft used for the survey was a DC-3 which operated out of Windsor. Two Volkswagon trucks specially equipped with Shoran gear and masts, functioned as ground Shoran stations. They were parked at exactly known positions; both Shoran stations transmitted and received pulses from the Shoran unit in the aircraft. Use of this Shoran equipment enables the aircraft's flight path to be determined to within plus or minus 50 feet.

The final maps were compiled to show contours of the earth's magnetic field, and have been interpreted by Canadian Aero's geophysical staff to indicate areas of structural interest



SABRELINER FIRST FLIGHT: New twin-jet utility trainer and transport, North American Sabreliner, is shown on its first flight, Sept. 16. Capable of carrying up to ten persons, Sabreliner has 15,330 lb. gross weight. Powered by two GE J-85 turbojets, the transport cruises at 500 mph at 45,000 ft., with cabin pressurized at 8000 ft. Length, 43 ft.; span, 42 ft.; height, 16 ft.

THE AIRBORNE SERVICES

RCAF Rocket Meet

The RCAF's first annual air-to-air rocket meet was held last month at Cold Lake, Alberta. Used in the contest were 2.75 inch rockets carried by the CF-100 interceptors, fired at "radops", small torpedo-shaped targets towed behind T-33 jet trainers.

Eighteen teams were competing, two from each squadron across Canada. Winner of the McBrian Trophy was Ottawa's 410 Squadron, whose team gathered in 11,191 points out of a possible 12,000. High individual aggregate score was put up by F/L Mo Aller and F/O Lorne Jokinen, who collected 5,628 points out of a possible 6,000. Behind 410 Squadron, came 414 Squadron from North Bay, and third was 425 Squadron, which is based at St. Hubert.

Each team was made up to 16 persons. They are pilots, radar observers, ground radar controllers, armament systems technicians, and maintenance personnel. The competition was designed to test the crews' understanding of the air defence system of interception, and their ability to work together as a team.

Crumlin to Close

RCAF Station London, an air observer school during the World War II, and a NATO training unit aircrew induction centre since 1950, will be closed up. However the Air Force has not set a definite date. It is possible that old Crumlin will close when the German NATO students complete their training here.

Since 1950, London has been the initial training site for airmen of the air forces of Canada's western allies. It has a unique language training unit which has enabled European airmen to learn basic English in a six-week period.

German NATO Trainees

The first group of 36 German student pilots arrived in Canada in mid-September for training with the RCAF. A new group of 36 students arrive every three weeks from West Germany, by next March the entire 360 students will be on their way through the NATO course.

The NATO training plan was to have ended early next year after having produced some 3,800 navigators and pilots for the U.K. and eight other North Atlantic Treaty countries since its inception in 1950. However it is being continued at the request of West Germany, Denmark, Norway and The Netherlands.

Meanwhile, Canadair Limited has completed and test flown the first dozen of an order for 225 Sabre 6's ordered by the West German republic. The airplanes are being readied for ocean shipment. These aircraft are in addition to the contribution of 75 Sabre 5's made by Canada to Germany under NATO Mutual Aid. So far, 15 former Luftwaffe pilots have come to Canada for refresher courses.

Bomarc for RCAF?

The RCAF is studying the possibility of using U.S.-built guided missiles under the newly-established integrated North American Air Defence System. USAF Maj.-Gen. Harvey T. Alness, deputy chief of staff for plans and operations of NORAD, told reporters recently that plans have been presented to the Canadian and U.S. governments for setting up bases in North America of the Bomarc IM-99. This is the first unmanned interceptor designed for operational use in the continent's air defence.

RCAF - USAF Interchange

Two Ottawa-based CF-100 interceptor squadrons have recently shared a six-week work-out with American all-weather squadrons at Ernest Harmon AFB, Newfoundland. This is regarded as evidence of growing Canada-U.S. air defence co-operation, following the setting-up of NORAD which saw the RCAF's Air Marshal Roy Slemon transferred to Colorado Springs.

While at Harmon, the Canadian squadrons were engaged in rocket fir-

LOCKHEED JETSTAR: Seen above on the ramp, and below in flight for the first time, the Lockheed JetStar presents a study in speed. The 500-550 mph, 10-passenger utility jet transport is at Edwards AFB for flight tests. Pods on rear fuselage contain Bristol Orpheus engines, with take-off thrust totalling 10,000 lbs. The JetStar's 53-foot wing has a 34-degree sweep back on the leading edge.

THE INDUSTRY

CF-100 Mk. 6 Scrubbed

Production plans for the Mk. 6 version of the CF-100 have been cancelled by the Government. Indications are that the cancellation may be traced to the unavailability of the weapon which was to be the Mk. 6's *raison d'être* — the Sparrow 2 air-to-air guided missile — plus the new Conservative Government's desire to economize.

To help ease the effects of the cancellation of the Mk. 6 contract, a further order for additional Mk. 5's is being placed with Avro Aircraft.

The decision to manufacture the Sparrow 2 in Canada as a weapon for the CF-100 and possibly the CF-105 Arrow, was made early in 1956. However because of licensing delays and a hold-up in the final selection of a guidance system for the Sparrow, the missile still has not reached the production stage. It is considered extremely unlikely that operational Sparrows will be available in less than 18 months from now.

The CF-100/6 has essentially the same airframe as the CF-100/5, but is fitted out as a guided missile carrier. A further important point of difference is in the powerplants, which in the case of the Mk. 6 are fitted with short afterburners, and are known as Orenda 11R's (Orenda 11's are also used in the Mk. 5, but, not having reheat, the designation does not have the suffix "R").

The 11R, with afterburner in operation, is rated at 9,000 lb. th. for take-off, compared to 7,500 lb. for the Orenda 11.

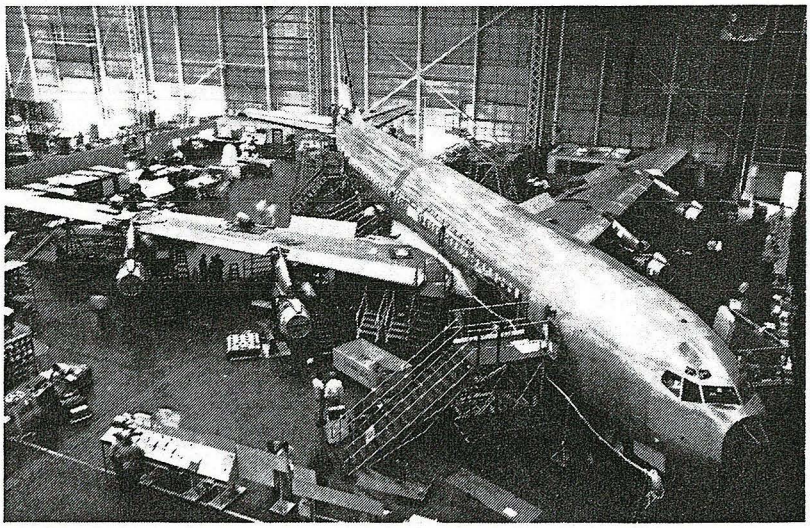
"Wright" Iroquois

An agreement has been signed between Orenda Engines Ltd. and Curtiss-Wright Corp. covering rights for the manufacture, sale and further development of Orenda's new Iroquois supersonic turbojet in the United States.

Announcement of the deal was made jointly Sept. 30 by Crawford Gordon, Jr., president of A. V. Roe Canada Ltd. and chairman of the board of Orenda Engines, and Roy T. Hurley, chairman and president of Curtiss-Wright. The agreement which runs for seven years, also provides for the exchange of technical information between the two companies.

Orenda President W. R. McLachlan said that the agreement, reached after many months of discussion, is the first of its kind ever concluded by a Canadian aero engine or aircraft company. Initially, it covers the present Iroquois — widely regarded as an outstanding engine because of its mechanical simplicity, low weight and high thrust.

In addition, it is anticipated that the two companies will collaborate in the development of further variants of the Iroquois, "suitable for the very high speed, high altitude interceptors and bombers now on the drawing board, and for commercial applications."



BOEING STRATOLINER NEARS COMPLETION: Engines in place and tail surfaces installed, the first of 151 Stratoliners now on order by 13 airlines nears completion in the Boeing plant at Renton, Wash. The first two Stratoliners will be rolled out of the factory late this year, and will be delivered to PAA late in 1958.

DH Props for CL-44

De Havilland Propellers Ltd. has been awarded a multi-million dollar contract to supply propeller equipment for the Canadair CL-44, as ordered for transport service with the RCAF.

The de Havilland constant-speed, feathering and reversing propeller for the RCAF's CL-44's is 16 feet in diameter and has four solid aluminum-alloy blades. These blades are of wide chord to absorb the high power developed by the Orion engines. The propeller operates on the hydromatic principle, using hydraulic pressure to actuate the pitch-change mechanism.

New safety features comprise an automatic drag-limiting control and mechanical pitch-lock. The drag-limiting system limits the propeller pitch in event of an engine failure. It operates on receipt of a mechanical signal from the engine reduction gear, and by automatically coarsening the pitch of the propeller, prevents the torque in the engine shaft from falling below a preset value. Thus propeller drag is maintained at an acceptable level.

The mechanical pitch-lock operates automatically in response to either loss of propeller control oil pressure, or to propeller overspeed. By mechanically checking uncontrolled movement of the blades towards fine pitch, the lock prevents serious overspeeding or high windmilling drag that would otherwise occur.

Automatic synchrophasing, which will ensure that corresponding blades of all four propellers on the CL-44 are kept in a pre-set angular relationship to one another, will maintain noise and vibration within the cabin of the aircraft at the lowest possible level.

Collins for TCA

TCA has placed a new and additional order totalling over $500,000 for 33 Collins automatic pilot systems for installation on new Viscounts.

Eighteen other Collins AP-101 Automatic Pilot Systems were recently installed on Viscounts by TCA. Delivery of the additional 33 will begin in December and will be completed by March, 1958. The AP-101 includes the

FIRST DOUGLAS DC-8: Photo shows the first DC-8 at the mid-point of the final assembly line, the aircraft being rolled out only to be turned around for the last half of the assembly process. Yet to be installed are the wing leading and trailing edges; fin and rudder completed; engine pods installed, and basic furnishings completed. Production model deliveries are scheduled for May, 1959.

healthy increase, rising 401 from 2,145 to 2,546. Other categories were as follows (with 1956 totals in parentheses): Senior commercial, 422 (380); airline transport, 946 (831); glider, 278 (246).

Other types of personnel licences: air navigator, 98 (77); air traffic controllers, 530 (416); flight engineers, 38 (33); aircraft maintenance engineers, 1,875 (1,747).

The number of licenced airports also continued on the upgrade, with 547 being registered at the end of September, 1957 as compared to 519 a year previous.

Photo Aid for ATC

The difficulties of permanently recording and projecting information presented on a cathode ray tube have been solved by a rapid processing photographic projector produced by the U.K.'s Kelvin & Hughes Ltd.

Designed initially in conjunction with the Ministry of Supply, the equipment is now being sold in quantity to the U.S. There it is being used to investigate and to help solve some Air Traffic Control radar problems, to record data from high speed computers, and is also employed in several other capacities for recording cathode ray tube information.

Three of the projectors have been installed by the CAA at its Technical Development Centre, Indianapolis. There the equipment is projecting air traffic information from cathode ray tubes fed by two radar systems geographically spaced 50 miles apart. A photographic record is made of the tube face, this then is developed by the equipment and projected onto a large screen. The processing cycle can take as little as 6 seconds and the film can then be kept indefinitely.

High Temp Grease

The development of a new class of greases for high temperature, high speed application in missiles and supersonic airplanes, has been announced by Shell Oil Co. of Canada Ltd.

The new lubricants, called Shell ETR (extreme temperature range) Greases, withstand temperatures up to 600°F and protect metal parts running at speeds up to 30,000 rpm. The lubricants contain an organic vat dye that serves as a thickener to improve heat stability and gelling efficiency.

Shell said company scientists began research on high temperature lubrication some years ago, when it became apparent that the highest quality soap base and petroleum oil greases would be inadequate for the operating conditions met in extremely high speed flight.

The new lubricant class includes two members: ETR Grease B, and Grease D. Canadian enquiries regarding the new lubricant should be directed to the Shell Oil Co. of Canada Ltd.

New USAF Bomber

The United States' most advanced intercontinental bomber, being developed by North American Aviation, has been designated the B-70. The aircraft is the project formerly known as WS-110A and will be capable of speeds in excess of 2,000 mph at altitudes above 70,000 feet.

Under the Weapon System Manager concept, the Los Angeles aircraft firm is responsible for the development of the entire system required to put a bomb on the target. After an intensive two-year-design competition, it was announced last December that North American had won the contract upon the unanimous recommendation of the USAF's Strategic Air Command, Air Materiel Command, and Air Research & Development Command.

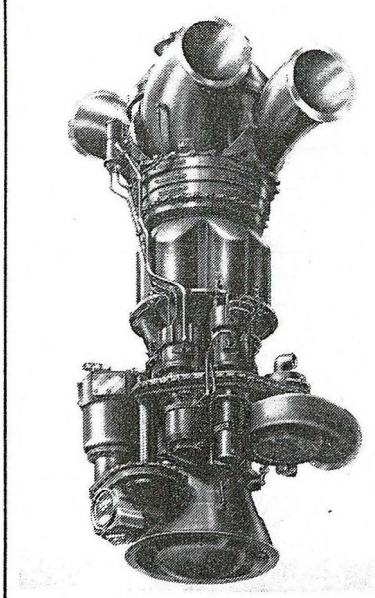
New Flying Club

The Schefferville Flying Club, Schefferville, P.Q., a member of the RCFCA, has been recently organized. Holding a Class 6 license, the club is operating with one Aeronca Champ, one Cessna 140, one Fleet 80, and one Seabee. Secretary of the new club is Jean Blouin, P. Eng.

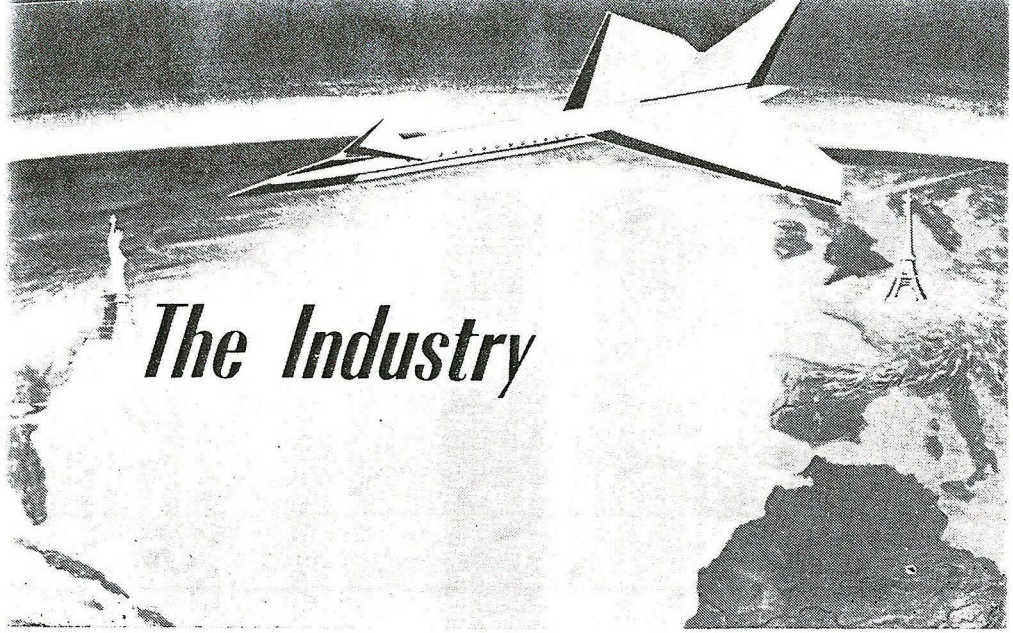
Radar Rescue

The DoT's new Decca MR-75 Short Range Surveillance Radar installation at Toronto's Malton Airport proved its worth as an aid to aircraft operations when it recently was the means of directing a USAF aircraft to a safe landing after fire broke out in flight.

The aircraft, a transport carrying Major-General D. F. Callaghan of the U.S. Army to Ottawa, had passed



NAPIER GAZELLE JUNIOR: New free turbine engine by D. Napier & Sons, available both for helicopter application and as a propeller turbine. Initiall rating is 920 shp, but this will be increased to 1,070 shp during development.



The Industry

CHEMICALLY FUELED Mach 3 jet airliner envisaged by Lockheed would be able to cross Canada in 80 minutes, enable Londoners to breakfast at home, do business in Vancouver same morning, return home for dinner.

Avrocar Prototype Completed

After six years of interesting though unconfirmable rumors, Avro Aircraft's famous "saucer" is reportedly ready for first tie-down tests at the Malton, Ontario plant. Recently the Space Committee of the U.S. House of Representatives was given a briefing on the highly-secret Avrocar, which has been financed since 1955 by the U.S. Department of Defense. To date, this program is said to have cost the American government some $5.5 million.

The Avrocar's performance is unknown, but reputed to lie within the 300 mph top speed, 1000 mile range bracket. The second prototype is expected to be ready for flight testing in the full-scale wind tunnel facility at the NASA's Ames Research Centre.

New Canadian Rotorcraft

Plans to produce a unique rotating wing two-place aircraft, the Avian 2/180 Gyroplane, have been announced by Avian Industries Ltd., Georgetown, Ont., a new company that was formed by a group of ex-Avro engineers immediately after the cancellation of the Arrow program and the subsequent mass lay-offs.

The Gyroplane, essentially an autogyro but with the added feature of a VTOL capability, employs ducted fan propulsion. Powerplant is a 180 hp Lycoming.

First flight is scheduled for the end of September of this year.

Rotor tip-jets utilizing stored compressed air are used for take-off and landing, thus briefly converting the autogyro into a helicopter during the take-off and landing phases. Vertical take-off to a height of 200 ft. is possible.

The compressed air is continuously stored in a fibreglass bottle at a rate of 5 bhp. during cruising flight and is released at a rate of 250 bhp. through the tip-jets for take-off and landing.

Avian Industries describes the Gyroplane as a personal aircraft which possesses the performance and operating costs of a conventional light plane. The handling characteristics are the same as for a conventional fixed wing aircraft and no special rotary wing training is required to fly the new machine. Flight characteristics differ in that it cannot be stalled and that gust response is around one tenth that of a fixed wing aircraft, "making for unparalleled smoothness of flight at low altitudes".

The Gyroplane has a design maximum cruising speed of 150 mph., minimum flying speed of 0 mph. (vertical descent), and a maximum rate of climb of 1500 fpm. Other leading particulars: all-up weight, 1600 lb.; empty weight, 1000 lb.; normal fuel capacity, 26 Imp. gal.; normal still air range, 450 mi.; rotor diameter, 26 ft.; overall length, 14.6 ft.; width in cockpit, 35 in.

Initial cost, given by Avian with tongue in cheek, will be about $8000 ex factory, to which must be added sales tax and distributors profit, handling and service charges, all of which are expected to bring the customer's price up to at least $10,000.

Operating costs, on the basis of 300 hours logged per year, are estimated at 8.76 cents per aircraft mile and 4.38 cents per seat mile; 500 hrs., 6.81 cents per aircraft mile and 3.41 cents per seat mile; 700 hours, 5.96 cents per aircraft mile and 2.98 cents per seat mile.

Avian Industries is headed by Peter Payne, president, who, while with Avro Aircraft, initiated a new rotating wing project that because of its commercial promise was financed by the company for the 18 months prior to last Feb. 20, with some 60 engineers being engaged on its prior to the lay-off.

Other company officers include E. Howard Smith, vice pres.; G. C. Hewson, treas.; W. H. Carr, secretary; G. B. Sampson, H. Bairstow and J. Malcolm, directors.

The company is pushing for a small Army order, pointing out that no Government subsidy is being sought, as the enterprise is prepared to stand on its own feet. The announcement of the new Avian project concludes by explaining that the company "is seeking a small fixed-cost Army order because the need for such an aircraft apparently exists and Avian believes that no one else can fill this need at the present time."

Canadair On Time... Again

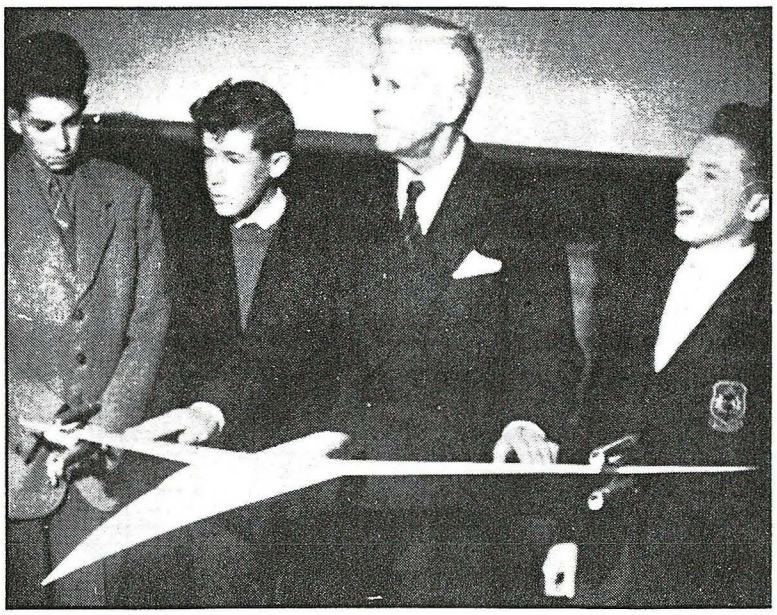
Canadair began on-schedule deliveries of Bomarc components to Boeing Airplane Co. of Seattle, on May 6. Since that time, delivery has been made of several more sets of wings and ailerons for the ground/air missiles, the first items to be produced under the new defence production sharing arrangements between the two countries.

At the time the contract between Canadair Ltd. and Boeing was announced in Washington Feb. 23, it was interpreted as a test of Canadian production facilities, even though the money value ($1.7 million) was small.

In the intervening ten weeks between signing of the contract and start of deliveries, an accelerated production program was carried out at Canadair in order to meet the exacting delivery schedule. In that time, shipments of tools from Seattle had to be installed

The Wallis Supersonic Long-Range Formula

By JAMES HAY STEVENS, AFRAeS



Above, Dr. Wallis is shown explaining the Swallow, with wings in subsonic position, to some of his audience; below, supersonic configuration.

FIRST INFORMATION about the Vickers-Armstrongs "Swallow" family of supersonic airplane projects was given at an Institution of Civil Engineers lecture (to children!) by Dr. Barnes Nevil Wallis, entitled "High Speed Communications Link the British Commonwealth". The outstanding feature was that the best route from the British Isles to Australia and New Zealand is by the North Pole — for ships as well as aircraft.

The explanation of the former lies in his belief in his experiments with laminar-flow water bodies suitable for freighter submarines 30 ft. in diameter and travelling at 30 kts. This hull form is an elongated ovoid (travelling slim end first) in which laminar flow is achieved by designing the form to give a smooth pressure gradient. Dr. Wallis advocated a similar route to the Pacific for his supersonic airliner, which means a range of 10,000 n.m.! Having made this startling proposition, Dr. Wallis with films and slides outlined the principles and a little of the development of his supersonic "polymorph", i.e., variable-geometry airplane.

First Steps: Development started during the War, when a laminar-flow body with variable-sweep wings and no tail, other than a swept fin, was designed. This, called the "Wild Goose" was successfully flown as a 30 ft. span radio-controlled model launched at 100 mph from a truck on a 400 yard track. A film showed that it was under satisfactory control, about three axes, simply by co-ordinated, or differential movement of the wings fore-and-aft in one plane to modify the forces of equilibrium. A film of the "Swallow" model, also about 30 ft. span, was shown. This model had a wedge-delta fuselage and its wings were fixed in the forward, high-aspect ratio, position. It took off under its own power, two rockets in the tail, and was controlled by elevons, powerplant nacelle side area being represented by endplate fins. The film showed a high (delta) take-off incidence, due to the 80° sweep of the forebody, the lift from which is essential for stability at all times. Flight was reasonably steady and the level-flight incidence was normal. The model was lost in the English Channel on its first flight through a radio-piloting error. Rocket-boosted models of the supersonic configuration have also been successfully fired, but the Ministry of Aviation would not allow films of these to be shown.

After withdrawing finance from the project in May 1957, the British Government is again supporting it in association with America's NASA and funds are now adequate for the continuance of basic research. Additionally, the Ministry of Aviation has placed a design contract with Vickers-Armstrongs (Aircraft) for a naval "Swallow" which would be developed under the direction of Sir George Edwards. This airplane, which could patrol subsonically for many hours with its wings forward and attack supersonically as they swept back, would weigh about 50,000 lb. and might be powered by Bristol Orpheus turbojets.

For the "Swallow" (the aerodynamic) philosophy was: *"All* wetted surfaces produce drag, therefore flatten the fuselage and cut out the tail." Furthermore, he cuts out the backside of the delta, which contributes little lift and large separation drag in supersonic flight.

First Impression: The first thing that strikes one is that, in the definitive supersonic form, it is a strictly homogeneous envelope: a sharp delta with all surfaces lying behind the high-pressure air of the Mach cone. The delta body/wing blends smoothly with the high aspect ratio "swallowtails"; from the markedly cambered nose of the former to the washed-out tips of the latter. Although the nose itself is sharp, the leading edges are radiused throughout — remarkably so along the sides of the forebody. The basic cross-section of the forebody is a flattened elipse, out of which grow the slender wings and a cylindrical, ogivally tapered, central tail which increases cabin

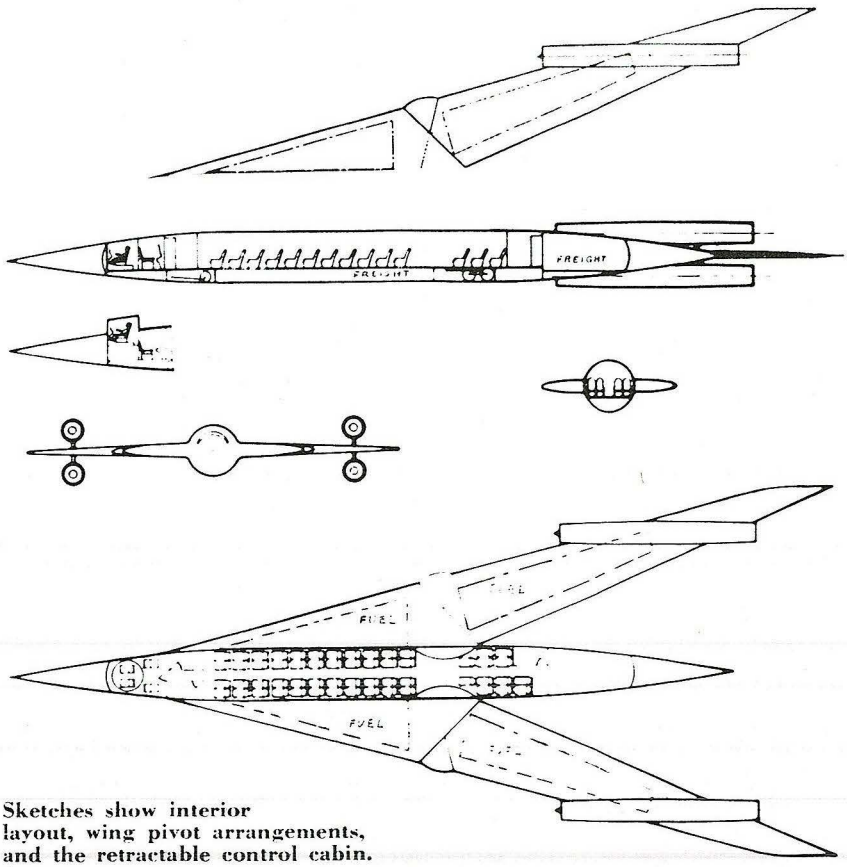
capacity and probably provides a tail-wheel support and stowage. A retractable cockpit is needed to prevent the pilots from being cooked after several hours at Mach 3 and to provide landing and take-off view. Running fore-and-aft along the top of the wing are two large strakes, much at variance with the general smoothness of the whole aircraft. It may be recalled that windtunnel tests on narrow deltas have shown the development of twin separation vortices at high incidence.* Strakes such as those on the model could well be fences to prevent the spread of these vortices at the necessarily high take-off and landing incidence — they would also be in about the right place for undercarriage fairings.

The reason why a "swallowtail" delta had not been tried before was that it would require a twenty foot high undercarriage because of the wingtips. After the earlier Wallis variable-sweep experiments the solution was obvious: simply swing the swallowtails forward some 70° to make them into high-aspect ratio wings for low speed. Figures of 130 ft. span spread (with similar overall length swept) and 40 lb./sq. ft. wing loading were given (in the lecture) for the 100,000 lb. airliner; therefore the wing area, the *entire* aircraft, is 100,000÷40=2,500 sq. ft. and the aspect ratio at low speed would be 6.8 — though there would be considerable gain, one would think, in induced drag from the swallowtails of which the aspect ratio must be about 15. A take-off in a few hundred yards at 100 mph was mentioned, which implies high acceleration as well — assisted, one would imagine, since take-off thrust/weight ratio is not all that high.

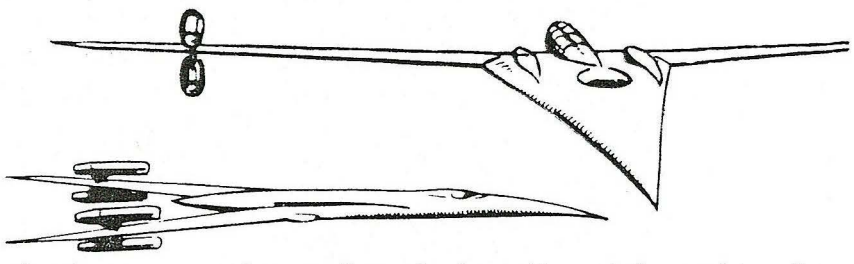
Greatest Problem: With variable sweepback, the greatest problem is to maintain correct c.g./c.p. relationship as the entire lift and stability pattern changes with the movement of the wings. Drawings show that the wings contain fuel from root to nacelle — the sides of the delta also have long tanks in them. The c.p. moves aft with the wings and, as there is no tail or fore plane for trim, longitudinal stability will have to be supplied by appropriate adjustment of longitudinal dihedral between the wing/body and the "swallowtails". Apparently, the engines near the wingtips are the major factor in bringing the c.g. aft in sympathy.

The high aspect ratio of the swallowtails makes them look thin, whereas they are actually about 15% thick *structurally*, when swept to 80° this is reduced to less than 5% *aerodynamically*. The aerofoil section of the swallowtails is bi-convex and of laminar-flow form; it is neither sharp-edged nor symmetrical and the incidence washes out markedly. The tips are cut away to be in the line of flight when fully swept. One would expect a reduction of incidence, relative to the body, as the wings move forward.

Because variable sweepback necessitates the engine nacelles swivelling through 70°, they might as well be universally mounted and power operated to act as elevators, ailerons and rudders. They also provide some vertical fin area — the acute delta would be highly stable at supersonic speed, while slight toe-in of the widely-spaced thrust lines could compensate for the shortage of fin area at low speed. Once the engines are universally mounted, there are many possibilities, of which coupling to autostabilizers for trim and offsetting for asymmetric flight (automatically upon power failure at take-off) are immediately obvious. It is important to realise that the control use of the nacelles is *aerodynamic*, any thrust-deflection effect is purely coincidental — except possibly in the dead engine cases. The mechanics of the universal mounting, which must be held rigid against feedback or flutter, and the actuating mechanism must have required as much ingenuity as the wing joint. The need to move the nacelles in pitch



Sketches show interior layout, wing pivot arrangements, and the retractable control cabin.



As wings move, engine nacelles maintain position relative to datum line.

*Aeronautical Research Committee Current Paper 387 "High Reynolds Number Tests on a 70° L.E. Sweepback Delta (HP 100)", (Her Majesty's Stationery Off., price 3s. 6d. equiv.)

necessitates triangulated mounting pylons with their apices adjacent to the surface. The nacelles project well ahead of their pylons so that the engines mass balance the wings, as well as their own mountings, against flutter. In side elevation the paired nacelles are reminiscent of Busemann's supersonic biplane, so that there may well be favourable shockwave interaction.

Wing Joint: Two hints have been given by Dr. Wallis about the wing joint, the key to the project. Dr. Wallis has likened it to the human hip joint and in his lecture he said it is "something like that used for training a gun". This suggests that, instead of having a hinge at the very root of the wing, a fulcrum and lever have been evolved by Dr. Wallis' genius. The "hip joint" could be the fulcrum or trunnion, with an inboard extension of the wing spar and an arcuate rack-and-pinion representing the "gun mechanism". Such a device would have the immense advantage of giving relief in bending, since the traditional bogey of the encastré wingroot has been sidestepped — it would be analogous to the ball joint at the base of a tall radio mast. To be effective, bearing loads have to be reduced to a low value (as in the pin joints of idealized structures) another key secret.

Dr. Wallis is known to have worked out some most unusual solution to the heat problem of flying for many hours at Mach 3. In this connection he mentioned that he considered the limit for sustained atmospheric flight would be M4.57, since "the equilibrium temperature of 300°C. was too high even for steel", and the practical speed would be M2.5-3.0, equilibrium temperature about 150°C.

Flight control of the "Swallow" would be by conventional control column and rudder pedals. Nothing has been divulged about the wing sweep control, but since it is a function of acceleration and speed it is psychologically linked with the throttle, so far as the pilot is concerned, although it would obviously be related to some form of automatic control through a Machmeter. So long as increase of drag, when rapidly applied, is not accompanied by unpleasant compressibility effects, the reverse action is potentially the most powerful speed brake yet devised. Put another way, the speed of the "Swallow" will always lie below its Mcrit, which is related to the Mach angle of the bow shock, behind which the wings lie at all speeds. Acceleration must, therefore, be a co-ordinated effect of reduced wing wave drag (and frontal area) plus, perhaps, increase of thrust from the rising ram recovery. Once accelerated, power would be reduced to the remarkably low values needed to maintain the design speed.

Calculations: Some simple sums based on figures given at the lecture add interest to the project.

(Continued on page 55)

CF-104: VARIATIONS ON A THEME

A round-up of the points of difference and features of the CF-104, as compared to the Starfighter variant on which it is based, was recently released by Canadair Ltd.

The CF-104 strike-reconnaisance fighter being built for the RCAF is the Canadian version of the F-104G, which has been adopted also by the air forces of West Germany, Belgium and Holland. The Canadair-built CF-104 is intended as a replacement for the Sabre 6's presently in service with Canada's eight day fighter squadrons in Europe.

Like earlier marks of the F-104, the Canadian version will be capable of Mach 2 flight. Major difference is in the beefed up structure to withstand the higher wing and airframe loadings that can be expected in its low-flying role. A number of new forgings are incorporated in the fuselage main frames, wing fittings and spars, fuselage longerons and joints, fuselage tail frames, tail unit spars and ribs.

The vertical tail surfaces have been enlarged by 25% and a fully-powered rudder has been added to give more precise control during attacks on ground targets. The horizontal stabilizer mechanism has been modified to give increased hinge-movement.

Maneuvering flaps have been added to provide an increase in the available load factor. This will reduce the turn radius by one third at an altitude of 5000 feet, a significant advantage for ground attack operations.

The drag chute diameter has been increased from 16 feet to 18 feet to reduce landing roll. To meet possible icing conditions during low high-speed flight, electrical de-icing elements are fitted to the air intakes.

Max range for specific bombing missions is allowed for by the provision for installing aluminum fuel tanks in the ammo, gun and shell case compartments of the fuselage. This installation is interchangeable with the gun and increases the internal fuel capacity by 120 gallons.

As with other late models of the Starfighter, the CF-104 has a conventional upward ejection seat instead of the downward system used in early models.

Other interesting features of the CF-104 include: anti-skid wheel brakes; provision for the pylon-mounting of Sidewinder missiles under the fuselage; a large-calibre rocket and other external armament stores under the wings along with extra fuel tanks.

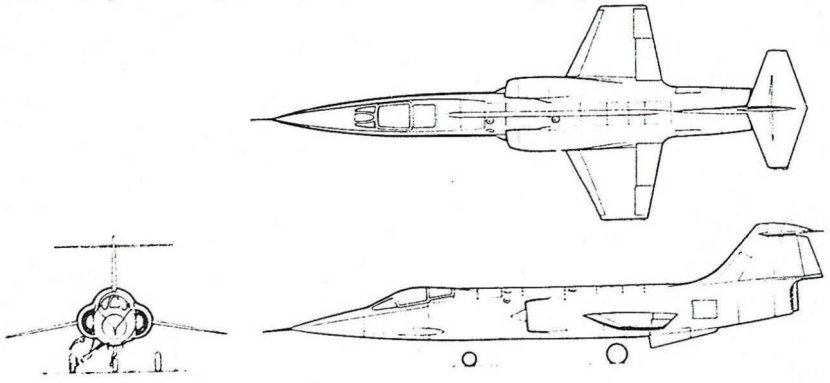
The CF-104 will be equipped with an autopilot complete with "stick steering". This will include modes for preselecting and holding altitude, speed, heading and a constant rate of turn.

It will be fitted with the multi-purpose NASARR radar system consisting of a radar set and fire-control computer; a bomb computer; an air data computer; and the PHI (position & homing indicator) developed by Computing Devices of Canada.

Other items: TACAN radio air navigation system; provision for a data link-time division set; and UHF radio.

Powerplant specified for the CF-104, and which will be produced by Orenda Engines Ltd., is the GE J79-7 rated at 15,000 lbs. thrust with afterburner in. Wing span is 21 feet 11 inches; sweepback at the quarter-chord line is 18.3°, and length of the slender fuselage is 54 feet 9 inches.

The first of 200 Canadair-built CF-104's will be delivered to the RCAF in the spring of 1961.



RADIO THEORY

(Continued from page 31)

that 121.9 megacycles has a wavelength of 2.4 meters and 500 kilocycles has a wave length of 600 meters. Commercial broadcasting stations in Canada have wave lengths that range from 540 to 200 meters.

The formula also indicates a very significant point. That is that the higher the frequency, the shorter the wave length. Consequently, since antennas must be matched to the frequencies being transmitted and received, the higher the frequency, the shorter the antenna required. Actual antenna length is a compromise involving a number of factors such as space available, cost of construction, frequencies to be used and the power being used. Exact antenna matching is usually automatically accomplished by the addition or subtraction of inductance (coils) or capacitance (condensors). Adding inductance in series to the antenna, electrically lengthens the antenna and adding capacitance in series electrically shortens the antenna.

In the next article, the frequency spectrum, frequency application, skip distance, skip zone and propogation will be discussed.

SUPERSONIC AIRLINER

(Continued from page 18)

The 50,000 lb. gross weight naval project may have four Bristol Siddeley Orpheus, say 5000 lb. thrust each at sea level, a quarter of that at 60,000 ft. or so — the likely height for supersonic cruising. The 10,000 n.m. airliner might be supposed to have a similar thrust/weight ratio. At 100,000 lb., this would mean a total cruising thrust of 10,000 lb. Thus, cruising L/D=100,000÷10,000=10.

Dr. Wallis said his BOAC "Swallow" airliner project would carry 50 or 60 passengers, say 15,000 lb. including baggage and crew: 100,000—15,000=85,000 lb.

Assuming 30% of the gross for structure: 100,000—30,000=70,000.

This leaves 55,000 lb., or about 7000 IG, for fuel and a reasonable assumption for the cruising sfc of a low pressure ratio supersonic engine is 1.0.

Thus, 55,000 lb. of fuel would last 5.5 hours, or almost 11,000 statute miles at Mach 3 (2000 mph) which seems near enough for an armchair "guesstimate", but rather tight on allowances for London-Melbourne.

However, let us suppose that this graceful aerodyne has an L/D of 12, the optimum value for supersonic range, and one gets this remarkable picture:

100,000÷12=8350 lb. thrust for cruising,
and 55,000÷8350=6.6 hours,
or 13,200 statute miles, i.e. 10,000 n.m. with 1,500 n.m. reserve, which fits logically into the route pattern.

Finally, it must be clearly understood that there is no Vickers Swallow, as such, there is a whole range of "paper airplanes" designed on a similar principle to meet different specifications. The officially-released airliner must be an early study before the full implications of the airflow and lift pattern of wedge-delta wings was understood. Today, aerodynamicists realize that the body and wing *must* be blended like the demonstration model. One would also guess that because of the need for blending there is a minimum practical size for this configuration — even with a prone pilot — since the cockpit must be extended and retracted.

NAE WIND TUNNEL

(Continued from page 13)

system and fine mesh wire smoothing screens installed in the settling chamber of the tunnel. The steady air flow leaves the settling chamber by a convergent fixed contraction and is further accelerated in passing through the supersonic nozzle. The shape of the air flow passage of the supersonic nozzle is provided by two 45 ft. long, 5 ft. wide, 0.86 in. thick, flexible steel plates, acting between parallel sidewalls. Each of these plates is positioned against accurately set mechanical stops by 22 hydraulic jacks. Various stop settings, giving a range of convergent-divergent nozzle shapes and test Mach number, are available.

Transonic Testing: For tests in the transonic range a special test section is inserted into the wind tunnel circuit between the supersonic nozzle and model support section. This transonic test section, which is 16½ ft. long, has perforated flow surfaces surrounded by a 12 ft. diameter plenum chamber. Models are supported from the base by a mounting sting which is attached to a vertical strut. Housed within the model support system are hydraulic servos which provide model attitude control, in pitch and roll, during a tunnel run. The air forces acting on the model during a blowdown are measured electrically by a strain gauge balance mounted within the body of the model and air pressures are converted to analogue voltages by pressure transducers. The air flow through the test section is slowed down in the variable and fixed diffusers and finally discharged to atmosphere through an exhaust silencer designed to reduce the outlet noise to an acceptable level.

The aerodynamic measurements made during a run, which are electrical voltages proportional to model loads and pressures, are measured by self-balancing strip chart potentiometers fitted with digitizers and recorded on IBM punched cards. Subsequent processing in computing equipment gives the reduced results in tabular and plotted form.

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and retain its designation.

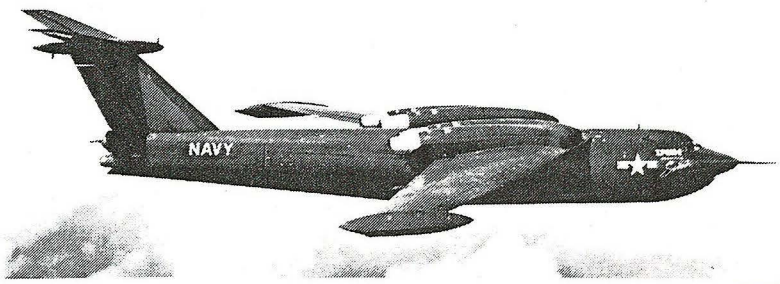
Early in the new year, conversion courses will begin at the Royal Canadian School of Artillery (Anti-Aircraft) at Picton, Ont.

474 Jet Deliveries

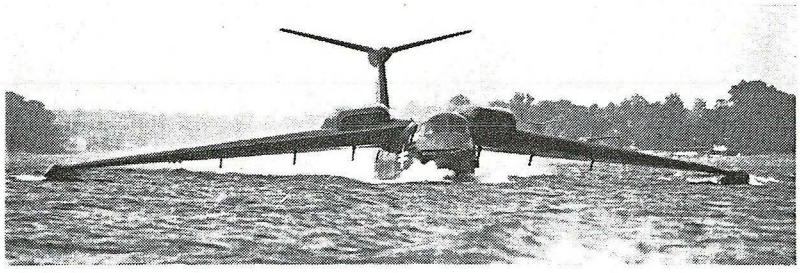
With the successful completion a few weeks ago of Operation Random 18, the RCAF's Air Division in Europe had received from Canadair Ltd. at Montreal a total of 474 jet aircraft, including 106 Mk. 6 Sabres. The others were Mks. 2 and 5 and a small number of T-33 Silver Star trainers.

Deliveries have been carried out by 1 Overseas Ferry Unit, stationed at St. Hubert, P.Q., commanded by Squadron Leader Bob Middlemiss. The route is from Montreal to Goose Bay to Bluie West 1, Greenland, to Keflavik, Iceland, to Kinloss, Scotland, and thence to the Continent.

Random 18 comprised 22 Mk 6's, 19 for 3 Fighter Wing at Zweibrucken, Germany, three to 4 Wing at Baden-Soellingen.



SWEPT, DROOPED, AND POINTED: The USN's new Martin XP6M-1 SeaMaster, which has been undergoing test flying since last July, is described as being "unusually promising". Designed for minelaying and photo-reconnaissance, the aircraft can carry a 30,000 lb. payload and is fitted with a watertight version of the Martin-developed rotary bomb door. The SeaMaster is powered by four Allison J-71A4 turbojets which, with afterburner, each give 13,000 lb. thrust for take-off.



Landing Assist

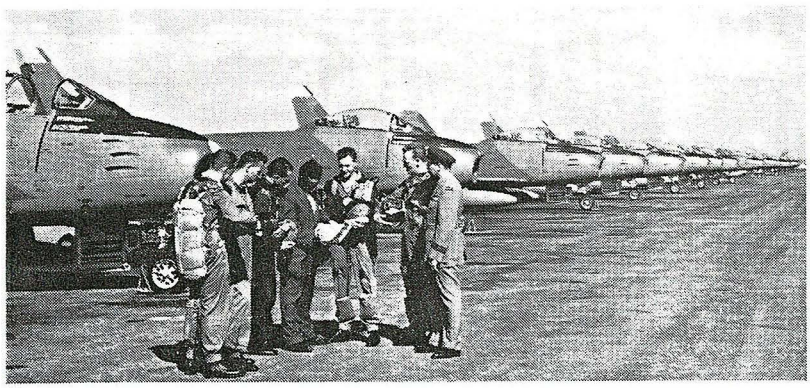
The RCAF's 2 Fighter Wing at Grostenquin, France, had an opportunity last month to test a U.S.-developed emergency procedure for dealing with malfunctioning nose wheels.

Flying Officer Bob Caskie, aloft on a Sabre training exercise, discovered that his nose wheel would not retract — that it had jammed at right angles to the direction of motion. The tower instructed him to circle to burn fuel while Flight Lieutenant Lloyd Skaalan, Operations Officer of the day, arranged to lay a path of fire extinguisher foam down the centre of the runway.

F/O Caskie made a long approach, lined up and set down, his main wheels straddling the foam strip. When he dropped the twisted nose wheel it skidded easily until the main wheels braked the aircraft to a safe stop.

Moths Retired

The RAF has retired the last four of 5,145 Tiger Moth trainers it has had in service since 1930. They are awaiting disposal at RAF Cosford. Maintenance Command is also trying to dispose of retired Tempests, Spitfires, Dakotas, Mosquitoes and Lancasters.



AT RANDOM: Squadron Leader Robert Middlemiss (right), officer commanding No. 1 Overseas Ferry Unit, is shown checking last minute details with Canadair Technical Representative Howard Webb, prior to take-off from St. Hubert recently of a batch of Canadair Sabre 6's, headed for service with RCAF squadrons in Europe. This ferry flight was code-named "Operation Random 18".

CS2F Simulators

The RCN has placed with Redifon Ltd. in Britain an order exceeding $1,000,000 for a flight and tactical simulator of the Grumman CS2F anti-submarine aircraft. It is intended for mobile use and will be housed in a trailer.

The Redifon CS2F is the first British simulator to combine facilities for flight familiarization with training in the use of radar and tactical anti-submarine equipment. Crews will not only practice take-offs, landings and stalls, but also learn to hunt out underseas craft with the latest detection gear.

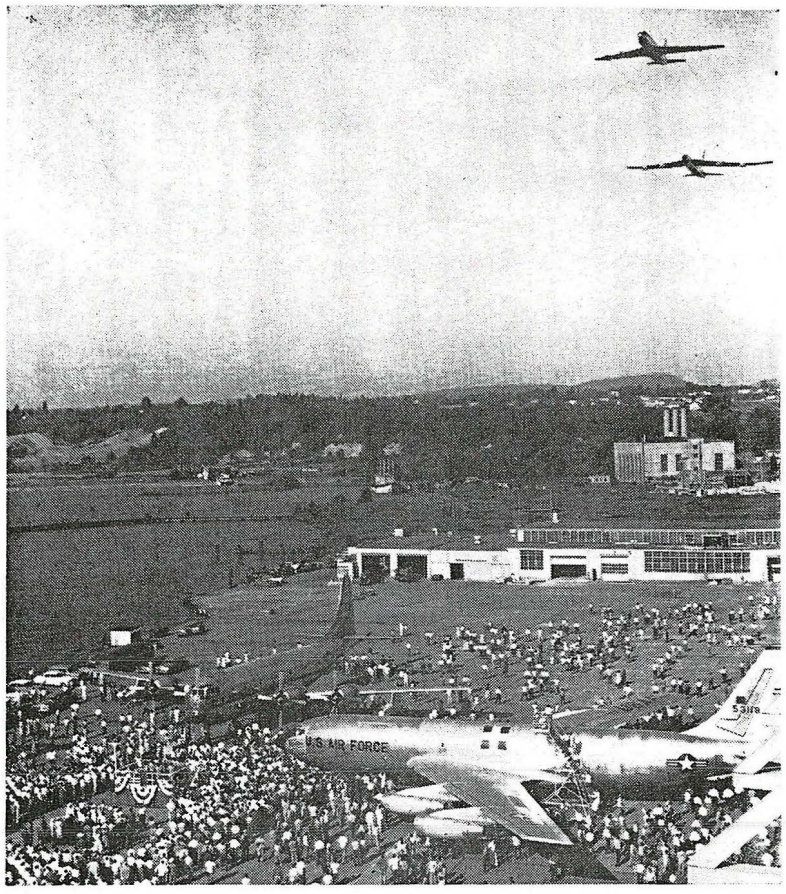
For Young Brass

A new six-week, 300-hour Junior Officers' Administration Course has opened at RCAF Station London to prepare promising young flying officers and flight lieutenants for the Staff College in Toronto and later the National Defence College in Kingston.

Most important phase is English expression, which incorporates effective service writing. Other phases include air force law and service management. Course commander is Squadron Leader W. A. Dunbar.

Postings & Careers

• The RCAF announces the appointment of Group Captain R.B. Whiting,



KC-135 ROLL-OUT: The first production KC-135 jet tanker was rolled out of Boeing Airplane Co.'s Renton, Wash., plant during July. The KC-135 is at right while a left is the last of 888 KC-97 piston-powered tankers built by Boeing. The KC-97 emerged from the plant just minutes before the KC-135. In a flypast at upper right are (front) the Boeing 707 jet transport prototype and (rear) a B-52 bomber.

aircraft is now undergoing work at the Montreal plant. Canadair recently completed the modifications to seven North Stars and is expected to receive modification work on the RCAF C-5 early in September.

How Tyne Flies

The new Rolls-Royce Tyne turboprop has successfully completed its first flight. The engine was installed in the nose of an Avro Lincoln flying test bed where it was used to assist in the take-off. The Tyne ran throughout the flight, which lasted one hour and forty minutes. While airborne, performance testing of the Tyne was commenced and the Lincoln flew with the two outboard Merlin engines feathered.

CS2F Contract

A contract for the complete rear fuselage assembly on the de Havilland Canada assembled CS2F sub-hunter, has been let to Enheat Aircraft, a division of Enamel & Heating Products Ltd., Amherst, N.S. The present order is for 24 units but this is expected to be increased. At this time the company is working on units 23 and 24 of the empennage.

Details of the sub assembly tooling will be transferred from the plant of Canadair Ltd., previous sub-contractors, by the end of November with the final assembly tooling expected by February of 1957. Delivery of the first complete rear fuselage unit from the Enheat plant is scheduled for August or September, 1957. This date would appear to maintain the delivery schedule of two per month, beginning in September of this year, as set up by The de Havilland Aircraft of Canada Ltd.

CF-105 Heat Exchanger

The successful development of a new heat exchanger for the Avro Aircraft CF-105, has been announced by The Garrett Mfg. Corp. of Canada Ltd., Toronto. The Canadian firm, a sales, manufacturing and maintenance organization, is a subsidiary of The Garret Corp., Los Angeles.

Developed and produced by Garrett's AiResearch Manufacturing div. in Los Angeles, the heat exchanger is a part of the complete air conditioning and pressurization systems produced by AiResearch. It is said to be the largest stainless steel unit ever manufactured for aircraft use, and will supply cooling air to the cockpit of the fighter.

The new unit functions continuously in cooling compressed air received at high temperatures and pressures. Hot air is bled from the CF-105's two turbojets and while flowing through the heat exchanger is cooled by air ducted from outside the aircraft.

For efficient operation as part of the aircraft's air conditioning system, the AiResearch unit is located between the engine bleed points and an AiResearch cooling turbine, which forces the cooled air into the cockpit.

A new technique — brazing the core of the heat exchanger in a vacuum — was employed by AiResearch, establishing complete homogenous bonds for removal of impurities and gases, the principal causes of contamination and leakage. This uniform bonding is applied to the thin-gauge segments of the cooler, which utilizes plate and fin construction.

Other AiResearch items developed for the 68,000 lb. CF-105 are five oil coolers, one cooling turbine, two actuators and a temperature control system.

Course Completed

The first six men concerned with the installation of the electronic equipment on the CL-28 Britannia have completed their advance training course at the U.S. Naval Air Base, Norfolk, Virginia. The courses are designed to acquaint the engineers and electronic technicians at Canadair with the operation and maintenance of the radar and anti-submarine devices installed in the CL-28.

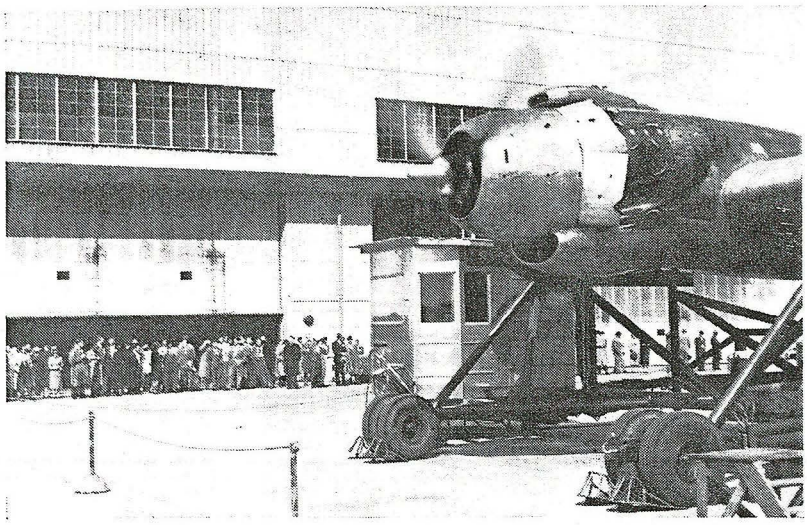
Contracts Awarded

Contractors awarded business in excess of $10,000 by the Department of Defence Production during the period May 16, to June 15, 1956, include the following. The list does not include orders placed by the Department outside Canada, or with other agencies, and increases in orders placed earlier — nor do orders classified as secret appear here.

(Names appearing in bold face are current *Aircraft* advertisers.)

Aircraft Industries of Canada Ltd., St. John's, Que. $313,000 for repair & overhaul of airframe spares during period April 1/56 — March 31/57.

Aircraft Industries of Canada Ltd., St.



RUNNING UP: Members of the Engineering Institute of Canada watch a run-up of the CL-28 MR Britannia's powerplant on the special test rig which Canadair engineers developed for this installation (see "Aircraft", May, 1956). Earlier photographs appearing in this publication showed the engine uncowled. Main component of the powerplant is of course, a Wright R-3350 Turbo-Compound 18, rated at 3,700 hp.

Canadair Ltd. by the DDP, according to a recent announcement by the company.

The initial contract for 13 CL-28's was let to Canadair in February, 1954, and it was understood that other contracts were to follow, each of these to cover, in most cases, a block of 12 aircraft. If this procedure has been followed, then it is thought that all of the 50 aircraft to be built for the RCAF are now on firm order.

Estimated value of the aggregate CL-28 orders is $185,000,000. The first machine is scheduled for delivery to the RCAF early in 1957.

Layoff at Orenda

Production cutbacks from 100 Orenda engines a month, during the Korean War, to less than 50 a month at present, have necessitated the layoff of a further 350 workers at the Orenda Engines Ltd., Malton, Ontario, according to a recent statement by Walter R. McLachlan, vice president & general manager.

According to the DDP, production of the Orenda is to be cut even below the current rate of less than 50 per month. The additional cuts referred to by the DDP are to be made on a sliding scale at various times during the next year.

In explaining the layoff arrangements to the employees, Mr. McLachlan said that . . . "steps already taken have succeeded in reducing to some extent the impact of the lowered production rate. These include an increase in the schedules of sheet metal, repair, and overhaul work, also the addition of a third shift in the experimental plant. Other urgent efforts to reduce the effect of the production decreases are continuing."

To date more than 3,000 Orenda engines have been produced for the RCAF's CF-100 and the F-86 Sabre aircraft. Orders have also been filled for the South African and Colombian governments, both of which have acquired Canadair Sabres.

Meanwhile, the development work on Orenda's Iroquois moves into higher gear.

Avro Layoff

An estimated total of 500 employees are expected to be laid off by Avro Aircraft Ltd. as a result of a new Government-ordered cut-back in the rate of production of the CF-100. However, this latest stretch-out in production will not affect the total number of CF-100's to be produced for the RCAF, according to F. T. Smye, Avro Aircraft vice-president and general manager.

This latest reduction in Avro Aircraft employment is the third since January of 1955.

At one time, production of CF-100's reached a peak of 25 per month, but the stretch-outs of 1955 reduced this to about ten. The new rate of production has not been announced.

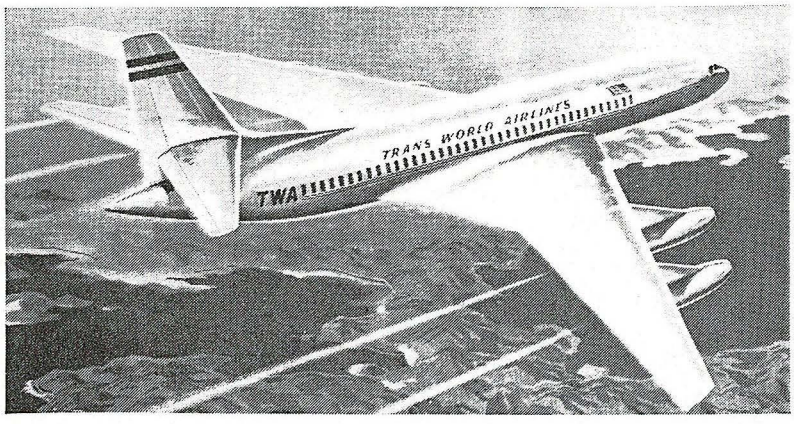
USN Orders Otters

The U.S. Navy has ordered nine additional Otters from The de Havilland Aircraft of Canada, Ltd. These will supplement the four Otters acquired last year for the Antarctic expedition, "Operation Deep Freeze", which comprised a preliminary phase of the U.S. contribution to the International Geophysical Year.

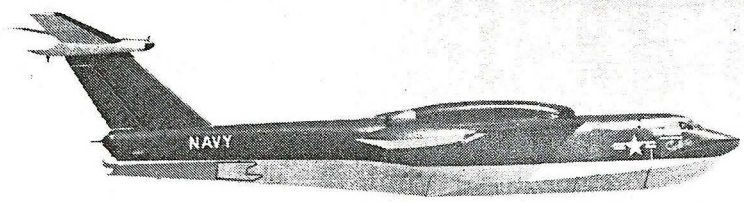
Australia and New Zealand are using Beavers for their preliminary survey operations in the Antarctic.

Maintenance Trainer

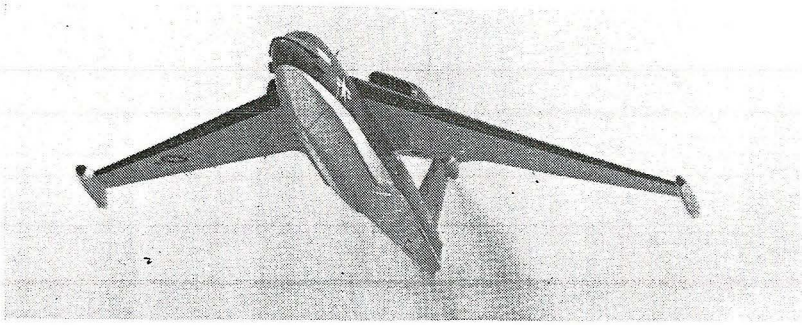
A $650,000 contract for the design and manufacture of a maintenance trainer for the RCN, has been awarded to The de Havilland Aircraft of



GOLDEN ARROW: Scheduled for delivery to TWA early in 1959, the Convair Golden Arrow medium range jet transport (above), will have a cruising speed of 609 mph and will be powered by four GE J-79/CJ-805 turbojets of approximately 15,000 lb. th. each. The Golden Arrow is ostensibly almost identical to the Skylark 600 announced earlier. Horizontal stabilizer is mounted on the fuselage of the Skylark; Golden Arrow is distinguished by its gold finish.



SMOOTH SEAMASTER: Now undergoing test flights is the USN's second Martin XP6M-1 SeaMaster jet-powered flying boat. It will be recalled that the first SeaMaster was lost last December in an accident which has since been blamed on a control system malfunction. Powered by four 10,000 lb. th. Allison J-71's, the aircraft can fly at over 600 mph. It is intended for mine laying and photo reconnaissance.



a likely successor to Air Marshal C. R. Slemon as Chief of the Air Staff. Weighing especially heavy in his favor in this regard was his brilliant record at the headquarters of NATO's Allied Air Forces Central Europe, where he served latterly as Chief of Staff, with the rank of Air Marshal.

Change in Roles

Beginning this month the former RCAF pilot weapons school at MacDonald, Man., has been re-designated as an Advanced Flying School for T-33 training.

Opened during World War II as a flying training station, MacDonald was reactivated in 1951 as a pilot weapons school. This course will now be given at the Operational Training Unit level at the two fighter OTU bases at Cold Lake, Alta., and Chatham, N.B.

RCAF Station MacDonald is under the command of Group Captain J. D. Somerville.

Jan. 1 for Mid-Canada

Canada's $170,000,000 Mid-Canada Line will go into operation on New Year's Day, Defence Production Minister C. D. Howe told Commons recently. Mr. Howe said that the 3,000-mile system, which runs roughly along the 55th Parallel, was scheduled to go into service on January 1, 1957, and he saw no reason why this target date wouldn't be met.

The early warning stations will be maintained entirely by civilian personnel under a contract agreement with the Bell Telephone Co. of Canada Ltd. although the over-all administration and operation will be handled and supervised by the RCAF.

This was the first official mention of the target date for beginning operation of the Line. Officials have said previously that it is intended to bring both northern warning lines into service at the same time. This would mean that the $400,000,000 Dew Line in the Canadian Arctic will also go into operation on January 1, 1957.

Mid-Canada Training

A unit of the Mid-Canada Line has been built for training purposes in the Ottawa Valley. This information was released by the Department of National Defence following the announcement by Minister of Defence Production C. D. Howe that the Mid-Canada Line would be in operation by January 1, 1957.

The unit, described unofficially as an exact duplicate of a major centre, has completed for some months and has been used by the RCAF and the Bell Telephone Co. of Canada as an environmental training classroom for candidates slated for line operations.

436 Completes Move

No. 436 Squadron of the RCAF's Air Transport Command has completed its moving operation from its former base at Dorval to Toronto's Downsview Airport.

The move necessitated the transfer of some 150 airmen and their families, and was originally scheduled to have been completed in June. However, the Squadron's aircraft—C-119's—were on duty at various points across the country during the peak load summer months and it was decided to postpone the move until such times as hangar space was required for the whole squadron.

The move originally became necessary when one of ATC's hangars at Montreal Airport was destroyed by fire earlier this year, placing hangar space at a premium.

USAF Mid-Canada Aid

Six USAF H-21 helicopters were employed on the Mid-Canada line during a three month peak load period this summer. The aircraft, from Donaldson AFB in South Carolina, operated out of The Pas, Man.

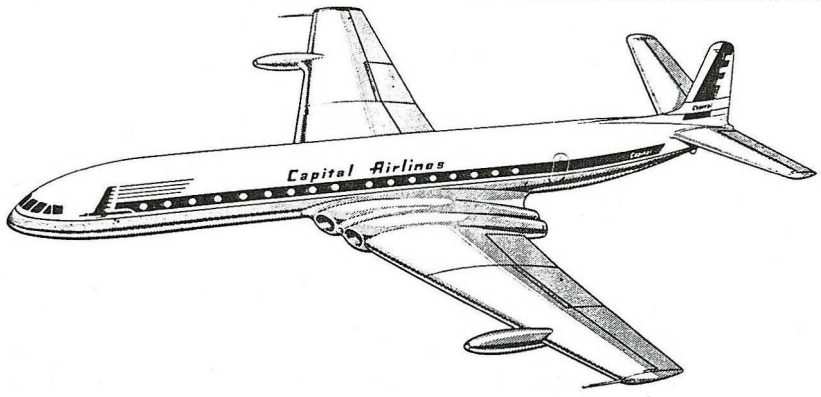
The RCAF says the helicopters were employed to maintain the tight schedule required to have the line in operation on time.

Postings and Careers

•Group Captain Kenneth C. Cameron has been appointed commanding officer of RCAF Station Clinton, succeeding Group Captain Harold C. Ashdown, who has been appointed director of radio warfare at AFHQ.

•The command of RCAF Station Moose Jaw, has been taken over by Group Captain G. Dunlop, former director of air training at AFHQ. G/C Dunlop succeeds Group Captain G. H. Elms who has been selected to attend the National Defence College.

•Group Captain D. J. Williams, DSO, DFC, CD, has succeeded Group Captain J. D. Somerville, DSO, DFC, CD, as commanding officer of the RCAF's No. 1 Fighter Wing, Marville, France. G/C Somerville becomes commanding officer of RCAF Station MacDonald replacing Group Captain J. J. Jordan, AFC, CD, who is to attend National Defence College.



The Comet 4A

The latest Comet variant, the 4A (unveiled coincident with the recent announcement that Capital Airlines had ordered ten Comet 4's and four 4A's), is described by The de Havilland Aircraft Co. as being intended for short and medium-range operations. Its role, therefore, differs from the one in which the 4 has been cast in that the latter has been designed for long range services. The 4, of course, will continue to be available to operators who need an airliner in this category.

The more important design changes which distinguishes the Comet 4A from the Comet 4, are as follows:

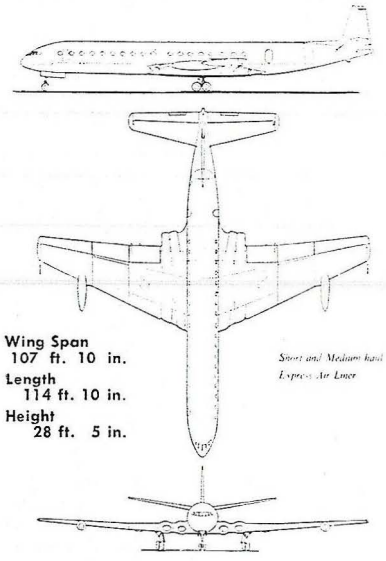
- The fuselage has been lengthened by 40 ins.
- The wing span has been reduced from 115 ft. to 108 ft. and this, coupled with some structural reinforcement of the rear fuselage and tail makes possible a higher cruising speed at lower altitudes.

All-up weight of both airliners is 152,000 lbs.

De Havilland notes that in order to achieve competitive economy on the short and medium stages with the Comet 4A, a special operating technique has been evolved and this may be summarized as follows: by cruising at a lower altitude the true air speed is increased relative to the limiting Mach number. This increase in speed goes far to compensate for the increased fuel consumption due to the reduced cruising altitude. In addition, both the rate of climb and descent are increased, resulting in the maximum possible distance for high-speed level cruise so block time is further reduced.

This operating procedure is said to enable the 4A to cruise at an air speed which varies between 520 mph and 545 mph, according to the ambient temperature, when flying at 23,500 ft. De Havilland reports that because of the resulting improvement in block time the 4A achieves good operating economy on stage lengths of 500 statute miles or less. At the upper end of the scale the high-speed cruise procedure shows advantages up to some 2,000 statute miles.

This high speed cruise technique can also be applied to Comet 4 operation, though with some loss in maximum range. In addition, for structural reasons the fastest cruising altitude in the case of the 4 will be higher by some 5,000 ft. and the cruising speed somewhat lower as compared with the 4A. Similarly, the 4A could be operated using the normal long-range technique, but its longest practical stage length would be somewhat less than that of the 4.



The 4A provides seating for up to 92 passengers. The maximum payload for the 70-seat version is 19,070 lbs., and that for the 92 seat arrangement is 22,690 lbs. With these payloads, the 4A, using the high speed procedure, is capable of maximum stage lengths, in still air with full reserves, of 2,040 statute miles and 1,880 statute miles respectively.

Both the 4 and 4A are powered by Rolls-Royce RA-29 Avons of 10,500 lbs. take-off thrust. The Comet 3 is now about to have its RA-26's exchanged for RA-29's and will begin certification flight testing later this year specifically for the 4 and the 4A. It will incorporate all the significant features of the new aircraft, including the shorter wing span of the 4A. Detachable wing tips will enable quick conversion from the 4A to the 4 shape for flight testing.

alyze it, and add it to our small storehouse of knowledge on transonic airflow. Part of what Whitcomb discovered has now become aerodynamic history. He noted that there was an interfering pressure field built up at the intersection of wing and fuselage. This caused large increases in drag at sonic speeds. By designing the wing and body as a unit, to achieve a smooth plot of their cross sectional areas from nose to tail (Figure 2), the drag could be drastically reduced.

To achieve this smooth plot, it is necessary to waist in the fuselage opposite the wing. The cross sections are taken at right angles to the longitudinal axis of the airplane at Mach 1.0, and at different angles at speeds above this. The net result is a deep "wasp waist" at Mach 1.0, with less waisting effect as the airplane's design speed exceeds the speed of sound. A similar necking in of the fuselage of course is necessary at other protuberances such as the canopy or tail. The effect of all this is called the area rule in formal circles. But informally Marilyn Monroe suddenly had a different meaning to the aerodynamicist than it did to the movie magnate.

Before Monroe: Like all things, it was soon discovered that others had suggested this approach from incomplete experiments and mathematical considerations. Both British and U.S. researchers had suggested this solution as early as 1947. And few know, even today, that the Supermarine "Swift" fighter of the RAF has a slightly waisted fuselage that was designed before the days of area rule, as a result of some incomplete work.

With this branch of the basic transonic research now building, it was time to move into the applied research stage. Other organizations picked up the trail that the NACA had blazed. In Canada we got started with an RCAF Sabre whose fuselage was altered by Canadair Ltd., to the area rule design of our National Aeronautical Establishment. This particular project got underway when R. J. Templin and Phillip Pocock of NAE talked it over with R. D. Richmond of Canadair. The result was a proposal to the RCAF to try the coke bottle fuselage on a Sabre 5. The project was approved late in 1954, and about a year later the modified airplane took off on its first flight from

(Continued on page 77)

THE AIRBORNE SERVICES

What Did He Say?

Press reports from Europe during late November quoted Defence Minister Brooke Claxton as saying that Canada was going to finance the conconstruction of five or six airfields in Western Europe to accommodate the 11-squadron RCAF air division which will eventually be based overseas. Mr. Claxton was also quoted as saying that these fields would cost $100,000,000, a figure which later turned out to be a news correspondent's estimate based on approximate costs of establishing an airfield given by Mr. Claxton some time earlier in the year.

The stories caused somewhat of a tempest in the House of Commons, with the opposition crying "foul" and claiming that the announcement constitute a statement of policy. Such statements, it was said, should be made in Commons, and not at press conferences.

Though Prime Minister Louis St. Laurent denied that such statements as had been credited to Mr. Claxton had been made by him, it soon became obvious that it would indeed be necessary to build several airports in Europe (probably in France), since none were now available, and further, that in the long run Canada would pay the cost of their construction.

Lack of airfields at present means that all of the first units of the RCAF air division will be based in the U.K. All of these incidentally will be equipped with F-86Es. The total of 250-300 aircraft arming the squadrons will be sufficient to provide air support for a full sized army of one to two corps.

In addition to the foregoing contribution by Canada to Europe's air defences, this country has also recently supplied a number of NATO countries with radar sets numbering several hundred in total.

Postings and Promotions

Appointment of Air Commodore Frederick S. Carpenter, AFC, CD, as Chief of Training for the RCAF, was recently announced by AFHQ. Formerly Senior Staff Officer at Training Command HQ, Trenton. A/C Carpenter is now responsible for directing and co-ordinating all phases of the RCAF's new expanding air and ground training program. Other recent postings and promotions include the following:

- Wing Commander R. B. Hoodsmith, MBE, has been transferred to Paris for duty with the Supreme HQ Allied Powers, Europe (SHAPE). He has been serving as Command Telecommunications Officer at Air Defence Command, St. Hubert, P.Q.
- Wing Commander C. G. Ruttan, DSO, CD, has been promoted to the rank of Group Captain. He is presently with the Service Requirements Branch at AFHQ.

RAF Navigators

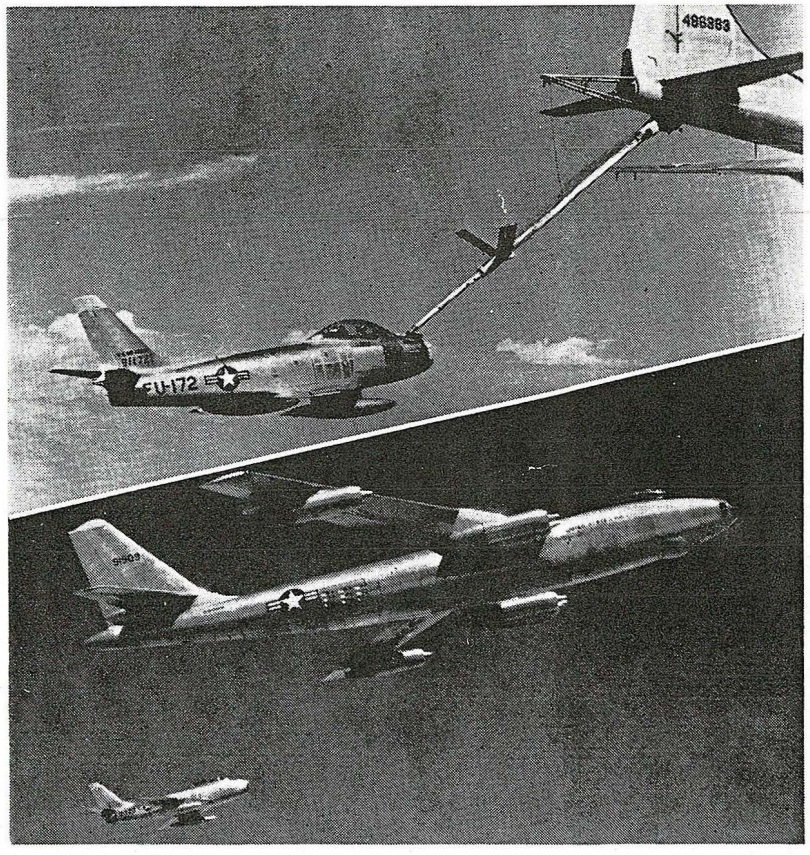
Graduation exercises for the first postwar course of Canadian-trained RAF navigators was held at RCAF Station Summerside on November 30. Air Commodore A. P. Revington, CB, CBE, Senior Air Liaison Officer with the U.K. Air Liaison Mission, presented wings to Canadian as well as British graduates.

The exercises marked the second occasion last year in which RAF and RCAF aircrews featured a combined graduation ceremony at an RCAF Station. The first such ceremony took place at RCAF Station Gimli when the first course of Canadian-trained RAF pilots graduated there in early October.

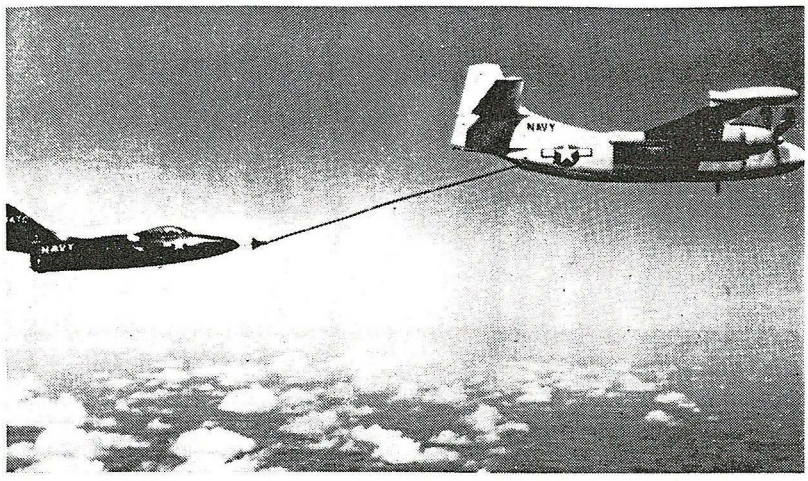
No. 430 Squadron

The new fighter squadron, No. 430, which the RCAF formed at North Bay, Ontario (See *Aircraft*, November), was originally formed at Hartford Bridge, England, in 1943, under the command of Wing Commander E. H. Moncrieff, AFC, who is now vice-president of Standard Aero Engine Ltd.

The Squadron trained at Dunsfold, another airfield in Surrey, beginning operations in June, 1943. Before D-Day it kept busy carrying out low-flying attacks against ground targets and making photographic and visual reconnaissances of the enemy-held coast. Once the invasion started 430 was em-



FIRST LINE: Top photo shows an F-86 Sabre being refuelled by a Boeing aerial tanker fitted with a flying boom. Lower picture shows the USAF's first line fighter and bomber team, shown together in flight for the first time. Similarity of lines is interesting. Both aircraft are powered by General Electric J-47 gas turbines, though the B-47 has six as compared to the F-86's one. Both aircraft are in 600 mph class.



Flight Refuelling

Recently the U.S. Navy adopted the British "probe & drogue" system of flight refuelling as a means of extending the effective endurance and load carrying capabilities of its carrier fighters.

Though it is many years since flight refuelling was first shown to be practical it is only within the postwar period that it has received general acceptance. This general acceptance was delayed first by the beginning of World War II and then paradoxically by the end of the War. In the first instance, Flight Refuelling Limited of England had received a contract to service Imperial Airways flying boats on the North Atlantic run. On regular schedule with Imperial in 1939, 15 refuelled crossings were made without incident. Then came the War.

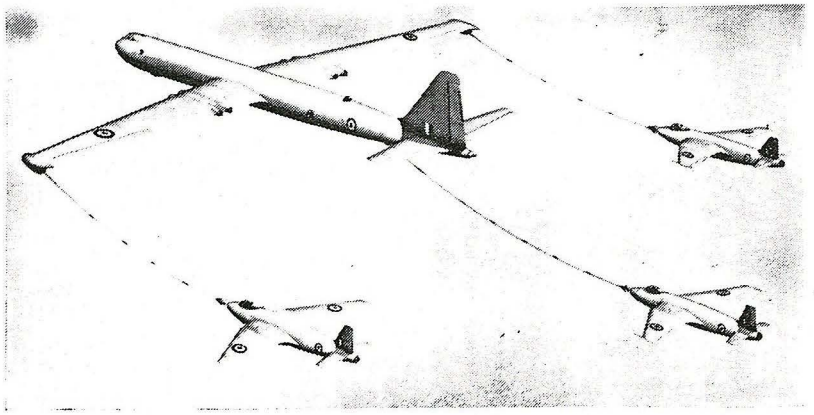
In the second instance, a large force of bombers was scheduled to be fitted for very long missions with the aid of flight refuelling, but the end of hostilities ended that project.

The possibilities of flight refuelling early attracted the attention of Sir Alan Cobham, and in 1934 he formed Flight Refuelling Limited. It is this company, of which Sir Alan is managing director, that has developed the procedure to its present high degree of perfection. In 1949 a U.S. subsidiary, Flight Refueling, Inc., was formed. In recent months, American interests have taken over control of this subsidiary.

Since the end of the War, the USAF has shown more interest in the system than any other group . . . the climax being the 23,108 mile nonstop flight of the B-50, "Lucky Lady". Commercially, Flight Refuelling carried out experiments with BSAA in 1946 between London and Bermuda, making 26 day and 17 night contacts. In 1947 eleven scheduled flights were made over the same route. The process used at this time was the "loop-hose" method.

The requirements of jet refuelling led to the much simpler "probe & drogue", which is practically foolproof. The receiver aircraft is fitted with a probe which it simply manoeuvres into the trailing drogue. The drogue has a funnel-like fitting that guides the probe into the fuel-tight automatic coupling at the hose end. The disconnect is made simply by slowing up the receiver. The hose is reeled in and out from a drum in the tanker.

The accompanying pictures show a USN North American AJ-1 Savage tanker refuelling a Grumman F9F Panther (top), and an artist's impression of how three fighters could be refuelled at once (bottom).



pulling 28" Hg, which gave a climbing speed of 80 mph. IAS at a rate of approximately 800 fpm.

Turn of Speed: At an altitude of 3,000 feet asl (temp. 32°F.) with the engine turning over 2,400 rpm. at 23" Hg, the indicated airspeed in straight and level flight was 115-120 mph. Because the air was quite choppy, it was difficult to get a satisfactory reading, but the 115-120 mph. figure stacks up fairly well with Piper's figure of 123 mph. at 7,000 feet asl. at 75% rated power, which sounds like a reasonable claim, though we did not check it. For the Pacer, the speeds are about 2 mph. higher.

The stalling performance is excellent. With wheel full back, power off, flaps up, the stall comes at approximately 47 mph. IAS; flaps down, about 45 mph. But under any combination of power and flap settings it appears to be impossible to get any reaction which could in any way be termed dangerous. Even when we pulled the nose up into the most extreme attitude, it never dipped below the horizontal following the stall. There is no perceptible wing drop which would be worth noting.

For the approach and landing, full flap is used and an approach speed of 75 mph. maintained. The powerful flaps make a good steep approach quite feasible, which in turn makes for good visibility. Following the round out, the airplane is held off until the tail is well down . . . so far down, it seems from the cockpit, that you are momentarily to hear the rear of the fuselage scrape on the runway. There is no tendency to balloon after the touchdown and as soon as the two main wheels are firmly on the runway, you let go of the wheel and remove your feet from the rudder pedals. When it becomes practical, you can apply a little brake to bring the Tri-Pacer to a stop.

Flying this airplane is truly a simple procedure. We heard it described somewhere as the airplane that takes the skill out of flying. There will be some who will deplore this characteristic as one which makes for a dull airplane. Yet considering its docile qualities, the Tri-Pacer still manages to be a fairly lively machine. In it, we think that Piper has achieved its design aim completely . . . to produce an economical, safe, machine that can carry four persons a reasonable distance at a comfortable turn of speed.—*R.G.H.*

FEB/53 *AIRCRAFT*

THE AIRBORNE SERVICES

RCN Aircrew Openings

Canada's growing Naval air arm has found the RCN with an acute shortage of aircrew, with the result that the service has sent out the call for a considerable number of trainees. Young men, 18-23, with junior matriculation or equivalent standing in English, mathematics, science, and one other subject, may now enter the Navy for aircrew duties on seven-year appointments.

Upon meeting the required standards, recruit will be entered in the RCN as a midshipman. He will then go to Cumlin, Ontario, for an aircrew aptitude test, during which it will be decided whether he will take pilot or observer training. Before embarking on aircrew training, the trainee will receive one year's basic naval training. Four months will be spent ashore and eight months at sea in a warship.

Following this, pilots will go to Centralia to train to wings standard. Upon graduation they will be appointed to the U.K. for operational and deck landing training. Observers will be sent to the U.K. for the observer course as soon as they complete the one year of basic naval training.

Aircrew candidates may be promoted to Acting Sub-Lieutenant upon completion of their first year's training afloat and ashore. Upon completion of their seven year appointment suitable aircrew officers will be given the opportunity to transfer to the RCN on a permanent basis, since the short service appointment is a recognized avenue of entry in the RCN.

Back to Home Base

Number 426 Thunderbird Squadron has changed its main base of operations on the Pacific airlift from McChord Field, Tacoma, Washington, back to Dorval. The squadron is continuing to fly to Japan under UN command and will maintain its full share of the airlift as allotted by the U.S. Military Air Transport Service.

Reasons for movement of the main element of the squadron back to Dorval were an increased requirement for space at McChord by the USAF, plus the fact that expanding RCAF operations will require the services of North Stars on domestic and European runs. Based at Dorval, the squadron will be more centrally located for operations over the Pacific and Atlantic oceans, as well as in Canada.

Several hundred ground crew will return to Dorval, leaving servicing detachments at McChord, Tokyo, and other points along the Pacific routes flown by the squadron.

During the first year of the airlift, the Thunderbirds transported to the Far East more than 2,900 combat troops, and close to 1,000 tons of war supplies. They have flown some three million accident free miles on the airlift.

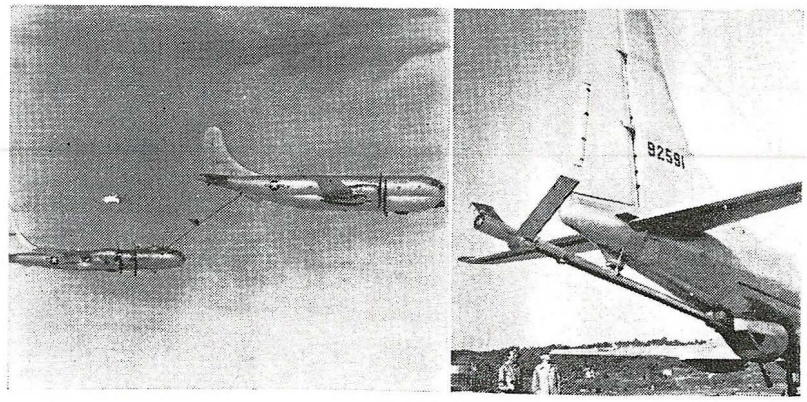
High Command

Air Vice Marshal J. L. Plant, CBE, AFC, has been appointed a senior staff officer under Lieutenant General Lauris Norstad, commander of the Allied Air Forces in Central Europe. A/V/M Plant is at present head of the Personnel Division at RCAF HQ, Ottawa.

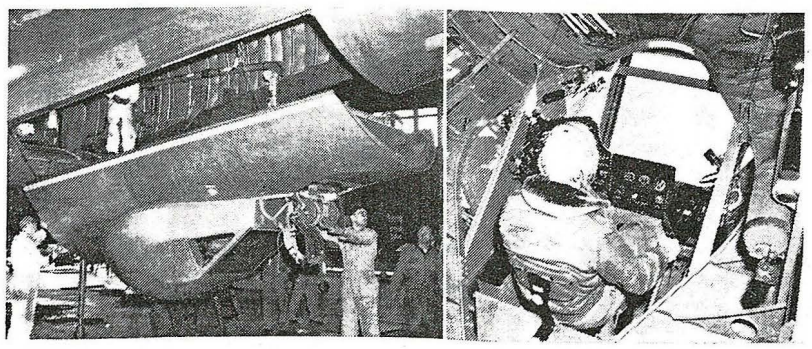
The announcement of the appointment was made by Defence Minister Brook Claxton, who said that because of the planned RCAF representation in the Integrated Force now being built up in Europe under General Eisenhower, Supreme Headquarters Atlantic Powers Europe (SHAPE) have requested that a senior position on General Norstad's staff be filled by an RCAF officer of air rank. A/V/M Plant has been selected for this important post and will serve as General Norstad's assistant chief of staff for personnel and logistics at his headquarters near Paris.

Replacing A/V/M Plant at AFHQ will be the present deputy of the Personnel Division, Air Commodore F. G. Wait, CBE, who will be promoted to Air Vice Marshal on taking over the position.

A/C Wait is to be replaced at AFHQ by Air Commodore L. E. Wray, OBE, AFC, now commandant of the RCAF Staff College in Toronto. The new commandant of the Staff College will be Air Commodore J.L. Hurley, CBE, who recently returned from the U.K.



FILL IT UP: The Boeing KC-97A Stratofreighter is shown at upper left refueling a B-50D in flight, utilizing the Boeing-developed "Flying Boom", shown in close-up at upper right. The Stratofreighters may be converted into tanker aircraft by the installation of the boom operator's pod in the opening where the cargo-loading doors are normally located (lower left). At lower right is the operator in the pod from where he "flies" the telescopic boom into position for refueling.



NEWS ROUNDUP

CF-100/4 Flies

The first production Mark 4 CF-100 has made its initial flight and is now going through its flight test program before delivery to the RCAF. The actual first flight was made early this month.

Meanwhile, according to Toronto news reports, the Canadian and U.S. governments are busy working out a deal whereby something like 250 Mk. 4's will be supplied to European NATO countries. According to the report, the U.S. would pay for five aircraft to every one financed by Canada. The negotiations are said to have reached the stage where Canada is seeking authority to buy 50 of the aircraft out of the current appropriation for Mutual Aid.

TCA Buys Collins

TCA has recently purchased 32 of the Collins 51X Airborne Communications Receivers for use in their fleet, it has been announced by Collins Radio Company, Cedar Rapids, Iowa.

The Collins 51X, 360 Channel VHF Receiver is the companion to the 17M-1 Transmitter with 50 kc channel spacing to provide complete VHF coverage for all present and future needs. The new VHF Receiver features the same Collins fingertip remote control circuitry as used for the 51R Receiver.

Air Parcel Post

The international air parcel post service, started last July 1 to the U.K. by the Canada Post Office, has been expanded to provide similar service to 12 additional countries. These nations are: Belgium, Denmark, France, Holland, Norway, Union of South Africa, Sweden, Switzerland, Australia, New Zealand, Japan, and Hong Kong.

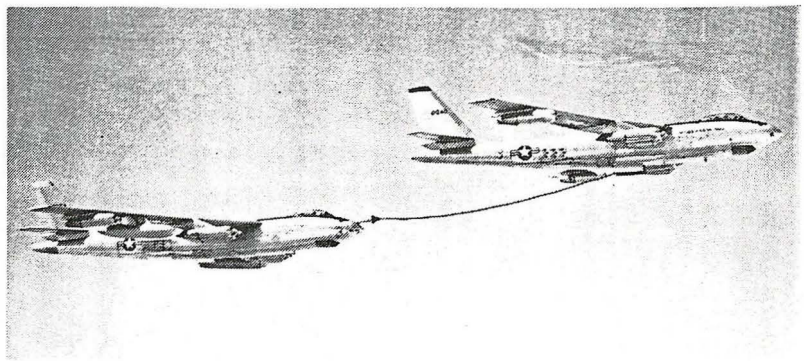
Rates will vary, but they will be only a fraction of air mail letter postage. For example, a parcel sent by air to Switzerland would cost $1.25 for the first half pound and 45 cents for each additional quarter pound.

Inspection Tour

Canada's aviation research developments, radar installations, and latest aerial navigation advances were demonstrated in mid-September to a USAF military mission led by Lieutenant General Donald L. Putt, commanding officer of the USAF's Air Research & Development Command.

The mission came to Canada at the invitation of Dr. O. M. Solandt, chairman of the Defence Research Board. The group of 25 comprised leading U.S. scientists and top-ranking USAF officers, including, besides General Putt, Major General James McCormack Jr., vice-commander of ARDC, and Dr. A. G. Hill, director of the Lincoln Laboratories, Cambridge, Mass., one of the world's leading electronic research centres.

Accompanying Dr. Solandt was a Canadian group consisting of C. M. Drury, Deputy Minister of National Defence; Air Marshal C. R. Slemon, Chief of the Air Staff; Air Vice Marshal D. M. Smith, Air Member for



JET TANKER: The world's first jet propelled aerial tanker airplane, the Boeing KB-47B Stratojet, is shown here refueling a B-47 bomber version of the Stratojet. The KB-47B is fitted with Flight Refueling Incorporated's probe & drogue refueling system. The jet tanker was developed by Boeing Airplane Company working in conjunction with the USAF Air Research & Development Command and Flight Refueling.

Utility Fighter

Folland Aircraft Limited of England is well advanced on the design of a very light utility supersonic fighter which can be built cheaply, according to the Society of British Aircraft Constructors.

Folland is said to be pushing ahead with the work and embarking on the construction of prototypes as a private venture. The aircraft is described by its designers as "a radical approach to the problem of weight saving". They believe that conventional attempts to reduce weight can produce no very great overall saving in the future and the best results will come from a completely fresh start.

According to the SBAC, these plans clearly imply the need for quite a different operational technique from that used by present-day fighters, whose weight is already cut to the limits possible

No MR Britannia?

U.S. reports say that the RCAF has invited bids for a long range maritime reconnaissance aircraft from Douglas, Fairchild, and Lockheed. The same reports say that the scheme to adapt the Bristol Britannia for maritime reconnaissance duties has now been abandoned because so much modification would have been required that the plan became unfeasible.

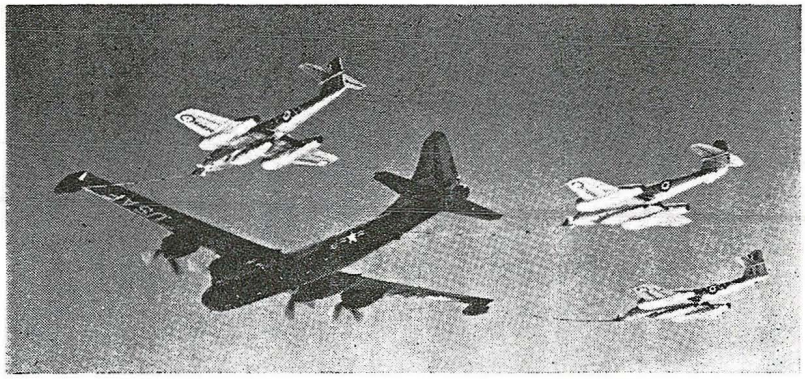
However, as recently as April 17, Defence Minister Brooke Claxton said, while discussing the possibility of increasing armament purchases from Britain, that Canada was still exploring the possibility of acquiring a license to make a new type of long-range aircraft. He presumably was making reference to the Britannia.

PSC Applied Research

Development and productive capacity of PSC Applied Research Limited will be more than tripled when three new buildings—situated near the parent Photographic Survey Corporation's O'Connor Drive plant in Toronto—are completed by mid-summer. The new facilities will add an additional 16,000 sq. ft. to Applied Research's present floor space of 7,000 sq. ft., and the enlarged laboratories will be the most completely equipped of their kind in Canada, according to General Manager J. M. Bridgman.

Machine and model shops occupy the ground floor of the main ARL building, with instrument development, production, and administration offices on the second floor. A feature of the building is a penthouse third storey, housing the drafting section, publications section, and electronic laboratories where microwave and optical research will be carried out. The central building is flanked by two smaller buildings, one for inspection, receiving, and shipping; the other for metal finishing, plating, painting, etc.

PSC Applied Research specializes in the custom design and production of electronics, mechanical, and optical devices used in industry, air survey, navigation, photogrammetry, and other fields.



FEEDING TIME: This flight photo shows an actual triple-refueling operation being carried out with a USAF B-29 tanker aircraft and three RAF Gloster Meteors. Developed by the British company, Flight Refuelling Limited, the probe & drogue system has met with greater acceptance in the U.S. than in Britain. It is used by both the USAF and the USN. A number of other systems have been tried, but most lack the simplicity of Flight Refuelling's probe & drogue.

600 Hour Avon

A Rolls-Royce Avon has been operated in service for a period of 600 hours with only routine maintenance care. The 600 hours were flown in 50 actual days in a remarkable feat of intensive flying by the RAF to determine the ultimate overhaul life of the Avon engine to the latest modification standard, as well as to provide a yardstick by which to assess RAF requirements in respect of personnel and facilities for maintaining and overhauling the latest jet engines.

To make the tests, three English Electric Canberras were used. Of the six Avons concerned, two were examined at 400 hours and one at 450 hours. As their strip condition proved satisfactory, a decision was taken to continue flying the remaining three engines to an overhaul life of 600 hours.

Maintenance during flying was negligible and the performance of the engine was still acceptable to Rolls-Royce Production Schedule at the end of the 600 hour period. Comparative figures for engine performance show that the thrust output was still within 3% of the standard figures and the increase in specific fuel consumption was as low as 0.11%.

After the 600 hour engine had been stripped and examined, the following parts were all that it was necessary to reject: four compressor rotor blades; two auxiliary drive roller bearings; two auxiliary drive oil seals; two flexible fuel pipes; two compressor shaft taper bolts.

The flame tubes, which are the commonest "short life" components on gas turbine engines, were only slightly affected, and all have been accepted for a further service life of 400 hours. The turbine was found satisfactory in every respect.

New Britannias

Three new versions of the Bristol Britannia are to be offered for world sale, according to a recent announcement from the Bristol Aeroplane Co. of Canada Limited. Designated the Mk. 200, 250, and 300, they are respectively a freight transport, a mixed freight and passenger aircraft, and a passenger airliner. All three are larger and more powerful developments of the Mk. 100 which is now in production.

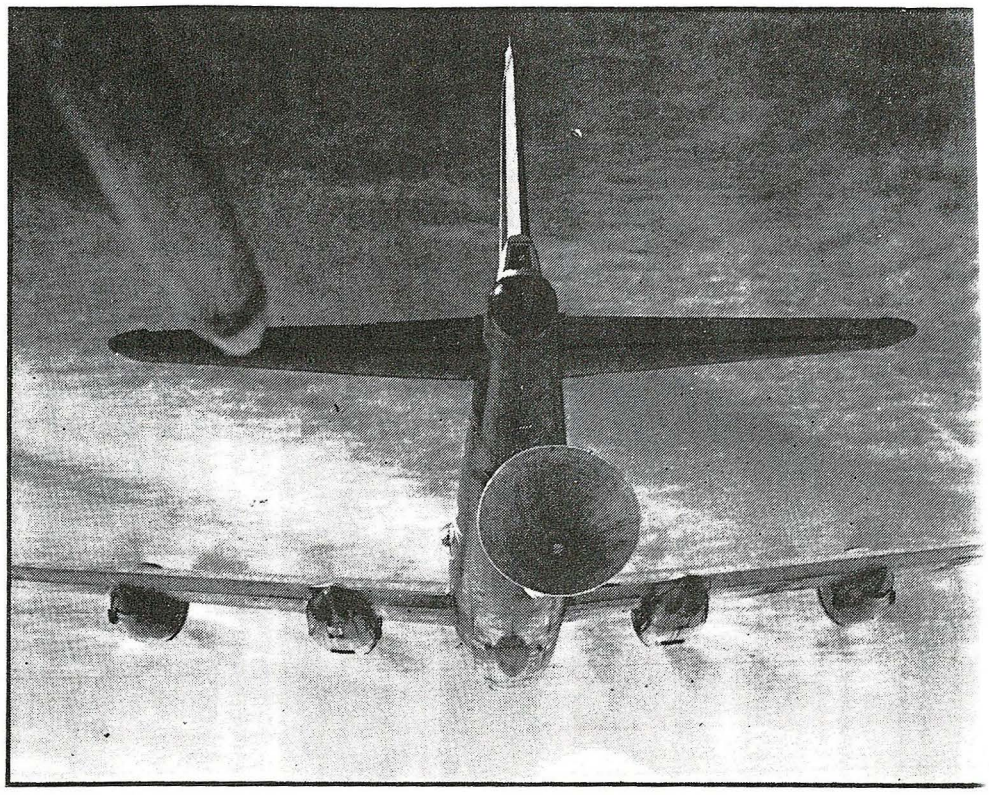
The Mk. 100, which will first enter service with BOAC, has a gross weight of 140,000 lbs., and is powered by four

Probe & Drogue Triple Threat

LATEST wrinkle in the development of in-flight refuelling is the simultaneous refuelling of three aircraft from a single tanker. Evolved by the British firm of Flight Refuelling Limited, the three-at-a-time technique makes use of the probe & drogue system of fuel transfer, also a Flight Refuelling development.

The multiple refuelling operation is made possible by fitting a small pod-like unit to each wing tip and a retractable unit in the belly of the aircraft to be used as a tanker, and mounting a probe on the nose or other convenient part of the aircraft to be refuelled.

So successful, safe and simple in operation has the system proved, that it has been adopted by the USAF and the USN. The RAF has also been experimenting with the system and has equipped a complete squadron of Meteors for evaluation trials. So far only one tanker aircraft has been fitted for three-point refuelling. It is a USAF B-29, but the refuelling equipment can be used in any suitable type of aircraft earmarked for tanker duties.

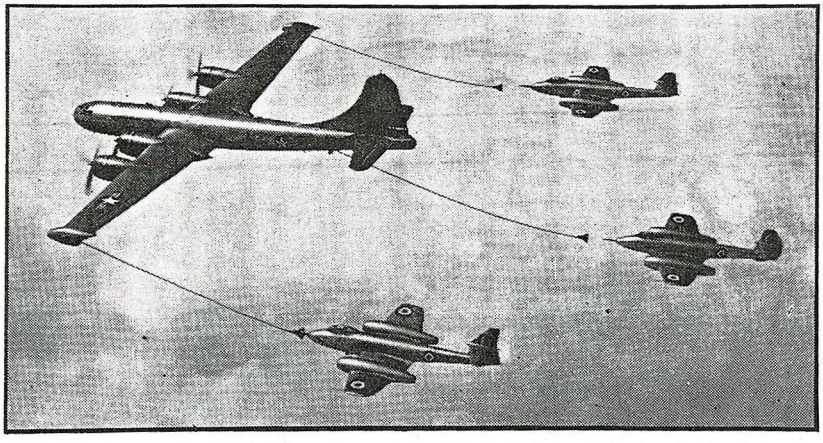


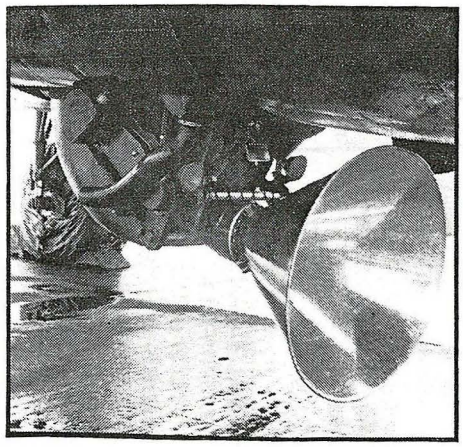
The probe & drogue, which succeeded the somewhat clumsy, though effective looped hose system, consists simply of a length of straight fuel hose trailed behind the tanker, with a funnel-shaped drogue at the end to keep the hose steady. Within the steel drogue is a simple and robust coupling. The receiver aircraft is fitted with a probe whose nozzle fits this coupling.

Rendezvous and location are assured by wireless telegraphy, radio telephone, and specially designed responder radar beacons within the aircraft. To make connection the pilot of the receiving aircraft flies up behind the tanker at a slightly faster relative speed, aims his probe into the drogue, and the coupling automatically locks the probe into place. The fuel line between the two aircraft is then complete.

Electric pumps speed the flow of fuel from tanker to receiver, and male and female valves in the probe & drogue coupling simultaneously open the fuel flow system to the receiver's tanks. When his tanks are full, the receiving pilot merely lies back and when the load on the fuel line reaches about 800 lbs. tension, the probe is released from the coupling automatically and the fighter or bomber is free to con-

THE PICTURES: Top, a pilot's view of the drogue as he approaches to refuel his aircraft. Below left, three Meteors refuel from a B-29 tanker; one has made contact, while two are nearing their drogues. Right is a close-up of the retractable unit which winches the drogue hose in and out. Pilots say that no special skill is required to refuel by this method.





LOOKING ON THE OTHER SIDE

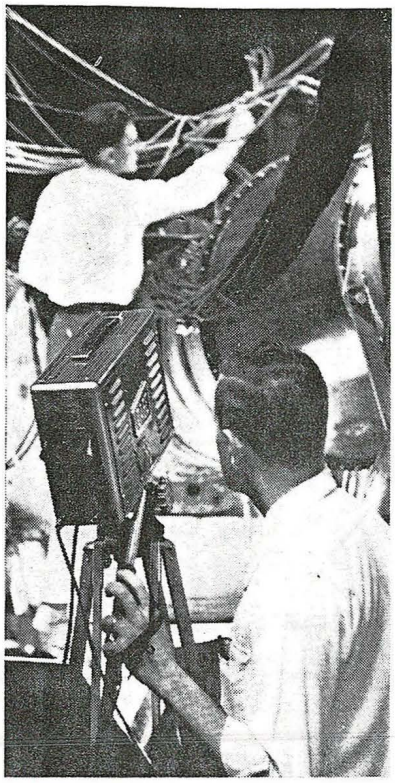
TV for Testing

How Pratt & Whitney Aircraft electronics specialists are experimenting with industrial television to test gas turbine engines and their components, was described recently by John W. R. Drummond, vice-president of Canadian Pratt & Whitney Aircraft Co. Limited.

The experiments show promise of adding an important visual aid to the test stands, Mr. Drummond said, and are being conducted by the parent company's research staff at East Hartford, Connecticut. It may soon be possible for a test stand operator, from his control panel outside the test cell, to view an engine from every angle merely by flicking a couple of remote control switches and scanning a standard screen.

P & W says that a perfected television set-up would prove invaluable, particularly in the experimental testing of advanced jet engines, for it would provide the engineering staff with visual proof of the proper functioning of various parts of an engine, previously hidden from view.

At present, engines under test are viewed from the control room through double glass panels. With the engine mounted in a fixed position, it is practically impossible, without television, to examine more than a small part of the engine through the restricted viewing panel at any one time. With television, not only can the operator see what is going on at all points of the engine under test, but it is also possible to obtain permanent records of various tests by focusing a motion picture camera on the screen of the receiver.



Pratt & Whitney experimental test engineers have been working on the industrial television project for more than two years. A group headed by Arnold Waterman, assistant project engineer; Charles Wilkins, experimental test engineer, and Ernest Amiot, development technician, has conducted most of the experimental work.

A TV camera and accessories were constructed by the group. Tests showed promise, but it was evident that several refinements would be necessary.

Chief among the difficulties encountered was the limited distance which the picture could be carried by cable from the camera to the receiver. A cumbersome coaxial cable, measuring about 2½ inches in diameter, would carry a satisfactory image only 35 to 50 feet. This posed a real problem in the large test cells at the Andrew Willgoos Laboratory.

Armed with its own extensive test data, the P & W group then obtained a compact industrial television camera (see illustration). With this equipment, the group overcame one of the major difficulties in adapting industrial television to the jet engine laboratory.

The new camera measures twelve by fourteen inches. It will carry a distortion-free picture as far as 1,000 feet over a small, easy-to-handle coaxial cable measuring only a quarter of an inch in diameter. Improved lighting has also played an important part in recent developments. The best results to date have been obtained by using banks of ordinary fluorescent tubes.

At present, only one camera is being used. But, if tests prove conclusive, the engineers envision batteries of cameras being placed in a single test cell. They are thinking in terms of mobile, rather than fixed units. The cameras could be placed on traversing mounts, allowing them to be moved alongside the engine to scan it from almost any angle.

tinue its mission.

Length of time it takes to refuel an aircraft varies, of course, with the size and fuel capacity of the receiving aircraft, but normally a fighter type machine can be refuelled in three minutes.

The probe weighs only a few pounds and can be fitted to any convenient part of the receiver aircraft . . . in the nose, on the fuselage, or port or starboard wing, or external tanks. It does not affect flying qualities.

While flight refuelling offers attractive possibilities for extending the range of civil transports, its most immediate role will be a military one . . . especially with the three-point system. Obviously it can increase the effectiveness of fighter defences many times by making it possible for fighter aircraft to remain airborne for durations up to the limit of the pilot's endurance, or until ammunition is exhausted.

In addition, days can be lopped off the time it takes to make delivery flights between continent and continent, while the Atlantic and Pacific can be spanned non-stop. Pilots report no difficulty in making connection by probe & drogue either by day or night.

Looking at it from another angle, a big advantage in flight refuelling is economy in aircraft. Even when the tankers are included, fewer, not more aircraft, are required when flight refuelling is employed. Studies show that a combined force of 100 flight-refuelled bombers and tankers could do the job of 200 un-refuelled bombers. To cover the North Atlantic gap with air patrols would take only half as many aircraft refuelled as un-refuelled.

The triple-refuelling method enables three fighters to refuel simultaneously, while four tankers could refuel a full squadron of 12 aircraft in three minutes. Refuelling units can be operated individually if desired.

Flight Refuelling claims that the system is so simple that it can be applied at small cost in weight and money to any aircraft which is equipped for pressure refuelling on the ground. A bomber or transport can be converted into a tanker in as little as half an hour, while any aircraft can have a probe fitted in a few minutes if a connection is provided in the fuel system. Ninety per cent of the equipment required for flight refuelling is already installed in a pressure-refuelled aircraft.

Bristol Buys Wright

The Bristol Aeroplane Company of Canada, Limited, has acquired the whole of the aero engine repair and overhaul business of Canadian Wright Limited from the Mailman Corporation, Limited, it was announced last month. As operated by Bristol, the business will go under the name of Bristol Aeroplane Engines (Eastern) Limited.

The board of the new company will comprise W. R. Verdon Smith as president; R. J. Reynolds, deputy president; H. V. Wright, managing director; Armand Limoges, vice-president and secretary-treasurer.

Mr. Smith is an executive director of the Bristol Aeroplane Company Ltd., of England, and president of the Bristol Aeroplane Company of Canada; Mr. Reynolds, the resident executive director of the Bristol Aeroplane Company of Canada. Mr. Wright and Mr. Limoges have been the principal executive officers of Canadian Wright Limited for many years and Bristol says that it is its intention that the business, its management, and its operations should continue without interruption.

Like its predecessor, the new company will overhaul such engines as the Merlin 224 for RCAF Lancasters, Merlin 622 for RCAF North Stars, Merlin 1650-7 for RCAF and USAF Mustangs, Wright R2600-29-13 for RCN Mitchells, and Wright Cyclone 2600-20 for RCN Avengers. The company employs some 300 persons.

The Bristol Aeroplane Company of Canada also owns and operates British Aeroplane Engines Limited, Vancouver.

Much to Do

A working force of about 10,000 will probably be employed at Canadair Limited by the time it gets its full program of aircraft construction into high gear in about a year. Current plans call for Canadair to continue production of the F-86 and to produce as well the Lockheed T-33 and the Beechcraft T-36A.

The Lockheed T-33 is to be turned out in large numbers for the USAF and the RCAF. First production orders are expected to amount to about 500 aircraft, most of which will be for the USAF. It is improbable that the RCAF will be able to make use of more than about 100 of these aircraft, unless the current plans to build a forty squadron service are drastically revised upwards.

The Beechcraft T-36A is to be built for the USAF, which is ordering about 500 of the machines, half to be produced by Beechcraft, and half by Canadair. The Beechcraft is the winner of a USAF design competition in which Canadair also had an entry (see *AIRCRAFT*, Page 9, June) that is reported to have run a close second. T-36, the prototype of which is still to be built, will use two Pratt & Whitney R-2800 engines and will have a cruising speed of about 300 mph. It will have a crew compartment for four and a passenger space for twelve.

Controlled Materials

Arrangements have been completed which will allow Canadian manufacturers to participate on an equal footing with U.S. firms in the Controlled Materials Plan which was introduced in the U.S. on July 1, according to the Department of Defence Production. It has been emphasized that the arrangements will only apply to those materials and parts imported directly from the U.S. for the production of products designated as eligible in that country.

The Priorities Division of the Department of Defence Production has issued instructions outlining the new procedure. Application for assistance will be made on a new form, DDP-173, available from the Priorities Division, Department of Defence Production, Ottawa, and from regional priorities representatives A. R. Whitten, 55 York St., Toronto, and E. A. Leslie, 325 Marine Building, Vancouver. The forms will also be available from many of the Canadian trade organizations.

Advanced J-47

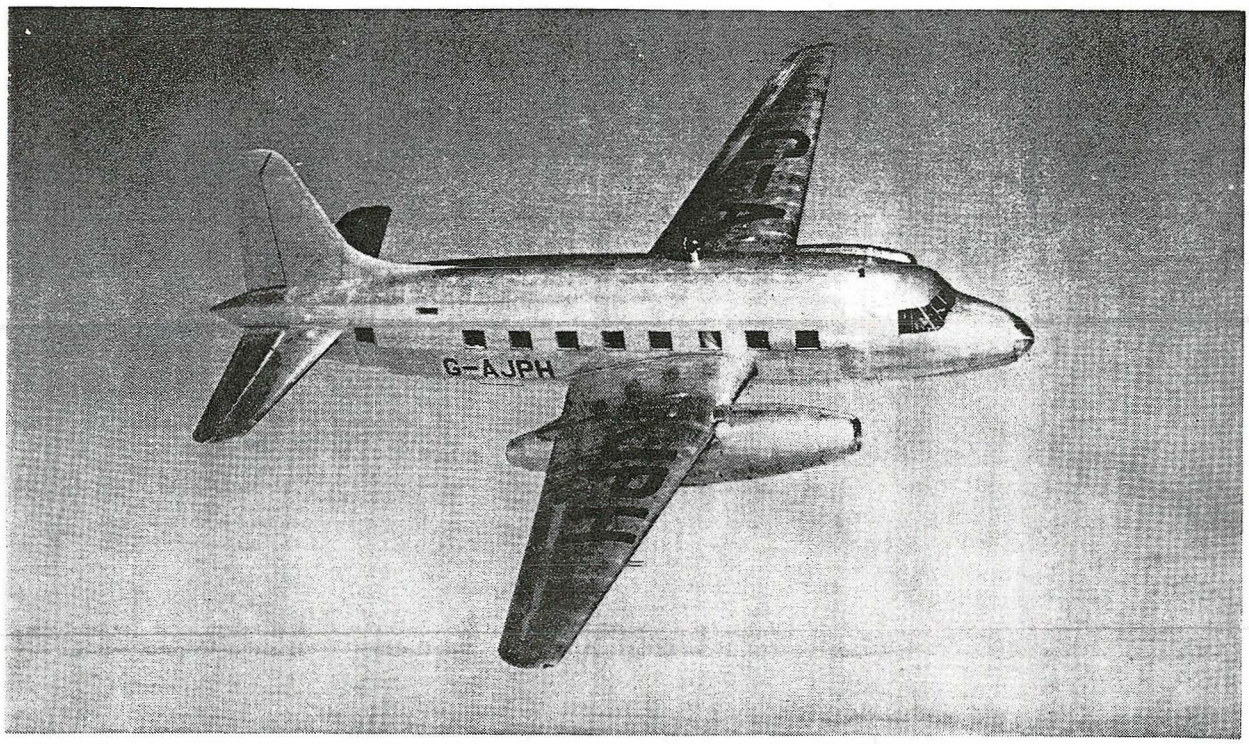
First of the advanced J-47 series of turbojet engines has been announced by the General Electric Company. The new engine, the J-47-GE-21, is claimed to have a thrust output so much greater than the current production J-47 (as used in the Canadair-built F-86) that "it isn't even in the same class". The current engine develops 5,200 pounds of static thrust.

It is described as an all-weather engine with anti-icing features and having high-altitude starting charac-

JET-POWERED CHASE: Shown on its recent first flight is this jet-powered version of the Chase Aircraft Company's C-123. Known as the XC-123A, this aircraft is powered by four General Electric J-47s and is a development of the version powered by two P & W R-2800s, which in turn was originally developed from the Chase CG-20 all-metal cargo glider. On its first flight the aircraft was off the ground in just over 1,000 feet and attained an estimated speed of more than 300 miles per hr.

PROGRESS

The Vickers "Nene/Viking"



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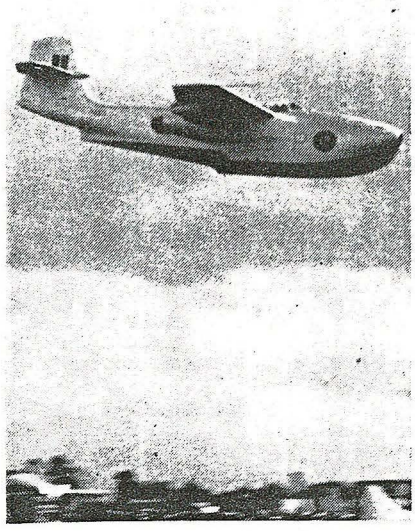
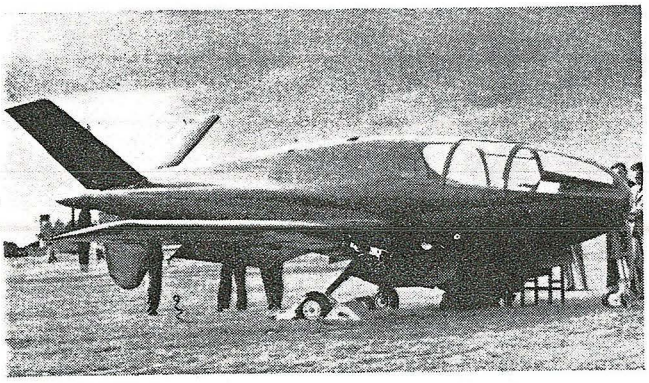
On This Page Are Just A Few Of The Many Types Exhibited At This Year's S. B. A. C. Show At Farnborough

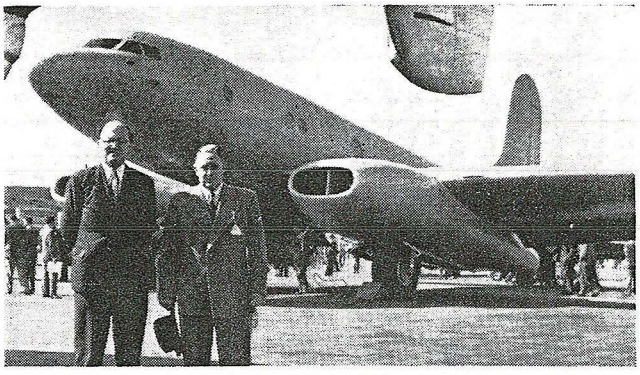
The Armstrong Whitworth AW-52, Rolls-Royce Nene powered, experimental flying wing shown in flight.



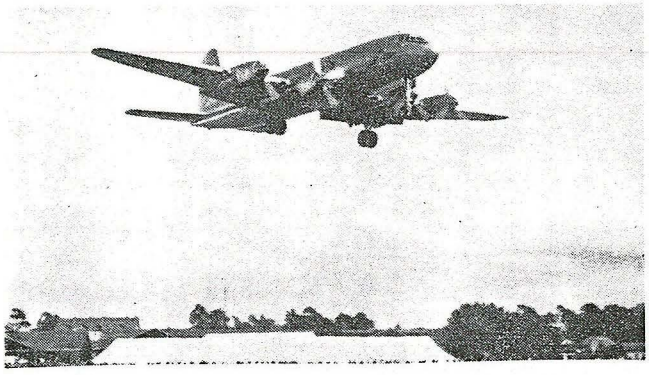
A flying boat with fighter performance is the new Saunders-Roe A/1. Two Metrovic Beryl jets are used.



Of magnesium construction the novel Planet Satellite is intended for the personal plane market. Engine is located just behind passenger cabin.

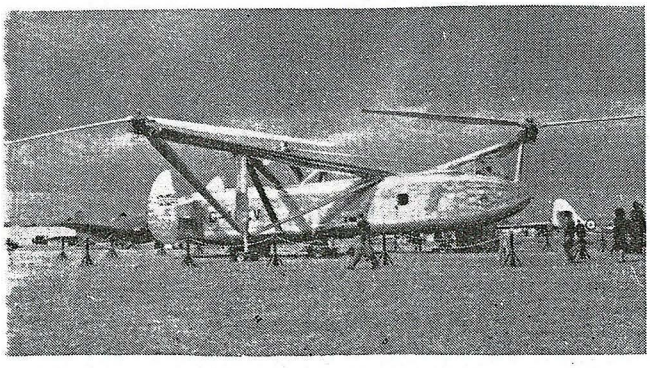


Lord Pakenham, air minister, and Sir Roy Dobson of A. V. Roe are shown standing in front of the new experimental Avro Tudor 8 jet transport.



Designed to compete with American transports, the Handley-Page Hermes IV has a maximum speed of 357 mph and a cruising speed of 298 mph.

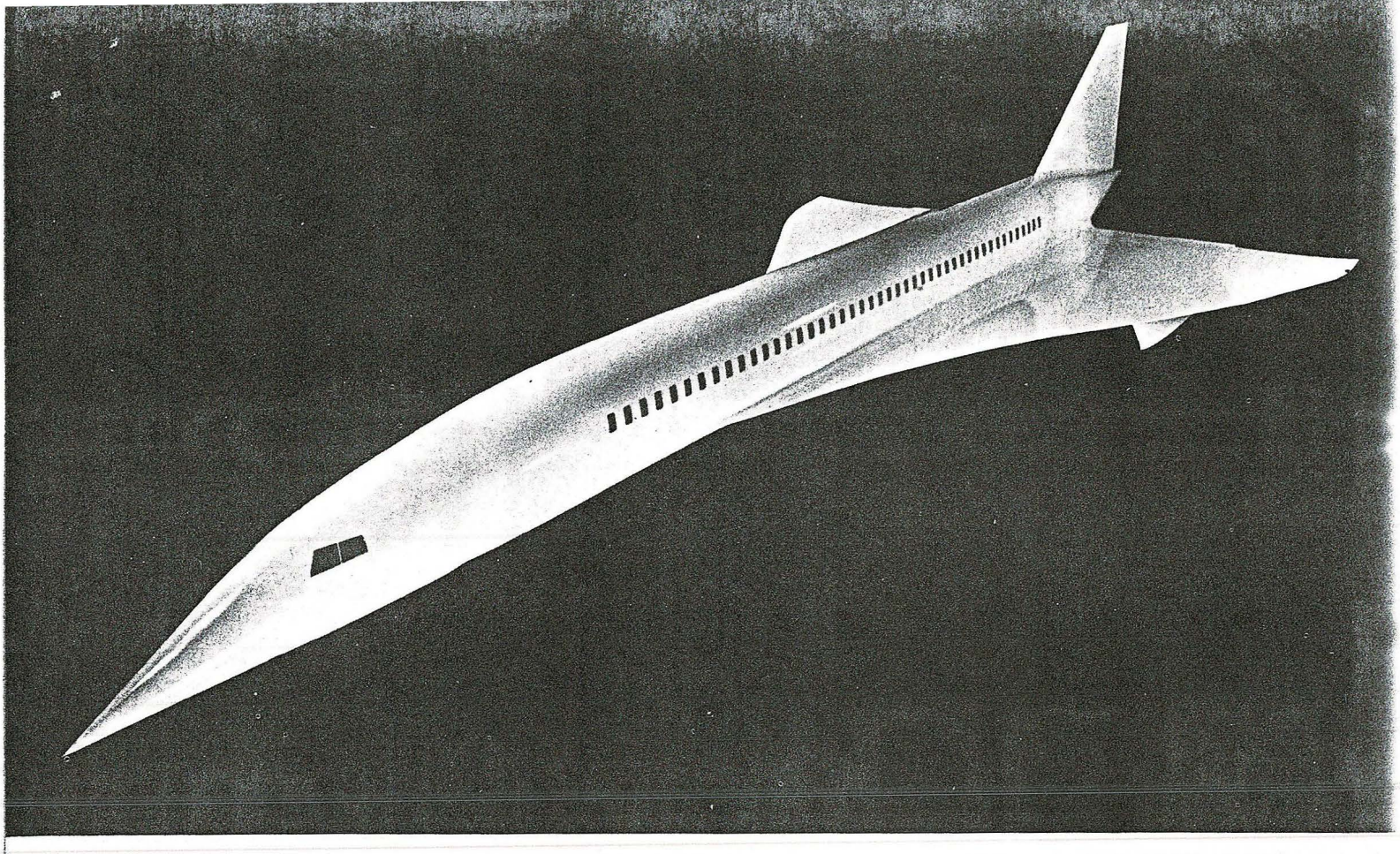
The Short Sealand II is a 5-8 passenger amphibian powered by two Alvis Leonides engines of 520 hp each. BSAA has ordered several of these.



Powered by a Rolls-Royce Merlin, the Cierva W.11 Air Horse must be the largest helicopter at present flying. It carries 24 passengers or three tons.

The Cierva W.14 Skeeter has been designed as a two-seat trainer or passenger autogyro. It is powered by a 106 hp Jameson F.F.I. engine.

AIRCRAFT



Anglo-French Supersonic Transport

WORLD AIR travellers, by 1970, should be able to wing their way to London and Paris from Montreal or Toronto in three hours instead of seven as at present, if joint Anglo-French plans turn out as expected.

"A thoroughly economical and competitive" supersonic transport is to be produced commencing at once, by two British and French aircraft companies.

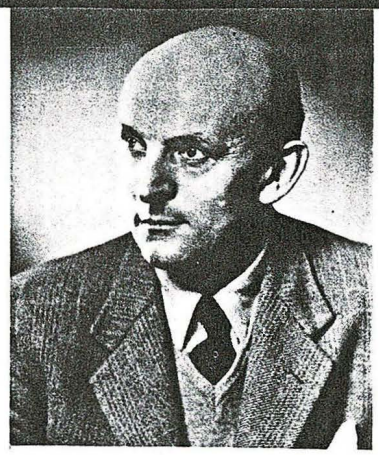
Model of the Mach 2.2 airliner shown above, is to be made with current standard materials and will reportedly meet the specifications for a 1,450 mile-an-hour passenger transport laid down in 1962 by the major world airlines who are members of the International Air Transport Association.

Sir George Edwards, managing director of British Aircraft Corporation, and General A. Puget, chairman and managing director of Sud Aviation of France in a joint statement said:

"We are delighted that the joint supersonic transport aircraft is now to go ahead. We are particularly pleased that our two companies are working together on this venture. We have both been doing preliminary work on this project for over a year and already personal friendships have been formed between many members of the two companies. They quickly discovered that there was a considerable identity of views as to the nature of any practicable supersonic airliner and that the work which had already been separately done on both sides of the Channel showed a remarkable measure of agreement.

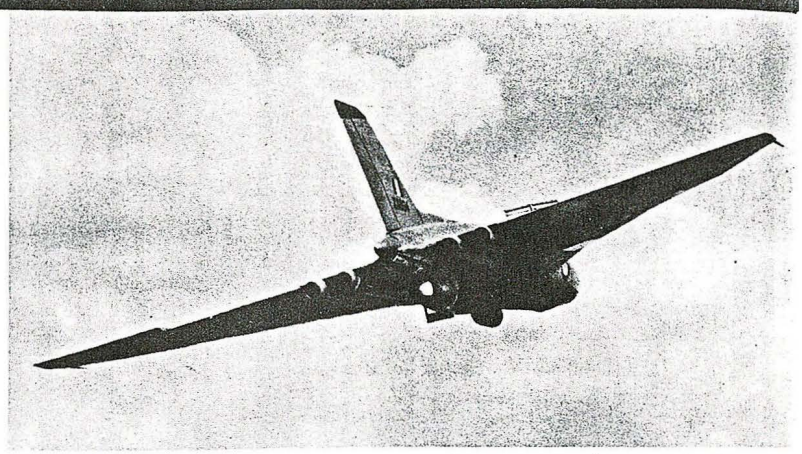
"We have no doubt that a supersonic transport is the next logical step in civil aviation. We are equally certain that the decision of our two governments to order an aircraft capable of cruising at twice the speed of sound is the correct one. Such an aeroplane can be built with conventional materials, about whose properties we have much knowledge, and will fly at speeds of which we already have practical experience. It will be powered by engines which, in basic form, are already flying and will

Gen. Andre Puget



Sir George Edwards

INTERNATIONAL cooperation between Great Britain and France is strikingly illustrated with the announcement that General André Puget, president of Sud Aviation had been elected president and director general of the joint company. Vice-president is Sir George Edwards, managing director of British Aircraft Corporation and chairman of its four subsidiary companies. These two executive positions will be rotated every two years between the two countries.



THE OLYMPUS 593 for the Anglo-French supersonic airliner is being developed from the military supersonic Olympus by Bristol Siddeley in collaboration with SNECMA. The military engine, which will power the BAC TSR-2 supersonic strike/reconnaissance aircraft for the RAF, has been flying since February, 1962, in a Vulcan bomber test bed. It is here seen, with reheat on, during the flying display at Farnborough in 1962.

use ordinary fuels. When it comes into service in about 1970 the supersonic transport will have built into it the fruits of a research programme already well under way; in France with the work jointly done by Sud, Dassault and the Etablissements de la Direction Technique et Industrielle de l'Air and in Great Britain by that of the Royal Aircraft Establishment, Farnborough. British Aircraft Corporation has supersonic flying experience on Lightning and T-188, and will soon have more with T-221 and TSR-2. There is also the HP. 115 programme. The French have experience with the supersonic Trident, Mirage III and Mirage IV.

"The supersonic transport will, of course, only be worth while if it offers its enormous speed advantage at acceptable economics. We are fully satisfied that it will take its proper place on the classic curve of aviation progress by providing this increase in speed while also producing a thoroughly economical and competitive aircraft."

The Anglo French agreement on development of a supersonic airliner brought out enthusiastic comment by Britain's world circling airline, BOAC.

"It's a promising foundation for supersonic transport development and production," said a BOAC official in London after the agreement was signed by the British on November 29.

BOAC said it would co-operate with the manufacturers by offering its wealth of experience in airline operation. If the established characteristics of the Anglo French supersonic meets the airline's needs, the BOAC board will be prepared to enter production commitments for an initial batch.

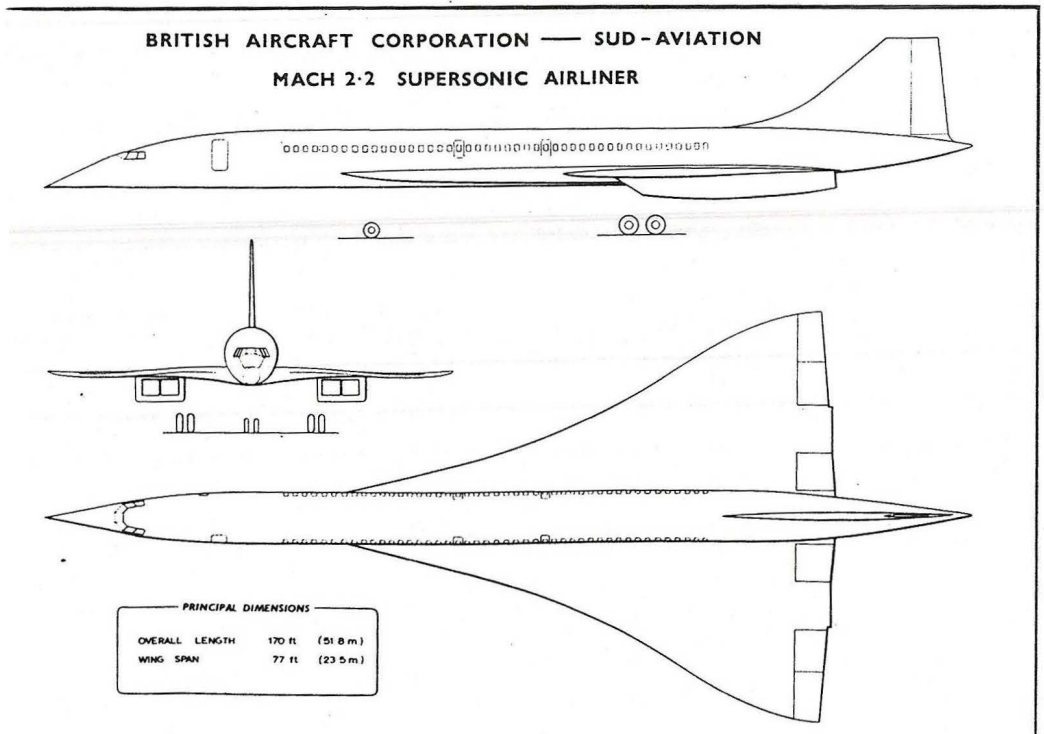
British Aircraft Corporation and Sud Aviation have agreed on plans for full cooperation to implement the joint programme of the British and French Governments for the development of a supersonic transport aircraft.

The distribution of the work between the companies is based on a fifty-fifty sharing of cost covering the whole project—airframe, engines, systems and equipment.

The central direction of the venture will be in the hands of a Board of Directors responsible for the whole industrial programme. The positions of president and vice-president of this Board will be rotated every two years between France and Great Britain.

The design and engineering organisation will organise full interchange of information and will ensure the best possible deployment of the resources of the two companies under one central control.

The organisation for the building of prototypes and of production aircraft will be on similar lines. It has been decided that each country will assemble one prototype and one pre-production aircraft. There will, however, be no duplication of the main production jigs. The manufacture of the various assemblies and sub-assemblies will be divided between the two countries and these components will then be transported to the final assembly lines in France or Britain as appropriate.



This system (each country building its part of the aeroplane and then bringing the components together in two final assembly lines) will also be followed with the production aircraft. This will, in effect, give two centres of production but both will be fed from the same main jigs, some of which will be in France and others in England. Each company will thus be responsible for one general assembly line and for the flight and acceptance tests of the aircraft it assembles.

All production aircraft will be designed to comply with the airworthiness requirements for supersonic transports as established by both the French and Britain airworthiness authorities. It is planned that the aircraft should enter service in 1970 or thereabouts.

The proposed supersonic airliner will have a slender delta planform and will be powered by four large Bristol Siddeley Olympus turbojets.

Its cruising speed of 1,450 mph will enable it to make a Transatlantic flight in about three hours against the seven hours flight time by current big jets. A flight from London to Sydney, Australia, will take about thirteen hours against the present schedule of more than twenty-five hours.

The aircraft will accommodate about 100 passengers and the passenger cabin will have a normal complement of windows. The overall length of the aircraft will be 170 feet and the wingspan 77 feet.

The Mach 2.2 airliner will be built mainly in aluminium alloy with localised use of titanium or stainless steel in areas subject to high thermal stresses. A retractable visor will be raised in supersonic cruise to reduce aerodynamic drag and lowered in subsonic flight to provide normal vision for the crew.

The engines proposed for the supersonic airliner will be civil versions of the supersonic Bristol Siddeley Olympus being developed for the British Aircraft Corporation TSR-2 strike/reconnaissance aircraft. Mounted in pairs in two nacelles beneath the wings, the engines will exhaust at the wing trailing edge.

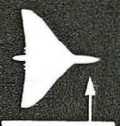
Before they began cooperating on this project, the French and British designers had independently reached the conclusion that the best practicable cruising speed for the supersonic airliner was Mach 2.2. This choice was determined by a combination of economic and technical factors.

If, for the next generation of airliners, only a moderate increase were made over present high-subsonic cruising speeds, the aircraft would have to operate largely in the transonic regime where, owing to the onset of "wave drag", a serious falling-off in aerodynamic efficiency occurs. Such an airliner could not compete economically with the present highly developed

(continued on page 33)

In 1956 the British Government set up a Supersonic Aircraft Committee which was a combined operation between the National Establishments and the aircraft industry. This Committee initiated a series of important aerodynamic and structural investigations into the shape and scope of a supersonic transport. In 1959 the Committee recommended that the British aircraft industry should make preliminary studies of an aircraft cruising at M 2.2 (some 1500 m.p.h.). In 1959/60, British Aircraft Corporation was awarded a detailed design study contract of a transatlantic range aircraft to be based on work already done by Bristol Aircraft Limited, a subsidiary company of B.A.C. In France, Sud-Aviation was also doing design studies and in 1961 Sud revealed results of their work on a project bearing a close family resemblance to some of the British shapes but aimed at a shorter range operation. At the end of 1961 Sud-Aviation and British Aircraft Corporation, with the backing of their respective Governments, began to co-operate on the supersonic transport design which has now been adopted for manufacture.

1962
T-188 supersonic research aircraft first flight



1962
Olympus Vulcan flying engine test bed

EVOLUTION OF A SUPERSONIC AIRLINER

1956
The first studies were on planforms similar to the above

1956-59
Further work suggested that the optimum planform might not be triangular

1959
Design study of a "paper" aeroplane for S.T.A.C. by Handley Page

1959-60
Preliminary design study by British Aircraft Corporation

1961
Design study by British Aircraft Corporation

1961
HP-115 built to study low speed handling of slender-wing aircraft

1961-62
Work started on Bristol T-221 (ex-Fairey D.2) to investigate high speed handling of slender-wing aircraft (first flight 1963)

1962
B.A.C./Sud Supersonic Transport

* In Great Britain alone some 300 models of supersonic wings have been tested in Ministry of Aviation wind tunnels. The development of the slender wing has been expedited by a co-operative effort from Government Research Establishments, the Aircraft Industry and the Universities.

1956
DURANDAL
Mach 1·6
Dec 56

1957
TRIDENT 01
Mach 2
8 Jan 57

1958
MIRAGE III
Mach 2
24 Oct 58

1958
GRIFFON
Mach 2·05
31 Oct 58

1960
MIRAGE IV
Mach 2+
Sept 60

EVOLUTION OF THE S.S.T.

French supersonic experience is already extensive and includes military aircraft which, since 1957, have been flying at about twice the speed of sound.

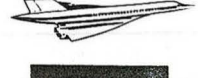
This supersonic experience began with the Durandal and the Trident of Sud-Aviation and was followed by the Griffon of Nord-Aviation and the Dassault Mirage III and IV.

Since the end of 1956 French official facilities have been deployed on an examination of a supersonic airliner. Just afterwards, Sud-Aviation also began similar studies and, in 1959, the French Air Ministry officially asked Sud-Aviation, Nord-Aviation and Générale Aéronautique Marcel Dassault to work on a project for a medium range Mach 2·2 supersonic transport.

Of the three projects which resulted, that of Sud-Aviation was chosen in October 1961 and work on the Super Caravelle followed in collaboration with Dassault. A model of the Super Caravelle was shown at the Paris Salon in 1961.

Towards the end of 1961 there began discussions about a joint programme with British Aircraft Corporation who were then working on a long range supersonic airliner of similar configuration.

1961
S. S. T.
French version
Mach 2·2
June 61



1962
S. S. T.
French/British version
Mach 2·2
Sept 62

Supersonic Transport

(*continued from page 11*)

and highly efficient subsonic jets.

However, as Mach number increases, two favourable factors are introduced: the effects of the falling-off in aerodynamic efficiency become more and more gradual and the efficiency of the turbine engine is progressively increased.

Good economy, in terms of seat-mile costs, can therefore best be achieved by operating at the highest practicable supersonic speed in order to exploit the increasing propulsive efficiency to the fullest advantage.

British Aircraft Corporation and Sud Aviation designers decided on a Mach 2.2 cruising speed because techniques and materials used for an airliner operating in this environment need not be radically different from current practice. Beyond this speed, aluminium alloy structures begin to suffer rapid deterioration and a complete switch to costly new materials and construction methods is necessary.

The first cost of the projected supersonic airliner will not be greatly in excess of that of current large subsonic airliners. Fuel costs and some hourly direct costs, such as depreciation and insurance, will also be higher. But the greatly increased operating speed will increase aircraft productivity, and will have the effect of reducing these charges per aircraft mile.

The total aircraft mile costs for a Mach 2.2 airliner should therefore be lower than those of the best subsonic airliner. Its greater annual carrying capacity will enable the operator to meet given traffic requirements with a smaller fleet.

The problem of the sonic boom has a great influence on the characteristics of a supersonic airliner, and the Anglo-French airliner is being designed to take account of the extensive research in both countries and the United States into the problem. In addition, it is expected that by adopting special operational techniques and by not flying at supersonic speeds below certain altitudes, disturbance can be reduced to a minimum.

On the runway, noise produced by the supersonic airliner is expected to be little more than that from current jets. Beyond the runways, where the noise caused by present big jets is monitored, the supersonic airliner should be quieter because the greater engine power available will enable higher speed and altitude to be attained in the initial phase of the climb and permit a proportionately greater throttling back.

ATAC Annual Meeting Report

(*continued from page 20*)

facturing industry, by calling on members to play their full role as leaders in the air transport field.

"We believe ourselves to be specialists in our field," he said. "As such, we should clearly put our thoughts on record."

The association's aim was to foster, encourage and stimulate the use of commercial air services in Canada . . . " and to promote sound practices and high professional standards among members."

For this it was necessary to clearly define the situation of air transportation in Canada and to stress the need for sound aviation policy.

"We must look unto ourselves and produce those important recommendations and actions which are necessary to perform our duties as an Association," Mr. Austin concluded.

RCAF Round-Up Report, 1962

(*continued from page 27*)

The year 1962 also saw RCAF participation in some aspects of space exploration. In collaboration with the Defence Research Board, a small Arcas research rocket was launched from RCAF Station Cold Lake, Alta. in September.

Reaching an altitude of 60 miles, it investigated polar cap absorption, which often causes communications blackouts in northern Canada after large solar flares. Data from the rocket's instruments were collected both by telemetry during flight, and by recovery of the nose cone after its parachute descent.

Also in the realm of space research, two RCAF CF-100s with their air and ground crews were stationed at the USAF's Patrick Air Force Base in Florida and played an important role in the U.S. missile program. In this third phase of "Operation Lookout", a joint RCAF—Defence Research Board project, the crews made infra-red observations of missile launchings, as part of a continuing program of research into anti-ballistic missile defence.

In Operation "Tirec", in February, the RCAF and Department of Transport collaborated with the U.S. Navy in photographing ice formations in the Gulf of St. Lawrence at the same time as similar pictures were being transmitted by the meteorological satellite TIROS IV in orbit over the Gulf.

Purpose of the operation, in which RCAF Argus, Lancaster, Dakota and CF-100 aircraft took part, was to obtain comparative data, enabling photo-interpreters to "read" ice conditions.

At the Primrose Lake Evaluation Range in Alberta, an RCAF technical crew maintained a watchful eye on space with the Baker-Nunn Satellite Tracking Camera installed there this year. One of a number located around the glove in the Smithsonian Institution's space tracking program, the three-ton camera is electronically controlled and specially designed for studying satellites and their orbits.

In the first ten months of 1962, the RCAF was instrumental in saving 95 lives. Some 4,000 hours were flown, 54 search operations conducted, and 240 mercy flights made to bring sick and injured persons from remote parts of the country to medical aid. In the same period 550 marine incidents were also co-ordinated by RCAF search and rescue centres. ■

Welcome Service is an innovation recently instituted by Air France to assist their travelling public. At Welcome Service counters throughout the world, including five in Canada, knowledgeable attendants give advice about everything from baby-sitting services to how to find a bi-lingual secretary, from how to rent a camera or a dinner jacket to finding a dentist or numismatist. Begun in Tokyo last year, it proved so popular that the French airline has now opened up 23 counters in North America alone, with numerous others throughout the world. Canadian locations include Montreal International Airport and airline offices in Montreal, Toronto, Vancouver.

Avro 748 Demonstrated in Vancouver

IN VANCOUVER recently, a versatile new aircraft made the DC-3 appear obsolete — while officials of Pacific Western Airlines looked on.

PWA were inspecting the 50-passenger Hawker Siddeley Avro 748, a plane which has already replaced the DC-3 in a number of other airlines.

As the aircraft climbed into the sunshine through the clouds, the pilot feathered one engine 9000 feet over Vancouver Island. The 748 flew 15 minutes at 170 mph on one engine and Hawker Siddeley officials said the plane was fully operational.

Hawker Siddeley claim that if any part of the aircraft were damaged, its job would be done by a neighbouring structure and the reduction of strength in that area would not exceed 20 per-cent.

PWA president, Dick Laidman, said the Avro 748 was the best plane he had seen and the airline might buy two and perhaps three aircraft, at a cost of a million dollars each.

The actual plane used for demonstration purposes will fly the Queen on her tour of eastern Canada this summer. The interior, laid out for the Queen, is not luxurious. Eighteen seats are provided forward, behind a small galley. In the rear is a lounge fitted with a couch and four chairs around a folding table.

The Queen has already ordered two prototypes. The plane demonstrated in Vancouver was diverted from a South American demonstration tour so that PWA officials could inspect it. It was then returned to England where Prince Phillip learned to fly it.

After demonstration and return of the aircraft, a Hawker Siddeley economic expert will advise Pacific Western Airlines on how best to incorporate the plane into their fleet.

Since January 1959, the Hawker Siddeley staff have hammered out the knotty problems of the 748 design. From its first flight in 1960 through its tropical trials in Spain and Cyprus in 61, to its final certification of air worthiness in 1962, the 748 has come a long way.

With an ability to stop 700 feet after touching down on rough runways, the aircraft could be a great boon to the airline in the North. It has a 100-mile-an-hour edge in speed, carries twice the payload of its precessor and has a range of 1000 miles.

The flight compartment has been designed to make things easy for the pilot. Both pilots' seats are fully adjustable. The jump seat hinges either to accommodate a third crew member or provide a take-off seat for the cabin crew.

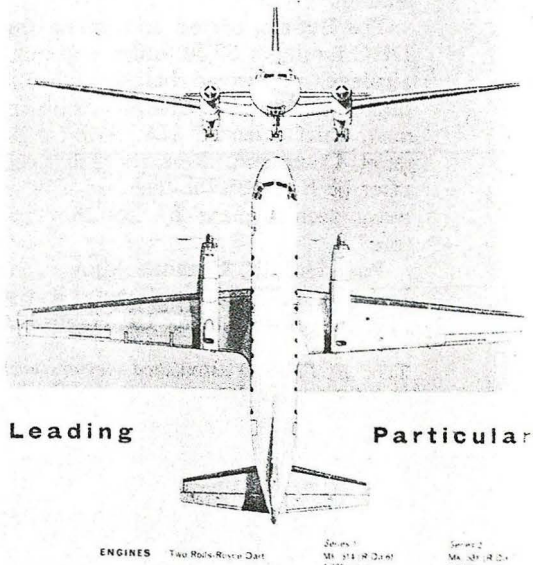
Except for access to the flight compartment, all maintenance is done from outside the aircraft. Mechanics do not enter passenger quarters.

The width of the fuselage is constant throughout the length of the passenger cabin. Therefore there is no reduction in the number of seats towards the rear of the plane.

The plane also can fold its seats away, thus converting itself from passenger to freighter in a matter of minutes. This, and other features, is expected to make the Hawker Siddeley aircraft a good replacement for the DC-3 in short-haul airlines.

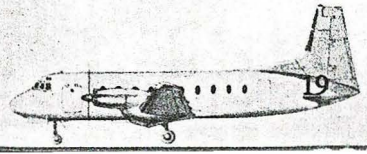
The 748 has been extremely successful overseas. Aerolineas Argentinas have the Hawker Siddeley plane in use nine hours daily. Skyways Coach Air Limited, B.K.S., Air Transport Limited, and the Brazilian Air Force are using the 748 with 100 per-cent regularity.

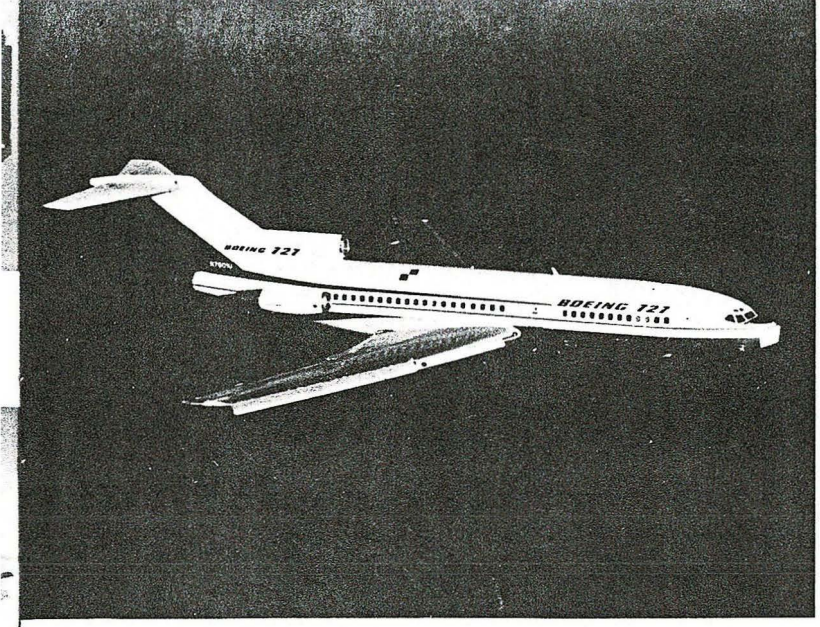
Two versions are currently in production: the Series 1 powered by two Rolls Royce Dart 6 engines, each of 1700 static horse power; and Series 2 with Dart 7 engines of 1910 static horse power.

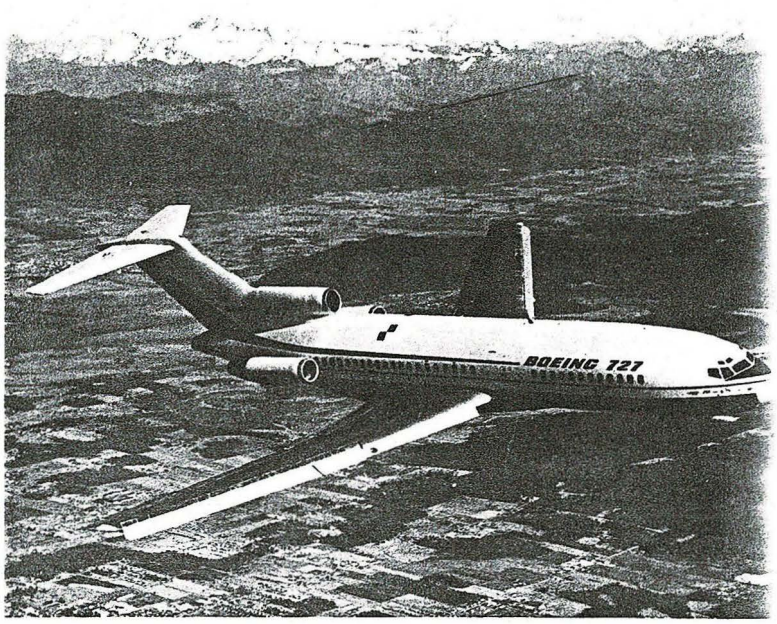


Leading Particular

		Series 1	Series 2
ENGINES	Two Rolls-Royce Dart	Mk. 531 (R.Da.6)	Mk. 534 (R.Da.7)
		1,700 s.h.p.	1,910 s.h.p.
OVERALL DIMENSIONS	Length	67 ft. 0 in.	67 ft. 0 in.
	Span	98 ft. 6 in.	98 ft. 7 in.
	Height (above ground)	24 ft. 10 in.	24 ft. 10 in.
FUSELAGE	Length	67 ft. 0 in.	67 ft. 0 in.
	Maximum diameter (external)	8 ft. 9 in.	8 ft. 9 in.
MAINPLANE	Gross area	810 sq. ft.	810 sq. ft.
	Span	98 ft. 6 in.	98 ft. 7 in.
	Aspect ratio	11.967	11.967
	Taper ratio	0.365	0.365
UNDERCARRIAGE	Track	24 ft. 9 in.	24 ft. 9 in.
	Wheelbase	20 ft. 1 in.	20 ft. 1 in.
FUEL CAPACITY		1,408 Imperial gallons	1,408 Imperial gallons







BOEING 727 SHORT RANGE JET TRANSPORT

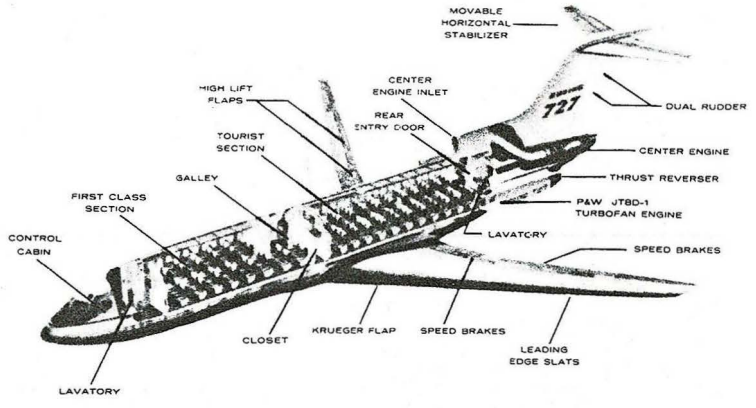
AIR & SPACE - June/63

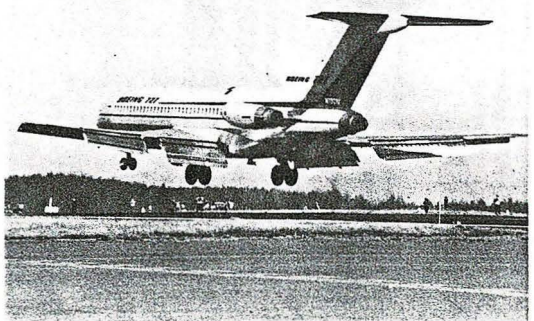
GRACEFUL tri-motored Boeing 727 in maiden flight over a typical Pacific-coast area near Seattle, above left, and below.

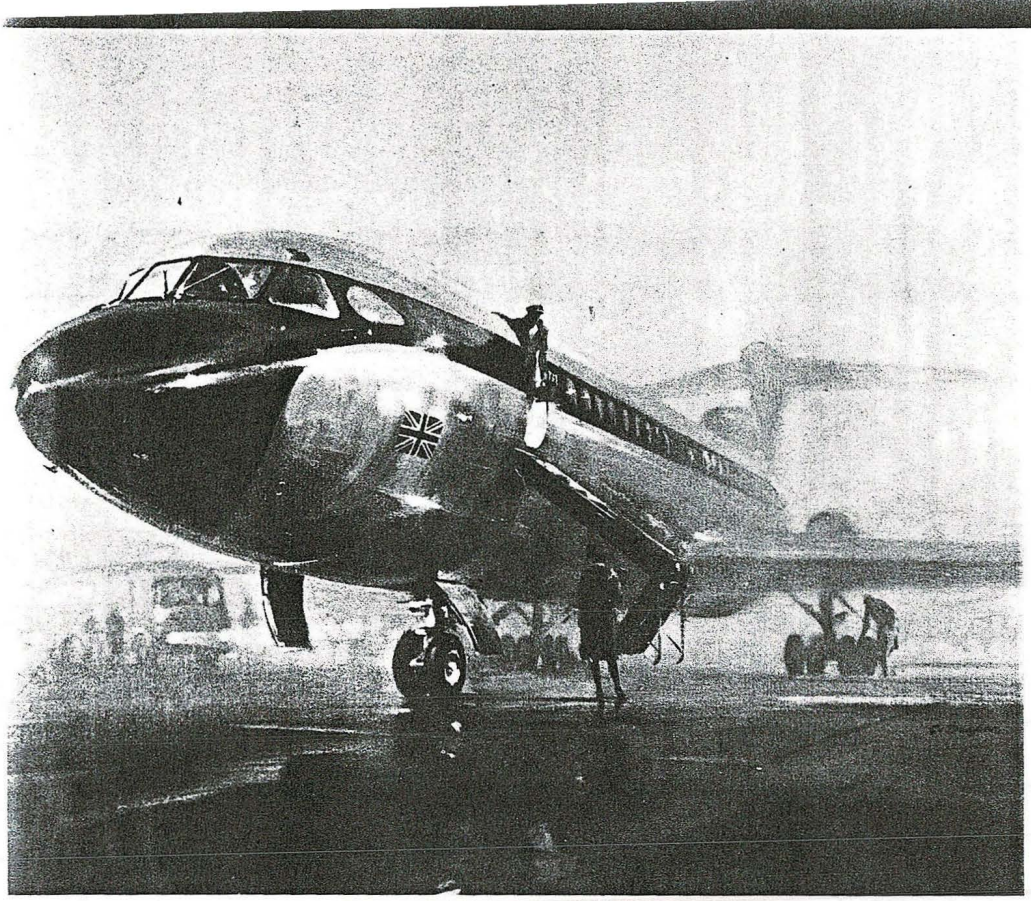
WORLD'S newest jet airliner, the 727, latest in the Boeing jetliner series pictured over Washington State February 9 during its maiden flight. Three Pratt & Whitney JT8D turbofan engines are mounted singly in pods on either side of the aft fuselage and in the tail cone.

	BASIC	ALTERNATE *
Maximum gross weight (ramp)	143,000 lbs.	153,000 lbs.
Maximum takeoff weight	142,000 lbs.	152,000 lbs.
Zero fuel weight	109,000 lbs.	109,000 lbs.
Wing area	1650 sq. ft.	1650 sq. ft.
Engines (3)	P&W JT8D-1	P&W JT8D-1
Design payload	24,000 lbs.	24,000 lbs.
No. of passengers		
First class	70	70
Tourist	114	114
Cargo volume	855 cu. ft.	855 cu. ft.
Fuel capacity (U.S. gallons)	7000	7500

*Includes minor aircraft changes for additional range.







Low Visibility Operations Not Feasible Before Are Now Possible as Triplexed Autoflare System Provides Accuracy Beyond Normal Human Capability.

INSTRUMENTED landings at 100-ft. ceilings now possible in Trident.

TRIDENT'S Automatic Landing System

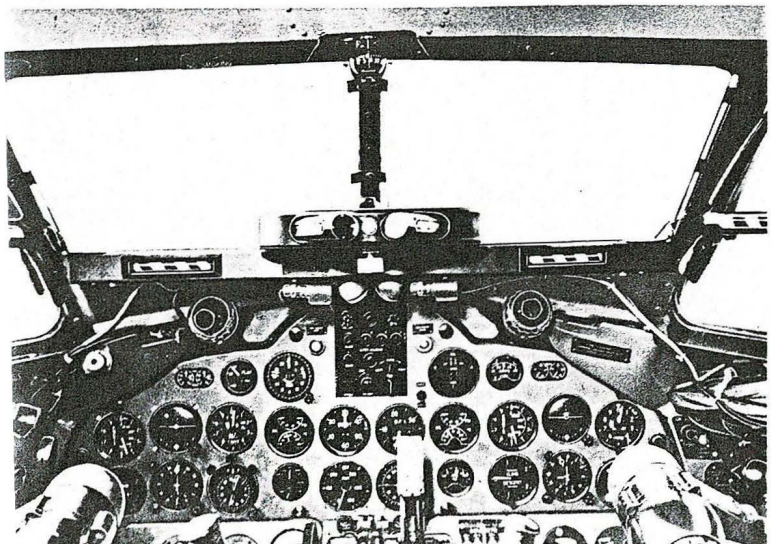
STATISTICS show that almost half the major airline accidents occur during the final approach and landing. On average, one such accident will happen in every 150,000 landings.

So, taking the 33 principal airfields in Europe, where there are currently some 750,000 landings a year, the average expectation would be about five major landing accidents within twelve months.

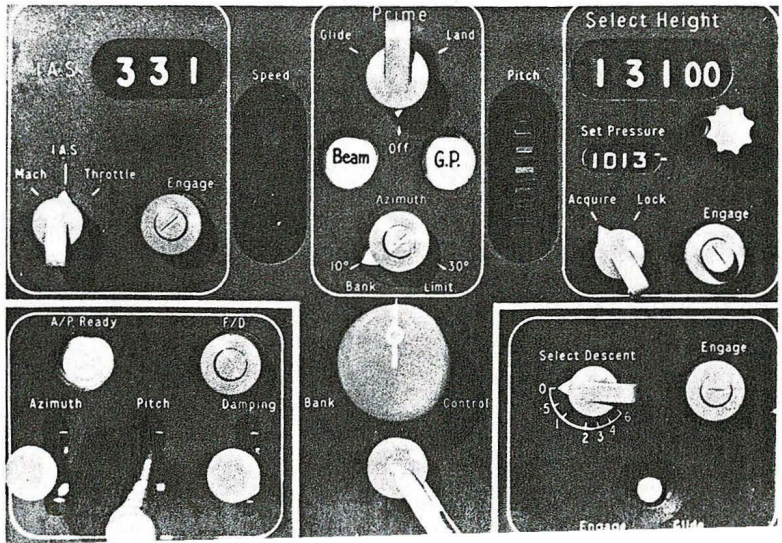
Most of the landing accidents occur in conditions of good visibility and are due to errors in height during the final approach and flare-out phase, caused by misjudgement or failure to control pitch attitude and airspeed.

The Trident automatic landing system is designed to eliminate practically all such accidents. The system design is based on the airworthiness requirement that it must show itself to have a reliability of not more than one failure in 10 million landings—a standard many times better than that achieved even by the most experienced airline.

BARBERS-pole indicators, here seen installed in a Dove aircraft, are part of the Para Visual Director system developed by Smiths Instruments for the Trident. Pilot has a compelling signal in pitch and yaw, enabling him to continue landing or to overshoot with duplex system disengaged.



ENLARGED view of the flight controller panel as installed in the Trident. Disposition of the controls is arranged to coincide as far as possible with position of the corresponding flight instruments on the instrument panel of the aircraft.



The Trident system has already shown itself to be capable of controlling the aircraft during the approach and landing with a consistency and accuracy well beyond human capability.

Safety in automatic landing is achieved by the multiplexing of systems to obtain an acceptable standard of reliability. In the Trident both duplex and triplex systems are being made available and both can make a considerable contribution to airline safety and regularity.

In the duplex system an autopilot has duplicated components with associated computers and radio receivers working in synchronism. If one channel malfunctions and thereby disagrees with the other, both are automatically cut out leaving the pilot with his aircraft correctly trimmed to continue the landing or overshoot. For this reason the duplex system cannot be certificated for operation in visibilities in which the pilot is unable to see sufficiently to take over if the autopilots cut out.

In the triplex system there are three autopilot channels working in synchronism. If one malfunctions the remaining two will 'out-vote' and cut out the faulty system. A pilot would not, therefore, be required to take over during the approach and landing unless two autopilots were to fail together.

Since the Trident autopilot and contributory systems are triplexed, however, it can be shown that a double autopilot failure is not likely to occur more than once in 10 million operations.

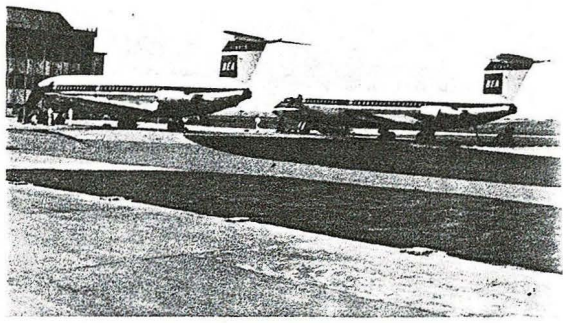
The only ground aid required for the Trident system is a good I.L.S. installation with appropriate standards of reliability. Leader cables are not required and indeed a new I.L.S. localiser, recently developed, has shown itself to be as accurate as the leader cable in azimuth guidance down to and along the runway.

When the Trident goes into service with BEA towards the end of 1963 it will be equipped to the duplex level which will provide 'autoflare' although not certified for 'autoland'. With autoflare the aircraft will carry out an automatic approach with the speed closely regulated by automatic throttle control, and will make an automatic flare-out. The automatic vall and yan controls are disconnected and the pilot is concerned only with keeping the aircraft level and aligned with the runway.

So, although 'autoflare' with the duplex system is not entirely automatic, it may well bring about a useful reduction in acceptable weather minima. And, because it can perform with great accuracy the difficult height and speed control tasks of the approach and landing, it will certainly cut down the number of missed approaches and reduce the hazards in marginal weather conditions.

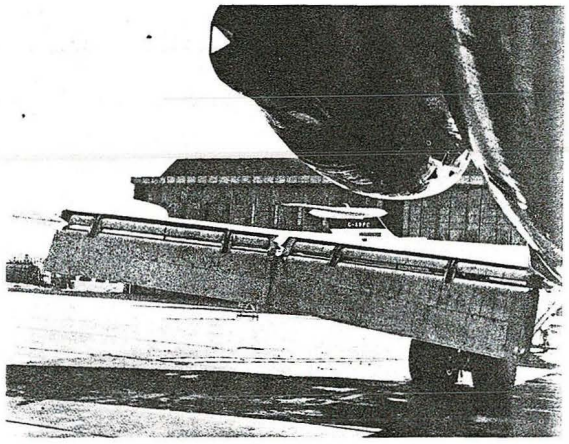
Recent assessments of the Smiths P.V.D. (Para-Visual Director) have shown that the director information to the human pilot is sufficient to enable him to continue the landing or to overshoot when the autopilot has cut out.

This provides a third channel or means of controlling the aircraft which is independent of the duplex autopilot. When this system is



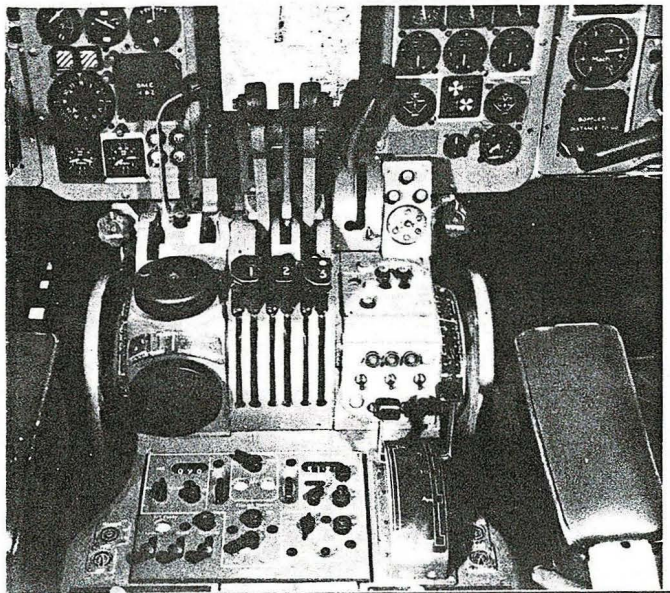
THE FIRST and second triple-engine jet Tridents standing outside the flight hangar at Hatfield, England.

The Trident has a wing span of 89 ft. 10" while overall length is 114 ft. 9". In a typical mixed-class configuration the Trident will carry 25 first-class and 58 economy class passengers. Maximum high density capacity is 104 persons, sitting six abreast. The three Rolls-Royce RB163-1 Spey turbofans each produce 10,400 lbs thrust on take-off.

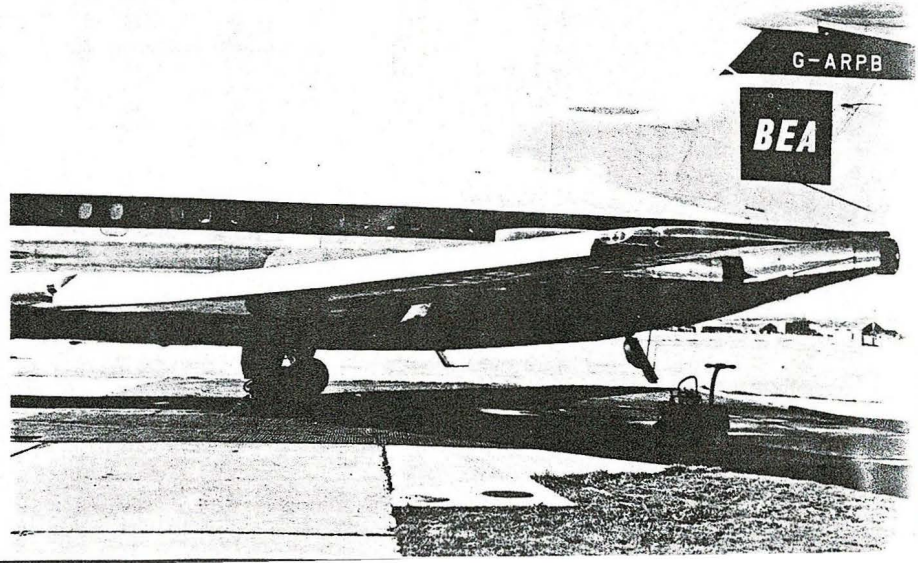


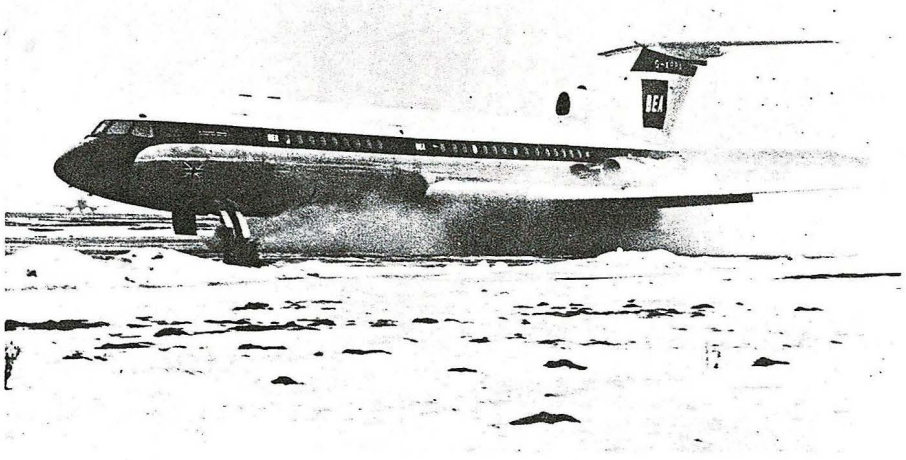
DOUBLE slotted flaps. Operation by hydraulic motors torque shafts and irreversible screwjacks is similar to the droop leading edge system. The screwjacks incorporate scrapers to remove ice from screw threads. A full scale hydraulic and flying control rig is being used for functional testing, fault analysis and endurance testing.

FLIGHT control panel for the automatic system in the Trident is conveniently placed on the horizontal control panel between the first and second pilots, a position which makes it easy for the third pilot to monitor the landing procedure.



LEADING edge droop. One of the high lift devices used on the Trident. It is operated by hydraulic motors via torque shafts and screwjacks. Protection is provided against asymmetric operation by simple mechanical circuits which cut off the drive motors. Photo shows the single wing fence, to be finally positioned on the dihedral line.





JANUARY English snow permitted high-speed taxying "bow-wave" trials on slush covered runway at Hatfield. Two-inch depth slush was no problem for this Trident says de Havilland.

brought into use an aircraft fitted with the duplex system and P.V.D. should be able to operate safely in weather minima much below the limits in use today.

It should be emphasised that the duplex system is capable of providing for both autoflare, as described above, or autoland—in which the whole landing operation is automatic, including guidance in azimuth and kicking off drift before touchdown. It therefore differs from the triplex system only in the minimum limits of visibility to which it can be certificated.

With the introduction of the fully developed triplexed system for the Trident, in five or six years' time, forward visibility will not be a factor in the landing manoeuvre and the ability of the pilot to control the aircraft on the ground will set the limiting weather conditions.

The operator's choice between 'autoflare' at a duplex level or 'autoland' at a duplex or triplex level will be governed largely by the incidence of bad weather on the routes concerned. Either system, in the appropriate circumstances, can be expected to bring about a significant saving in airline costs by a drastic reduction in delays, diversions, cancellations and aircraft damage. ■

Flight Test Progress of Trident Short-Haul Triple-Engine Jet

THE FIRST four De Havilland DH 121 Tridents have now completed over 500 flying hours in well over 300 flight tests, and one aircraft G-ARPB has already established an unofficial speed record.

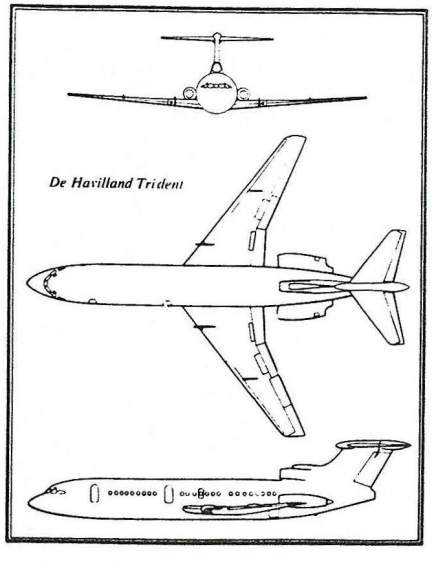
Hawker Siddeley's triple-engine jet-liner in November unofficially broke the speed record between London and Rome—at an average speed of 575 mph, while on its way to Africa for tropical trials. The 930 mile hop to Rome took 97 minutes. The official record at 566 mph is held by a two-seater Hawker Hunter.

The Trident is the first of a new generation or short-haul jet airliners incorporating experience of the first five years of regular jet operations. It represents, in fact, a development of the rear-mounted turbojet ideas introduced by Sud-Aviation in the successful Caravelle.

Power plant of the new aircraft consists of three Rolls-Royce RB163-1 Spey turbofans.

The "Autoflare" automatic landing system with which the Tridents are being equipped is said to be the closest approach yet to a true all-weather transportation system.

Smiths Aviation Division's "autoland" system, from which the "Autoflare" has been developed, is presently in use on RAF strategic bombers. All-out attempts at true reliability in this system have resulted in a development of triplication of all system components.



Autoflare permits full instrument landings at 100-foot ceilings and one-quarter mile visibility instead of the ILS maximum standards of 200-foot ceilings with one-mile visibility as at present.

The first flight of aircraft 1.G-ARPA was preceded by thorough investigations using an electronic flight and systems simulator. This simulator was coupled to an analogue computer into which had been fed the estimated aerodynamic characteristics. As a result of this, a number of modifications were made to the control system and many hours of test flying were saved. From the first flight, handling and control have been much better than is usually the case with a new aircraft.

On the aircraft, the undercarriage gives a rather hard ride, when taxying, due to bending forces acting on the oleo. A lever suspension system to cure this has been designed for incorporation on the existing undercarriage and will be installed on the aircraft early in 1963.

Since its first flight on January 9, 1962 1.G-ARPA has been used principally to investigate handling and performance, and to determine the precise configuration of the wing and its moving surfaces. Much time has been devoted to the attainment of good and safe flying characteristics at and near the stall.

The flight range covered has been from stalling speed to indicated air speeds and Mach numbers of 340 knots and 0.90 respectively. Within this range the original wing profiles have been confirmed as satisfactory, although modifications to the range of movement and span of the leading-edge devices, and to the shape of the slat on the double slotted flaps have been called for.

Trim changes due to Mach Number, air brakes, flaps, etc. have all been small. Investigation of wing-fence size and position, have now been finalized on the third Trident, G-ARPC, and shows that the inboard fence, originally put on the aircraft as a precautionary measure, can be removed (with a consequent reduction in drag).

G-ARPA has now started the flutter test programme. A hydraulic vibration exciter has been installed in the nose and the behaviour of the

(Continued on page 35)

Paris and Canada's Aerospace Capability

(Continued from page 15)

faithfully simulate supersonic flight conditions, sophisticated navigational devices, extremely accurate radar and fire-control systems, equipment for reliable ground-testing of airborne electronic systems, and many others.

"Hydraulic equipment plays a vital role in the over-all operation of today's modern aircraft. Canadian industry has made its mark in this field, producing landing gear and actuators of various kinds for supersonic interceptors, as well as developing specialized landing gear for Canadian-designed short take-off and landing aircraft.

"Canadian industry also manufactures a host of accessories and related equipment, from aircraft seats to fuel cells, from commercial airline galleys to ground support equipment, from aircraft tires to parachutes.

"A recently developed accessory of particular interest is the "tumbling airfoil", a foam plastic container designed for safe free-fall delivery of packages from an aircraft to the ground.

"As indicated by the outstandingly successful Alouette, Canada's aeronautical industry has entered the newest field of scientific activity, the exploration of space. Other examples of Canadian achievement in this field include the Black Brant series of solid-fuel sounding rockets, and the Martlet research missile.

"Aircraft designed and built in Canada fly over every continent under every conceivable condition, from the tropics to the polar zones. Specialized Canadian airborne equipment, such as navigational systems, are in widespread use throughout the world.

"As Canada's aviation industry continues to grow, its contributions to international aeronautics will steadily increase."

Trident's Test Program

(Continued from page 20)

aircraft is telemetered to the ground for recording and analysis. On a trial run, this equipment worked well over the entire required frequency range, and another exciter is now being installed in the tail. The aircraft will resume its flight test programme later this month. During the tests the flight boundary will be extended up to 450 knots IAS and 0.95 IMN.

Aircraft 2.G-ARPB first flew on May 20th, 1962 and has been used for systems and engineering development work. The work has included calibration of the radio, assessment of cockpit lighting, measurements of cabin noise levels, air conditioning tests, and functioning of the various systems and their components. The first Smiths S.E.P.5. auto pilot installation was made on this aircraft, and much of the flying has been devoted to development work on this. This is the first Trident to be fitted with an auxiliary power unit (A.P.U.).

G-ARPB was prepared for tropical trials and flew to Khartoum early in November at which time the speed record noted above was made.

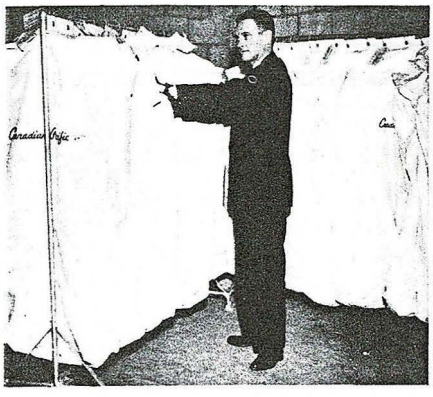
Aircraft 3.G-ARPC first flew on August 25th, 1962 and after a few check flights, went to Farnborough for the period of the S.B.A.C. Show. The daily punctual appearance of these three development aircraft demonstrated the reliability of the type. This third aircraft is now completing the low-speed handling work initiated on G-ARPA, after which it will be used to investigate high-speed handling characteristics and to make routine performance measurements with final production-standard engines (to be fitted by the end of October).

Aircraft 4.G-ARPD will be used for Trident IE development, and flew for the first time the end of November, 1962. It is fitted with leading-edge high-lift devices more advanced than those on the B.E.A. aircraft. These devices, together with additional engine thrust and a slight increase in wing span, give the Trident IE the required airfield performance at its higher take-off weights, and enable the aircraft to operate over stage lengths nearly double those required by B.E.A.

Fashions By Air

(Continued from page 29)

in our opinion, is maximum efficiency, and we feel that CPA must be complimented for the clean manner and efficient way they handled this shipment."



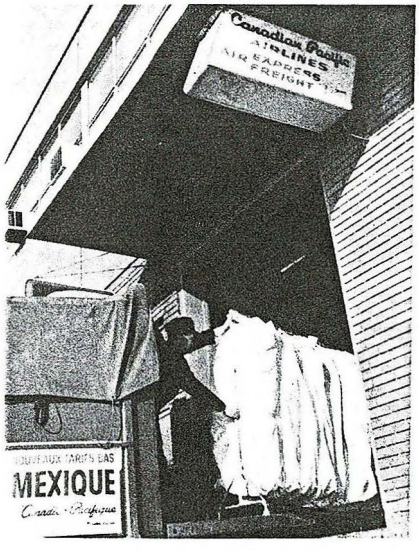
READY for delivery to consignees in Montreal, racks of garment bags are momentarily stored in CPA's air freight warehouse at Dorval, where employee inspects shipment.

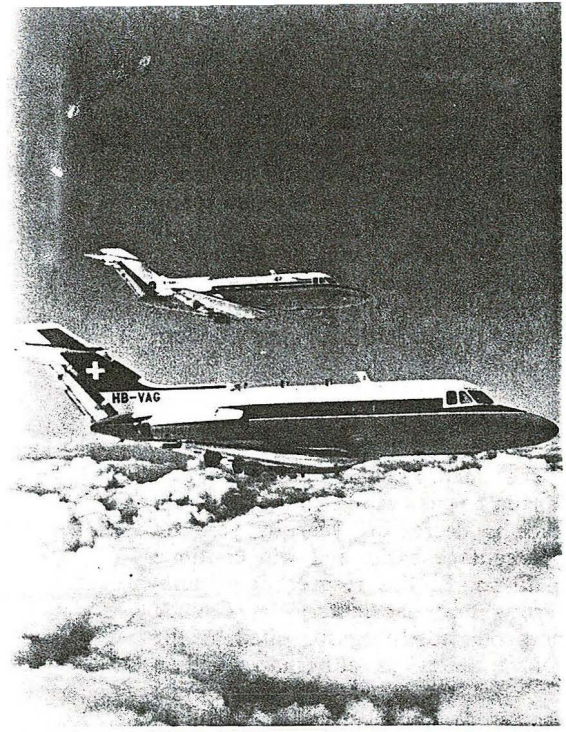
Airborne fashions from the Orient are only part of the garment bag story. CPA's Super DC-8's linking 12 countries and territories, are equipped to transport fashions of all kinds between Canada and a wide variety of ports of call.

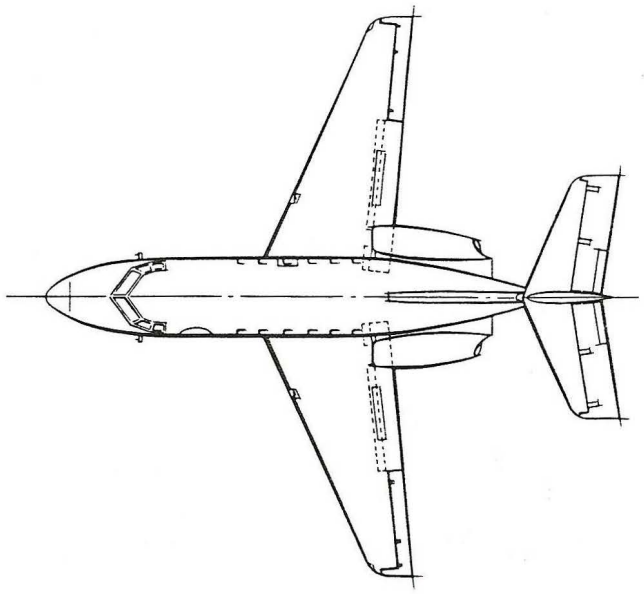
For example, the airline recently airlifted an 8,000-pound shipment of fashionable rain coats from Amsterdam to Vancouver. A few weeks ago, a collection of first-run Italian fashions sped across the Atlantic from Rome to Montreal for distribution to outlets in Eastern Canada.

One thing is certain. With the development of CPA as an international fashion courier, the airline's cargo handlers will speak with more authority when the missus asks, "Do you really thinks this suits me? Are you sure its the latest style?

LOADING garment bags into CP Express trucks for delivery to downtown consignees. Note bags remain on hangars from time they leave aircraft to completion of delivery.







Versatile New DH-125

THE DH-125 business executive jetliner — a twin turbojet designed for speeds up to 500 mph and a range of 1,700 statute miles — makes its Canadian debut at Montreal International Airport in September at a presentation being held by Timmins Aviation Limited.

In Canada for a two-week period, the aircraft will be flown across the country to various cities to demonstrate it to interested Canadian corporations. Now in production, first delivery of the DH-125 will be made later this year.

One of several small jets suitable for corporate use now becoming available, the DH-125 is said to offer for the first time all the advantages of jet flight at operating costs less than many piston-engined business aircraft.

Another outstanding feature of the DH-125 is the combination of high speed and ability to land on secondary, unpaved airstrips not used in scheduled airline flights.

Performance of this kind, and low cost, are considered the main selling points that make it particularly advantageous for Canadian business operations.

The DH-125 has close to 2,000 hours of flight experience to date. Fatigue and pressure tests on the fuselage have withstood an equivalent of 50 years of corporate flying without evidence of failure. The airplane is designed in accordance with the principals of fail-safe design philosophy.

The latest Airliner standards, in basic conception and design detail, not only ensure reliable travel but also afford the full amenities of a quiet boardroom, office or lounge, while travelling at eight miles a minute.

The aft-engine position and forward entrance have several advantages. Luggage is stowed when going aboard. The crew's movements before departure need not intrude into the passenger cabin.

There is a wide choice of furnishing arrangements, each providing generous comfort and free movement.

The recessed aisle, unencumbered by wing structure, gives plenty of headroom and makes the seats easily accessible. The six large windows on each side, the diffused lighting and the personal ventilation control make every seat position excellent.

Air conditioning is complete and automatic. Sea-level air pressure is maintained up to 21,000 feet, and even at 36,000 feet the "cabin altitude" is less than 7,000 feet. Air temperature remains equable whether flying in the tropics or in the arctic.

Baggage space forward and wardrobes aft are accessible during flight. Refreshments can be served from the galley, near the flight deck. The lavatory, located behind the passenger accommodation, is elegantly appointed, with running water.

The DH 125 has been designed for versatility of use and for adaptation when in service. Listed are some of the roles which have been studied and which are considered to be practical:

Military and naval communications aircraft. Troop carrier for 12 men. Casualty evacuation aircraft. Photographic survey aircraft. Pilot trainer. Advanced navigational trainer. Ground-aid calibration aircraft.

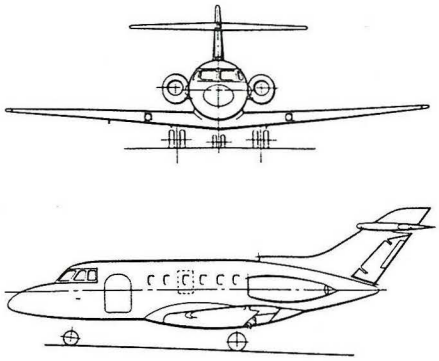
Conversion from one role to another is straightforward and call for no alteration in the basic structure.

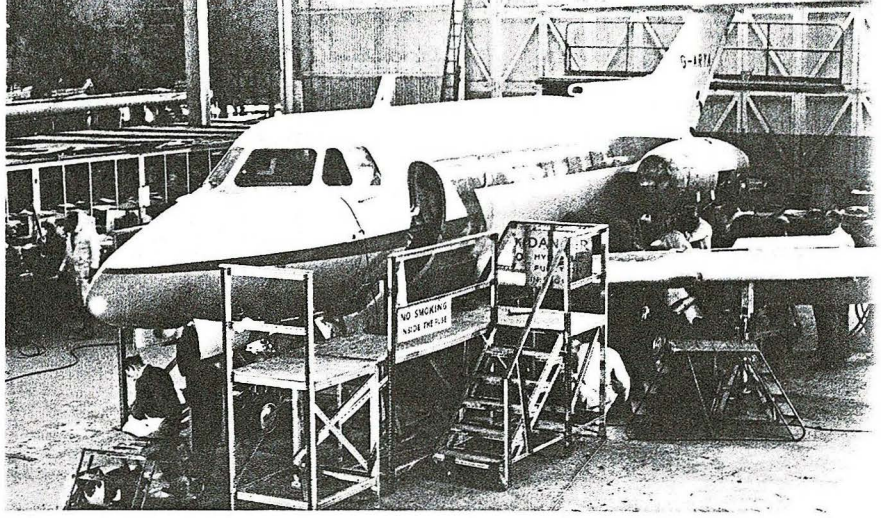
Principal Performance Data

All engines take-off distance to 35 ft., *10,67 m.*	3,000 ft., *915 m.*
B.C.A.R. take-off field length	4,360 ft., *1329 m.*
*Landing distance from 50 ft., *15,25 m.*	2,300 ft., *701 m.*
*B.C.A.R. landing field length	4,000 ft., *1219 m.*

*At typical landing weight with reserves and full payload.

Maximum speed at 25,000 ft., *7630 m.*	500 m.p.h., *805 km/h.*
Still-Air Range with 1,230 lb., *560 kg.*, payload and zero reserves	1,900 st. miles, *3050 km*





PRODUCTION LINE of the DH-125 Twin-Jet is at the Hawker Siddeley factory at Chester, England. 25 such are scheduled for completion in 1964.

Executive Jet Now In Canada

Production of the DH-125, which is powered by two side-mounted Bristol Siddeley Viper 521 engines, is well-underway. The Viper engine has been proven through over 300,000 hours of service, and it holds the world's altitude record for light aircraft at 50,818 ft.

A design innovation of the DH-125's Viper engine is an arrangement of steel blades in front of the compressor to prevent power failure should the plane encounter flocks of birds.

Timmins Aviation Limited, the exclusive sales agent and service representatives in the civil market in Canada for the DH. 125, has ordered three of these jet powered executive aircraft for delivery in 1964. One DH. 125 has been sold to a large Canadian construction company for executive travel, another aircraft will be used as a demonstrator and the third aircraft is reserved for a prominent executive in industry.

Timmins offers custom-designed interiors for the aircraft, which accomodates four or six passengers in the executive version, eight with airline standards or 12 with utility seating. Incidentally, the firm is a specialist in the relatively-exclusive field of aircraft interior design and installation. Instrumentation and electronics to custom design will also be installed by the company.

(About a year ago, Timmins fabricated and installed the first executive interior for the British-built DH-125 in a display mock-up, which then travelled to various air shows around the world. The company hopes its experience from this work will help give it the lead to compete successfully for contracts to install interiors and instrumentation for DH-125s in the large American market).

Approximate amount of Timmins' electronics and interior work of the total cost of the $800,000-odd aircraft is about 25 percent.

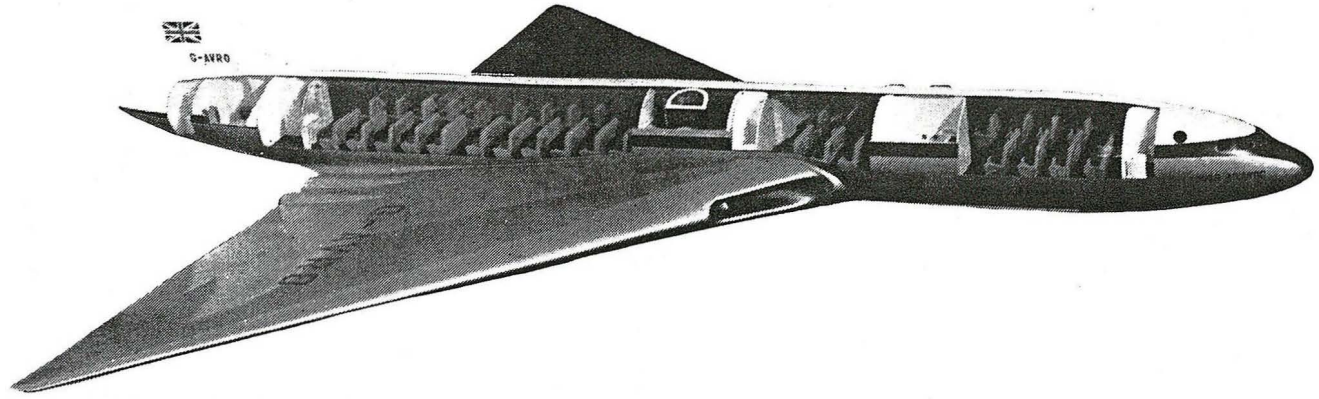
Timmins holds the exclusive sales and service representation in this country. It offers complete maintenance and servicing of operational aircraft, as well as lease and management.

With headquarters at Montreal International Airport, Timmins also has offices at Toronto, Edmonton and Calgary. ■

AN ARTIST'S conception of the DH-125 interior similar to the mock-up display which Timmins has been demonstrating for over a year, across Canada.

Principal Dimensions and Weights

Maximum take-off weight	19,000 lb., *8640 kg.*
Maximum landing weight	17,500 lb., *7950 kg.*
Maximum zero-fuel weight	11,900lb., *5400 kg.*
Span	47 ft., *14,32 m.*
Overall length	47 ft. 5 ins. *14,45 m.*
Overall height	16 ft., *4,88 m.*
Gross wing area	353 sq. ft., *32,8 sq. m.*
Engine type	2 × Bristol Siddeley Viper 520
Static thrust per engine (I.S.A., S.L.)	3,000 lb., *1361 kg.*
Wing loading	53·8 lb./sq. ft., *263,5 kg/sq. m.*
Thrust/weight ratio	0·316



THREE SIDES TO IT

The Avro Atlantic

THE FIRST delta wing airliner in the world has been announced in proposal form by A. V. Roe & Company Limited of Manchester. The airliner, to be known as the "Atlantic", is based on the design of the Avro Vulcan delta bomber, and according to Avro will fly non-stop London to New York with ease, in between five and six hours. Cruising speed will be something over 600 mph at 40,000 feet, while passenger carrying capacity will range from 90 to 115 passengers.

The Atlantic will be powered by four turbojet engines (the Vulcan has four Bristol Olympus turbojets in the production version), presumably of the most advanced type available when and if the aircraft proceeds beyond the proposal stage. Avro is promising delivery in 1958 if a reasonable production order is received soon.

Low operating costs will be an attractive feature of the Atlantic, Avro claims. Taking the North Atlantic route as an example, the direct operating costs, as computed by the SBAC method (1953), will vary between 8 and 12 cents per long ton/statute mile, according to wind allowances, and about one cent per passenger statute mile. Block times, dependent on prevailing winds, will be some 6½ to 7 hours westbound and 5 to 5½ hours eastbound.

Dimensionally, the proposed airliner will be large. It will have a span of 121 feet, a length of 145 feet, and a fuselage diameter of 12.5 feet. Maximum gross take-off weight will approximate 200,000 lbs. Payload, which will naturally vary with route and stage distance, will range from 20,000 lbs. to 45,000 lbs.

All fuel will be carried in flexible fuel tanks within the wing outboard of the engines, and normally the fuel on one side of the aircraft will be used by the engines on that side. However it will be possible to supply any engine from any tank or combination of tanks. The engines themselves will be completely buried, in pairs, at the wing roots. They will be mounted in fireproof compartments and will be accessible from beneath the aircraft.

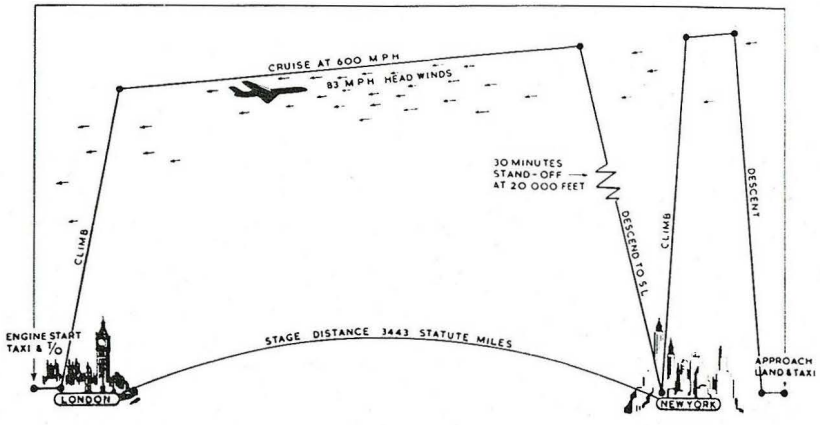
Each of the two main wheel units will be fitted with a multi-wheeled bogie and a single shock-absorbing strut. When retracted, they will be completely enclosed within the wing. The steerable nosewheel will be retracted into a non-pressurized compartment within the fuselage lines. The hydraulic braking system will incorporate Maxaret units, which permit the application of full braking power without wheel-locking.

The Atlantic will be available in three variants—basic, luxury, and tourist. All versions will be standardized in the following respects: the flight deck, which has stations for captain, first officer, and navigator/radio operator; the freight loading door on the starboard side of the front fuselage; the entrance door for passengers; the underfloor baggage holds; the emergency exits; the location of the galley, bar, lounge, and toilet facilities; seat pitching (other than in the "high density" version, which has seats for 139 passengers) and window pitching.

The basic version is so laid out that 94 passengers may be accommodated in three compartments. The forward cabin will have seats for 24, the centre

Flight Plan

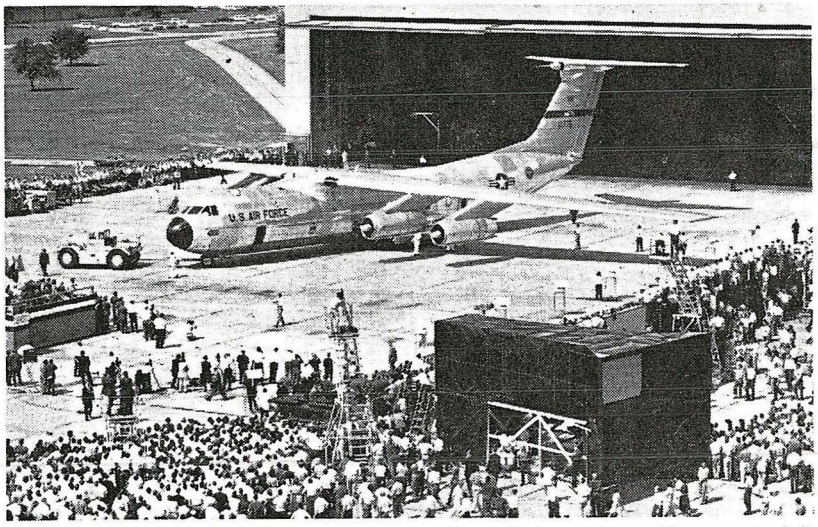
LONDON — NEW YORK



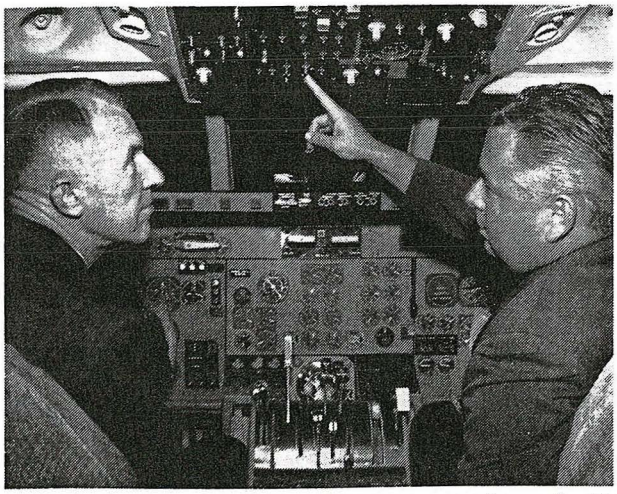
New Aircraft making news

BAC ONE ELEVEN short-haul prototype, seen making a low pass over British Aircraft Corporation's flight test airfield at Wisley, Surrey, crashed with the loss of the test crew of seven late last month. It was the only aircraft flying. The second aircraft is due to fly this month.

ONE ELEVEN designer Arthur Summers.



ROLL OUT of the Lockheed C-141A Starlifter, designed for military and civil operation. Span of the aircraft is 160 ft; power is provided by four P & W fan-jets giving a total of 84,000 lb of thrust.



DOUGLAS DC-9 mock-up gets once over from C. H. Ruby (left) president of the Air Line Pilots Association. With him is P. S. Patten, company test pilot. DH Canada has begun cutting metal for components of the aircraft.

BOEING 727 is on a round-the-world demonstration tour having visited Montreal and Ottawa in the early stages. Type has logged more than 800 hours, and first airline deliveries were scheduled for late last month.

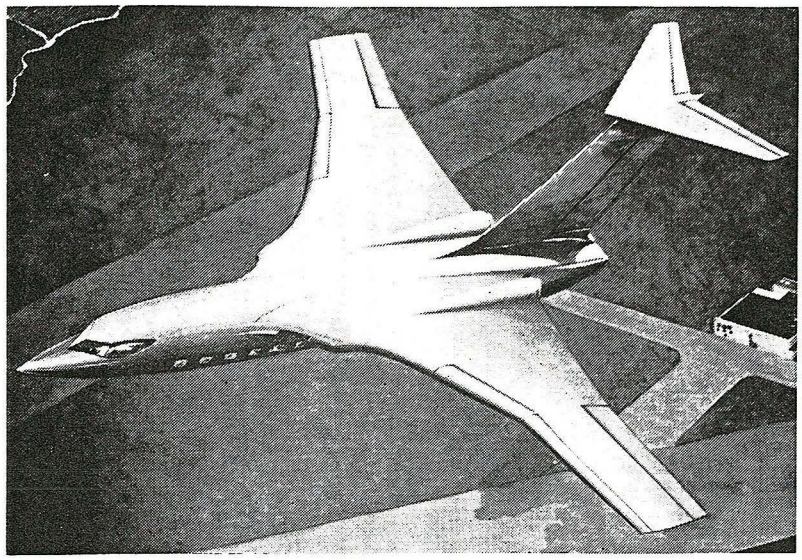
Piper Twin-Stinson, which first flew in March, 1952. At that time, Piper was aiming at a target price of less than $25,000 (in the U.S.). However, rising costs, plus such factors as the adoption of all-metal construction throughout and the use of more powerful engines than originally installed in the prototype, have resulted in a somewhat higher price, described by Piper as "in the $30,000 class".

In spite of this increased figure, it would still appear that Piper is offering potential customers a genuine bargain. Basically, this price buys an airplane which can carry four persons over 600 miles at cruising speed of 170 mph at optimum altitude. The range can be stretched to over 850 miles, by using 45% power and flying at 14,500 feet (giving a true air speed of over 130 mph).

The Apache is to be offered in three models: a Standard, which will have no radio equipment and will be available for those who wish to make their own special radio equipment installations; a Custom, which will be fitted with a Lear ADF, a Narco Omnigator, and a Narco Simplexer—a combination which will provide one LF receiver and ADF; two VHF receivers, one with omni and the other with a tuning frequency locater; two VHF transmitters with a total of 20 channels; a marker beacon receiver, and an ILS runway localizer feature. The third model, the Super Custom, will have similar radio equipment plus an autopilot installation.

Standard equipment includes Hartzell constant speed, controllable full-feathering propellers, flight instruments, artificial horizon and directional gyro, T & B, generator, and Southwind 18,000 BTU heater.

Vital Statistics: Powered by two Lycoming 0-320 engines each developing 150 hp @ 2700 rpm @ SL for take-off; gross weight, 3,500 lbs.; empty weight (Custom model), 2,158 lbs.; useful load, 1,342 lbs.; fuel cap., 72 U.S. gals.; baggage cap., over 25 cu. ft. and 200 lbs.; wing area, 204 sq. ft.; span, 37 ft.; length, 27.1 ft.; height, 9.5 ft.; power loading, 11.7 lbs./hp; wing loading, 17.2 lbs. psf; max. speed, full throttle, SL, 182 mph; rate of climb, SL, max. gross, 1350 fpm; SE rate of climb, max. gross, SL, 225 fpm.



Fairchild's Jet Transport

Latest paper airplane to be entered in the jet transport sweepstakes is a design proposal from the Aircraft Division of Fairchild Engine & Aircraft Corp., Hagerstown, Maryland.

Fairchild's proposed jet transport is a futuristic looking design featuring what the company describes as a "cusp" wing (cusp is defined by Webster's as a pointed end, apex, peak; especially a pointed end, part, or projection formed by converging curves. In architectural circles, it is used to describe a triangular proection from the intrados of an arch).

At first glance, this cusp wing bears a passing resemblance to the so-called "crescent" wing used on the Handley Page Victor. However, the crescent is a combination of the swept (inner section) and straight wings (outer section), whereas the cusp features design characteristics of the delta (inner section) and the swept (outer section) wings.

The Fairchild M-186 is a private venture and is one of two projects in the planning stage at Fairchild. Another design, currently classified, is for a turboprop military aircraft planned for operation from unimproved fields.

A preview of the M-186 was presented to air line representatives in New York in mid-November by Fairchild's chief design engineer, Walter Tydon.

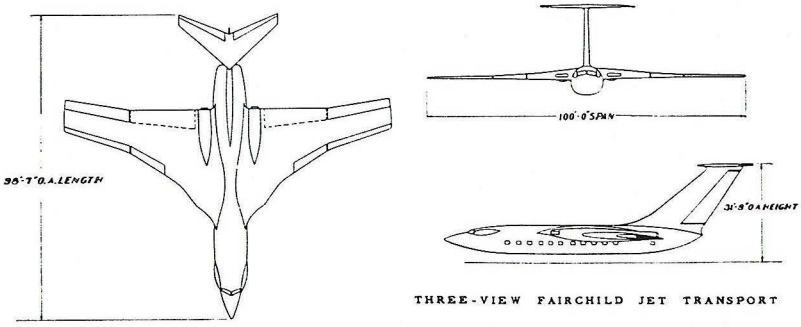
Mr. Tydon described the aircraft as a high wing jet transport which would be powered by two Wright J-67 turbojets, which would enable it to cruise at 570 mph. The thrust of the J-67 was estimated at 12,000 lbs.

The M-186 would normally carry a crew of three and 44 passengers, with provisions for navigator and radio operator. High density seating would permit carriage of up to 64 passengers.

The flight deck features a side bubble canopy for maximum crew visibility. APS-42 search radar would also be carried. The design calls for easy conversion to freight operations. The "beaver-tail" doors in the fuselage rear would be useful in this respect, as would the 48-inch truck level fuselage floor.

According to estimated performance figures, this airliner will take off at normal gross weight of 75,000 lbs. within 2,600 ft. over a 50-foot obstacle, and land in 2,500 ft.

The M-186 has a span of 100 ft. length, 98 ft. 7 in.; height, 31 ft 8 in. Cargo version will have a 35,000 lbs payload.



THREE-VIEW FAIRCHILD JET TRANSPORT

AIR LINE TRENDS

TCA Profit

The operation of TCA during 1953 resulted in a net surplus of $256,230 after taxes, it was reported during March when Rt. Hon. C. D. Howe, Minister of Trade & Commerce, tabled the company's report in the House of Commons.

The report, signed by G. R. McGregor, president of the company, showed operating revenues amounting to $62,236,564, an increase of 13% over 1952. However, operating expenses totalled $61,433,700, an increase of 16%.

A total of 1,307,810 passengers were carried, 15% more than in the previous year, resulting in revenues of $48,242,942. Mail revenues were $7,786,119, an increase of 1% over 1952, while the volume of mail carried increased by 11%. Air express and air freight revenues totalled $3,673,440, an increase of 9%, while commodity ton mileage was up by 12%.

The company's surplus of $256,230 was $551,649 less than 1952 net income. Mr. McGregor said this reduction was attributable to higher costs and to development expenses for which there was no compensating revenue in the period under review. TCA made provision for income taxes of $300,000.

The company payroll rose by $3,605,892, reflecting higher wage rates and the employment of additional staff required by the growth of traffic. There was an increase of 14% in staff, which generally corresponded with a 15% increase in revenue ton miles flown. At year's end, the company had 7,072 employees.

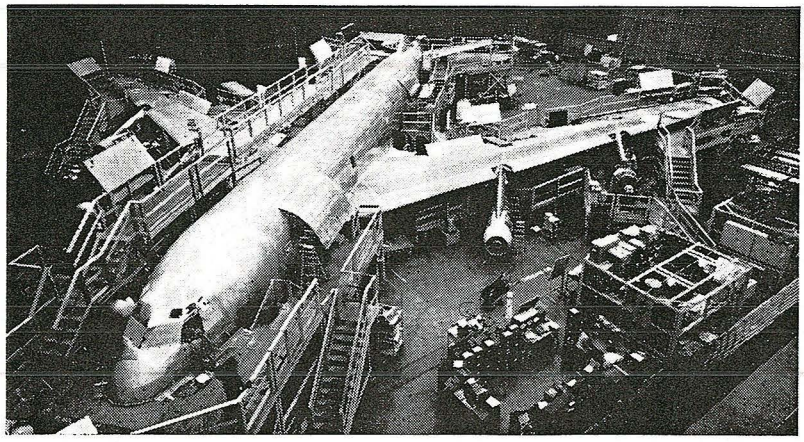
The air line offered an increase of 23% in available seat miles and provided service in excess of the increased demand even during periods of peak traffic. In all, TCA planes flew a total of 31,737,638 miles. At year end TCA routes totalled 9,916 miles in North America and 9,078 miles overseas.

Mr. McGregor pointed out that once again there had been no increase in the cost of air transportation in Canada. TCA's passenger fares have remained virtually unchanged since 1947, in marked contrast with the general price trend of other services and commodities. Flight performance was maintained at a high level, with 85% of flights operating on time or within half an hour of schedule. Ninety-six percent of scheduled flight mileage was completed.

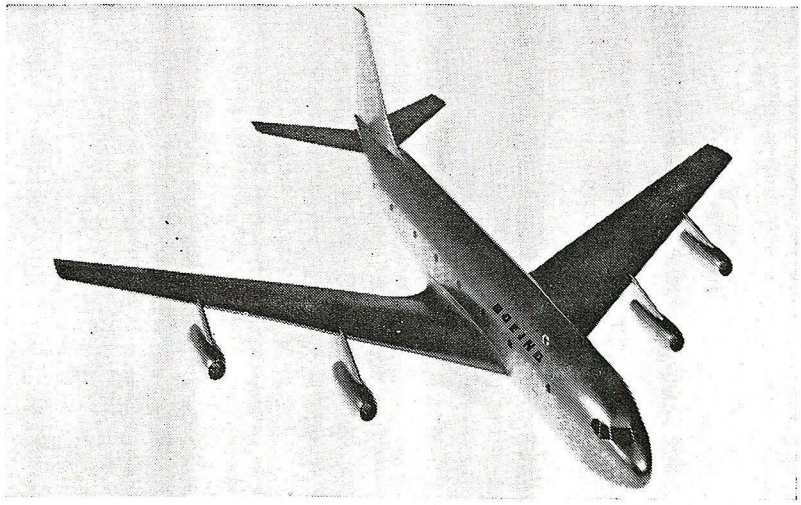
The carriage of "all-up" mail, up to one ounce letter weight, inaugurated by the Post Office Department in 1948, continued in 1953. The 5,373,841 ton miles of mail flown in 1953 established a new record. Aggregate mail pay, on the other hand, was almost unchanged under contract and unit payment per mail ton mile again decreased, as it has done steadily since 1947.

Mr. McGregor reported that during the year, TCA carried 7,947,113 ton miles of air express and air freight on its domestic and overseas routes. Accommodation for freight was provided on all flights and the extent of the airline's capacity was demonstrated by the February carriage of emergency Red Cross flood relief supplies from all Canadian stations to Montreal for overseas forwarding. In a matter of days TCA moved 135,000 pounds of such aid without delay or inconvenience to the travelling public.

Speaking of the financial prospects for the current year, Mr. McGregor pointed out the air line is in a transitional period of expensive fleet expansion involving many related expenses. Since much of this expense is not immediately offset by increased earnings, it is to be expected that 1954 net results will not be as satisfactory as has been the case in recent years. It is also the case that the average rate of return per passenger



BOEING MEANS BUSINESS: A private investment of $15,000,000 is represented by this jet transport, shown in an advanced state of prototype construction at the plant of Boeing Airplane Co., Seattle, Wash. Powered by four P & W J-57's, the Boeing transport has an all-up weight of 190,000 lbs., a span of 130 ft., and a length of 128 ft. Design cruising speed is 550 mph, while capacity will be between 80 and 150 passengers. Model below shows how completed aircraft will appear.



AIR LINE TRENDS

New QCA Subsidy

Latest development in B.C. aviation is approval by the Federal Government of an additional subsidy of $80,000 for Queen Charlotte Airlines. This sum is additional to the $125,000 granted to the air line last year by the Government. So far as is known, QCA is the only Canadian air carrier ever to get a direct government subsidy.

Confirmation of reports that QCA was to receive this additional financial assistance, came when Commons was discussing supplementary estimates, among which was included the sum of $80,000 earmarked for QCA. According to Transport Minister Lionel Chevrier, it was necessary to provide assistance so that QCA could continue to operate such essential services as the one from Vancouver to the Alert Bay-Minstrel Island-Sullivan's Bay area.

Collision at Moose Jaw

No findings have yet been made public on the cause of the mid-air collision over Moose Jaw of a TCA North Star and an RCAF Harvard, April 9, about 10.15 a.m., which brought death to 37 persons. The accident also brought to an end TCA's safety record of more than three billion passenger miles without a fatality.

Though many were quick to blame the Harvard pilot for the collision, it seems likely that both civil and military investigators will have difficulty fixing the responsibility. Eyewitnesses to the actual collision seem to be non-existent, making the job even more formidable.

Weather was apparently not a factor, being clear and sunny. The North Star (Flight 9, several hours late), was flying westbound on Green Airway 1. Since it was en route to Calgary from Regina, which is about 45 miles east of Moose Jaw, the airliner would have undoubtedly been at cruising altitude. Westbound flight on a Green airway calls for the maintaining of an even altitude (2,000, 4,000, 6,000 ft. asl, etc.).

The Harvard, according to eyewitness reports, which appear to have been frequently in conflict, was flying northeast. This would indicate that the trainer was crossing the airway, and since the rules of the air require that an airway be crossed at an angle of not less than 45°, it would seem that insofar as direction of flight was concerned, the Harvard pilot was not contravening any civil air regulations.

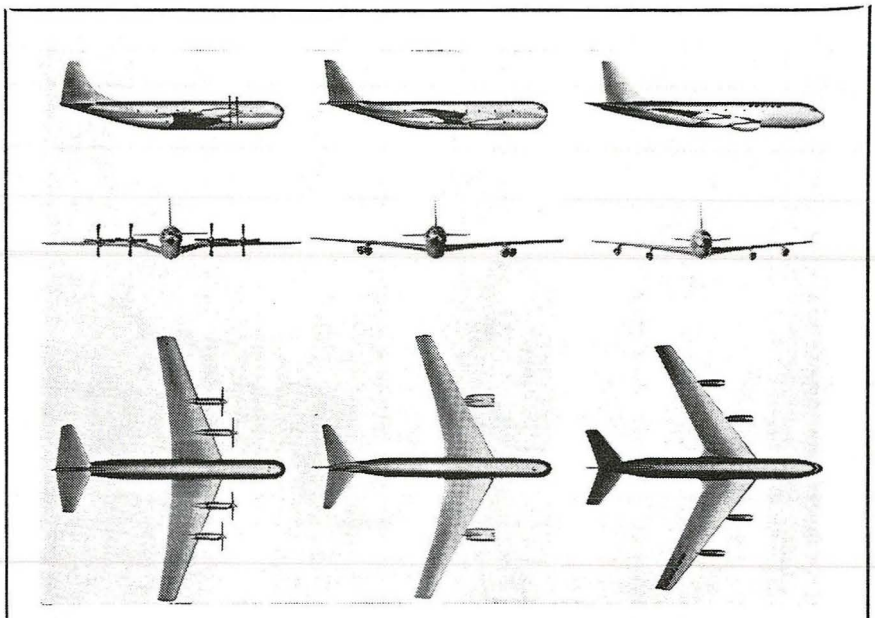
Under these circumstances, the North Star ostensibly had the right-of-way since, according to Air Regulations, "when two aircraft are on converging courses at approximately the same altitude, the aircraft that has the other on its right shall give way." At the same time, Air Regulations also say that "the aircraft that has the right-of-way shall maintain its course and speed, but nothing in this Part shall relieve the pilot-in-command of an aircraft from the responsibility of taking such action as will best avert collision."

The casualty list comprised 26 revenue passengers, four of the airliner's crew, the Harvard pilot, five TCA employees travelling on passes, and a woman who was working in the house which was demolished by fire and collision as a result of falling wreckage.

Among those dead are: Captain Ian H. Bell, veteran pilot from Vancouver who had been flying with TCA for 14 years, and had been a commercial pilot and flying school operator for a number of years prior to joining the air line; First Officer D. W. Guthrie, co-pilot; Louis Penner, steward; Miss M. L. Quinney, stewardess. Pilot of the Harvard was Pilot Officer Thomas Thorrat, an RAF student training under the RCAF's NATO training scheme. Included in the passenger list were T. M. (Pat) Reid and his wife (see "Names in the News").

Comet Setback

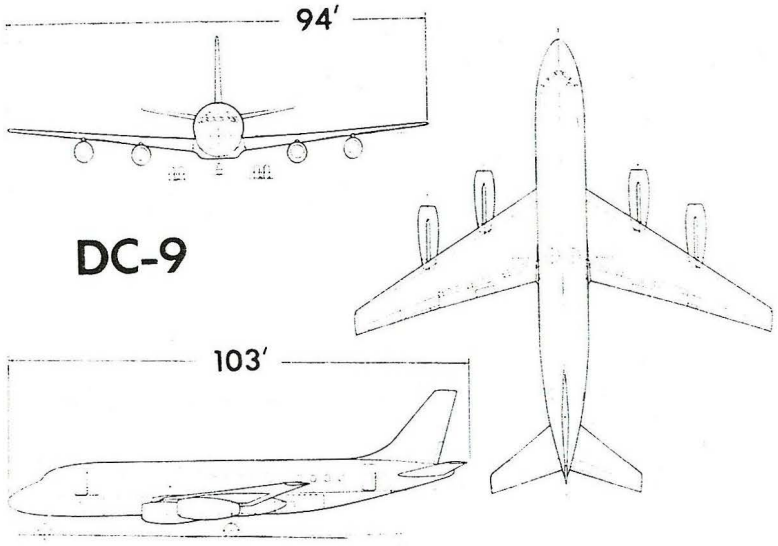
The possibility of Comet I's being returned to passenger service with BOAC appears remote unless some clear-cut explanation is found for the three crashes in which the world's first jet airliner has been involved in less than a year.



EVOLUTION OF A JET TRANSPORT: Models illustrate some of the stages through which Boeing design studies led when considering layouts for gas turbine powered transports. Left is the Model 367-60, a gull-wing, turboprop design which utilized the C-97 fuselage and empennage; centre is Model 367-64, which also used the C-97 fuselage. It featured pod-mounted turbojets, swept wings and tail surfaces. Right is the final choice, the Boeing Stratoliner, soon to fly.

The aircraft has not only been withdrawn from service with BOAC, but also had its C of A suspended by the British Air Registration Board. Both flight and ground tests are being carried out with the greatest possible urgency to trace the sequence of events, mechanical failure, or structural weaknesses which might be the cause of the accidents, the most recent of which occurred on April 8.

This third crash took place just 16 days after the Comets had been returned to service following their grounding as a result of an earlier, and



DOUGLAS DC-9 PROPOSED: An advanced short/medium range jet transport is being offered by the Douglas Aircraft Co. for operation in 1963. Powered by four P & W turbofan engines known as the Model JTF10A-1, the new aircraft will carry 68 first class or 92 coach class passengers over short to medium ranges at speeds and comfort comparable to the larger DC-8. The powerplant is being designed specially for the DC-9.

Aeronautics Act, Air Regulations and various and sundry ATB orders, rules and directions.

Although the Board found that breaches of the regulations had been committeed, it decided to reinstate the licenses following assurances by World Wide counsel John M. Schlesinger and Paul E. Lafontaine that they would operate the company by proxy.

In its decision, the Board rapped the company's behavior, pointing out that the . . . "evidence has shown a course of conduct by the Licensee which the Board considers most reprehensible."

Tariff Item 440r

The Minister of Finance has directed the Tariff Board to look into, among other items, tariff item 440r insofar as it relates to radios for navigation and air traffic communication. No date has yet been set for the hearing.

Comet Service Upped

As of June 16, BOAC has scheduled an extra weekly Montreal-to-London Comet flight. The new service operates every Tuesday from Dorval Airport, and supplements the existing once-weekly Comet which departs on Saturdays.

Block That CPA!

TCA President Gordon McGregor says parliament should block any further encroachments by CPA into TCA's transcontinental business.

Testifying before the Commons railway committee May 7, three days after CPA began its Vancouver-Montreal service, Mr. McGregor dropped a hint that TCA will go into the red if CPA gets any more franchises in competition with TCA.

"I hope that the effect of this competition will be outgrown by TCA and that it will not be continued to the point where we will have an unsatisfactory financial situation," the TCA president said.

He said TCA has been approached to buy supersonic jet passenger planes which would have a speed of 1800 miles an hour and cost $11 million each.

But the appearance of new types of aircraft poses financial problems for TCA, he said. The present fleet should be adequate to handle competition for only six years.

Integration at CPA

CPR ticket office staffers in principals cities across Canada have gone into uniform to stress the fact that besides selling railway tickets they also sell steamship and airline tickets and make reservations at the company's 15 hotels and resort-hotels across Canada.

Uniformed staffs are to be found in city ticket offices in Montreal, Toronto, Hamilton, Winnipeg, Vancouver and Victoria. In addition, uniformed personnel greet the travelling public at CP ticket offices in Toronto's Royal York Hotel, and Hotel Vancouver.

Integration of all available passenger services in terms of service at point of sale has been emphasized recently by Canadian Pacific's inauguration of daily Canadian Empress flights by Britannia aircraft linking Montreal, Toronto, Winnipeg and Vancouver.

ATB Orders

APPROVALS

Class 3 Irregular Specific Point:

- Addition of Lac Albanel to existing service from Roberval, P.Q., serving Montreal, La Tuque, Nictchequon, Fort Chimo, Chibougamau, Chute des Passes, Hopes Advance Bay, P.Q., and Frobisher, Baffin Island, N.W.T.; Nordair Ltd.
- Between Hamilton, Oakville and Toronto, Ont.; Group C Rotating Wing; Hamilton Helicopters Ltd.
- Addition of Old Crow, Y.T., to existing service between Dawson and Stewart River, Y.T.; Connelly-Dawson Airways Ltd.
- Addition of Paint Hills, P.Q., to existing service from Moosonee, Ont., serving Rupert House, Eastmain, Factory River, Fort George, Great Whale River, Richmond Gulf, Port Harrison, Provungnituk, P.Q.; Timmins, South Porcupine, Albany Post, Attawapiskat, Winisk, Fort Severn, Cape Henrietta Maria, Porquois Airport (Nellie Lake), Ont.; Austin Airways Ltd.

Class 4 Charter:

- From Mayo, Y.T.; Group C; Connelly-Dawson Airways Ltd.
- From Penticton, B.C.; Group C; Penticton Air Charter Service.
- From South Porcupine, Ont.; Group C; Georgian Bay Airways Ltd.
- From Fort St. James, B.C.; Group C; Northern Mountain Airlines.
- From Prince George, B.C.; Group C Rotating Wing; Highland Helicopters Ltd.
- From Moncton, N.B.; Group B in addition to existing Group C; MacDonald Flying Service.
- From Vernon, B.C.; Group C; Triway Air Services.
- From Melfort and Nipawin, Sask.; Group C; Parkland Airways.
- From Montreal; Group C; Air Charters Inc.
- From St. Johns, P.Q.; Group C; St. Johns Flying School.
- From Victoria, B.C.; Group C; Victoria Flying Services Ltd.
- From Prince Rupert, B.C.; Group C; Industrial Air Services Ltd.
- From Alliford Bay and Alert Bay, B.C.; Group C in addition to existing Group B; B.C. Air Lines Ltd.

Class 5 Contract:

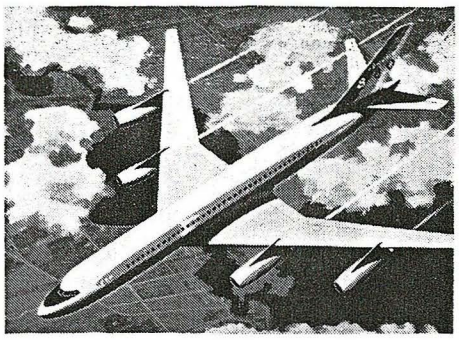
- From Vancouver, B.C.; Group C; restricted to transportation of employees, officers and directors of Canadian Collieries Resources Ltd., and of those companies entering into contracts with Canadian Collieries Resources, and the goods required by these companies in their operations; Collieries Timber Air Services Ltd.

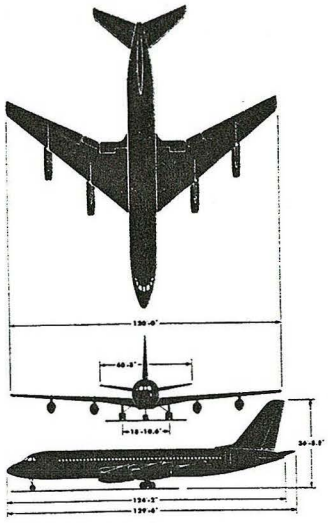
Class 6 Flying Club:

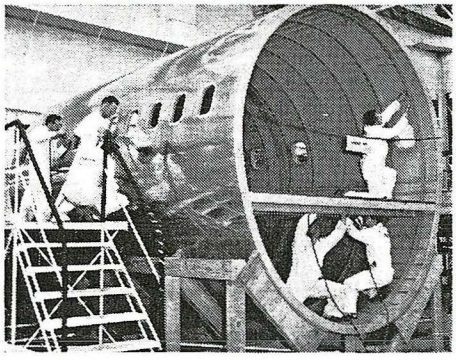
- From Mont-Joli, P.Q.; Aero-Club du Bas St. Laurent.

Class 7 Specialty:

- From St. Jovite, P.Q.; Aerial Patrol & Inspection/Aerial Fire Control/Aerial Fish Cultivation; Wheeler Air Lines Ltd.
- From Vancouver and Edmonton; Aerial Fire Control; Pacific Western Airlines Ltd.
- From Estevan, Sask.; Aerial Pest Control/Flying Training & Recreational Flying; Kenneth G. Nicholson.
- From St. Honore, Chicoutimi, P.Q.; Flying Training; Gagnon Air Service Ltd.
- From Roberval, P.Q.; Ice Reconnaissance; Nordair Ltd.
- From Wetaskiwin, Alberta; Flying Training & Recreational Flying; Airspray Ltd.
- From Churchill, Man.; Aerial Patrol & Inspection; TransAir Ltd.
- From Langley Prairie, B.C.; Aerial Patrol







CONVAIR 880: Refinements developed in wind tunnel tests on the Convair 880 have increased its max. cruise to 615 mph. Fleets of this four-engine, medium-range jet airliner have been ordered by TWA, Delta Air Lines and Transcontinental S/A. At left: Convair production workers assemble a fuselage section.

dian Government contract for high level photography of the Arctic and a 19,000 square mile, high-altitude photo-mapping job in Africa.

BENDIX PB-20

(Continued from page 46)

aimer, who can himself control the actual bombing run.

The nerve centre of the Argus is the ANTAC system (developed by Computing Devices of Canada Ltd.) which co-ordinates the operation of the many electronic devices on board, and incidentally supplies the PB20 with its heading signal.

Special Version: The foregoing features are, of course, peculiar to the Argus aircraft for which a special version of the PB20, known as the PB20C was assembled, but a model can be similarly tailored to any airplane. By choosing from the great variety of standard PB20 components a system can be assembled to suit specific requirements. The fear of early obsolescence is banished from the minds of operators because not only are additional existing automatic controls (VOR, ILS, etc.) easily added as required, but provision is made for new control functions before they are on the market.

New functions will give automatic selection of economical cruising and avoidance of dangerous Mach number condition. A flight monitoring system will provide a continuous check on operating conditions by comparison of control signals with an independent source, allowing the auto pilot to check its own operation.

With the auto pilot performing these additional functions, the aircraft operator might be pardoned for wondering how much he must sacrifice by way of payload to accommodate this remarkable device. This weight would have been enormous had we been forced to rely on the use of vacuum tubes for amplification, but that amazing little invention, the transistor, together with new techniques of manufacturing miniature electronic components helped to remove this bogey.

By making this amplifier in the form of plug-in "cards" (see Fig. 1, p. 45), we make servicing easier, and cut down the quantity of spare parts to a minimum.

As if in support of the axiom of designers, that complexity behind the panel results in simplicity at the front, the control panel of the PB20 is remarkably simple. Only the maneuvring controller and selector panel for the automatic flight controls show at the front. (Fig. 2, p. 46).

We have now arrived at the stage where the auto pilot, having surpassed the human pilot in speed and accuracy, has earned the more comprehensive name of — Automatic Flight Control System.

QUALITY CONTROL

(Continued from page 43)

ment and utilization of Quality Control personnel. The application of the system is kept flexible so that each senior RCAF inspector may utilize his own and his inspectors' time on those problem areas which occur from time to time in even the best regulated plants.

Improvement of Methods

IT IS OUR continuous and pious wish that the RCAF will some day find the answer to all quality problems, although we consider this about as likely as the production of a new Bible by monkeys with Remingtons. The staff of the Chief of Quality Control is, however, always working on the improvement of surveillance procedures, and the increase of efficiency in the field. Methods which are utilized in this program include:

(1) **Liaison with Industry:** By visits from AMCHQ to contractors across Canada, by close working association with AITA, CQC is always aware of industry's quality problems, and ideas of mutual benefit are exchanged.

(2) **Liaison with Other Government Quality Agencies:** The RCAF works very closely with DND/IS, and at the same time takes every opportunity to discuss contemporary problems with our counterparts in other countries. The British Director of Aeronautical Inspection and the USAF Chief of Quality Control have both been visited in the past few months.

(3) **Quality Audit:** The Chief of Quality Control is just now introducing to the field the highest phase of RCAF assurance inspection namely the quality check of the RCAF Quality Control staffs. Because quality procedures vary from plant to plant, as do quality problems, RCAF orders must be kept flex-

AIRCRAFT AND AIRPORT
CONSTRUCTION · MAINTENANCE · OPERATION

News Roundup

BRITAIN'S JET-WING PASSES TESTS

AW-52 Acclaimed As New Design Completes Trials

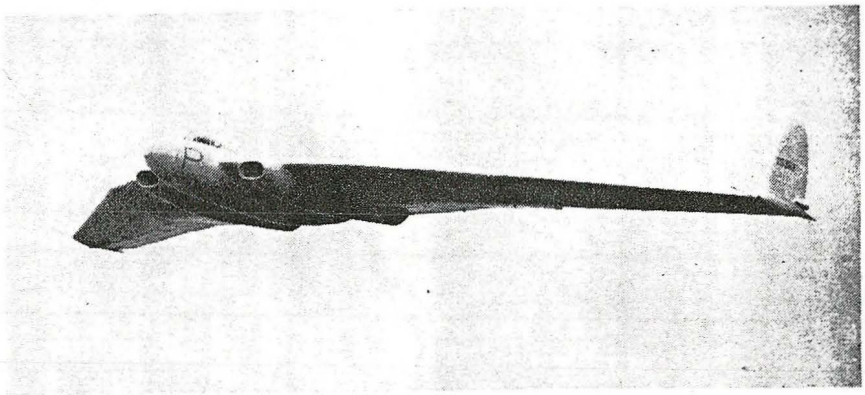
The jet-propelled AW-52 Flying Wing has passed its flight tests with flying colors, and with this accomplishment is marked the opening of a new era in aircraft design.

Preliminary statements were only that the AW-52 fulfilled all expectations, and that it reflected the wealth of experience gained by Armstrong Whitworth's with the flying wing glider. At the same time it was revealed that AW engineers have not yet finished their series of flying wings, but are already at work on 90-passenger transport.

Completed a year ago, the AW-52 only recently finished its initial flight tests and just last month was shown to the public. It is pointed out that the jet-propelled aircraft is purely a development ship, as is the flying wing glider, and that from these aircraft many lessons will be learned which will be applied to further exploitation of the swept-back wing design.

Details are scant on performance of the AW-52, except that it is capable of doing 500 m.p.h. and will cruise at 400. It has a 90-ft. span, and actually is just a laminar flow wing with two Nene jet engines tucked in the centre section, where the two pilots are housed.

While the jet-wing is hailed as the "aircraft of tomorrow," H. M. Woodhams, managing director of Sir W. G. Armstrong Whitworth Aircraft Limited, assured *Aircraft and Airport* that the industry is only embarking on a phase of aerodynamic design necessary to reap full benefit of the vast power potential of the jet engine.



The Armstrong Whitworth AW-52 in Flight

He explained that, for example, the Meteor design actually is a refinement of the conventional type aircraft, and while we are achieving results far beyond what should have been expected, to get full value from jets it is necessary to design to them.

The laminar flow wing, boundary layer suction and all-wing and swept-back wing are as yet largely unknown quantities, he added. It is by building types such as the AW-52 that the industry will assess these developments, and find the basis for a new era of design.

In this respect, he admitted, the AW-52 is perhaps the prototype of an "aircraft of tomorrow," but in any event it is certainly the key to design development.

Babb Co. at Dorval Business as Usual

The Babb Co., has taken up temporary quarters at the Administration Building, Dorval Airport, Que., owing to a fire which gutted their premises at 1477 Sherbrooke St. W., Montreal, early this month.

The old building will be restored as soon as possible, and the company will return there when this is done, but in the meantime Dorval will be their base. Customers will be interested to learn that the loss of records was negligible, and apart from inconvenience, the company's business will not be seriously affected.

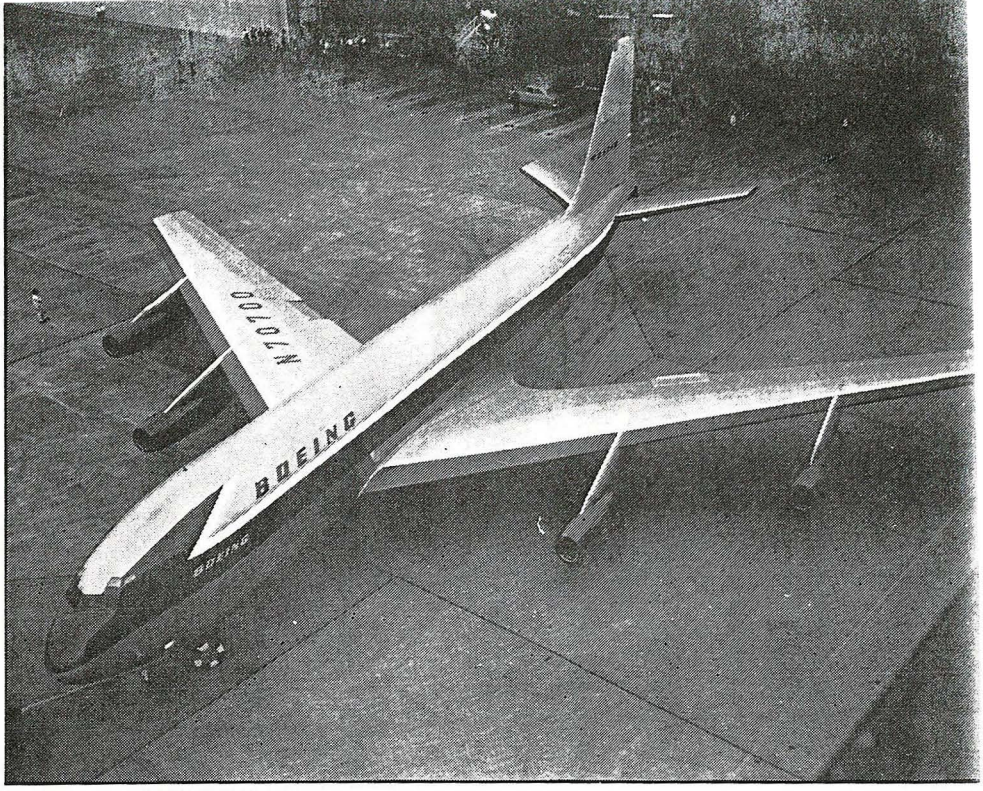
Beaver Orders Grow Plan Ski Tests

Ski tests on the de Havilland Beaver are now under way, and it is anticipated this versatile bush plane will be in full production and deliveries well under way before Spring, it is learned from a visit to the Downsview factory.

Ontario Provincial Air Services who have already carried out extensive "on the job" tests with the already approved float version of the Beaver, will be taking delivery of the first of 12 machines ordered for this year, within the next few weeks. Additional Beavers to be added to the PAS fleet will be delivered over the next two years.

Other well-known flying interests to get early delivery of the Beaver are the Saskatchewan Government Air Service, Lundberg-Ryan Air Explorations, Laurentian Air Services and

Boeing Rolls Out the 707



. . . BUT AN UNDERCARRIAGE FAILURE DELAYS THE FIRST FLIGHT

BOEING proudly rolled its big new 707 Stratoliner/Stratotanker out of the assembly hangar of the company's Renton (near Seattle), Washington, plant on May 14, and seven days later the $15,000,000 white hope had become a crippled bird without even getting off the ground.

The new transport was damaged—not seriously, Boeing claims—when the left main undercarriage gave way May 21 following a high speed taxi run prior to first test flights. Reports indicate that four runs had been made—one at 98 mph—and it was while taxiing slowly back down the runway after one of these runs that the undercarriage gave way.

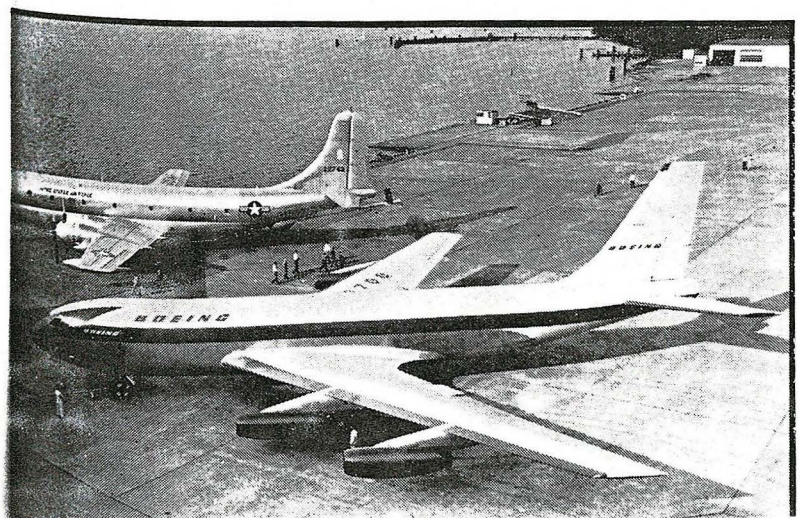
According to a Boeing statement released after the accident, no primary structure of either mainplane or fuselage received damage. The statement said that damage was confined to scraped engine nacelles and to ruptured skinning aft of the left wing spar, the left flap being similarly affected. The 707's landing gear is said to be designed so that in the event of failure it will not rupture fuel tanks or the main wing supports. However, published pictures of the damage indicate that the undercarriage itself did not collapse, but rather the wing structure to which the undercarriage is attached gave way.

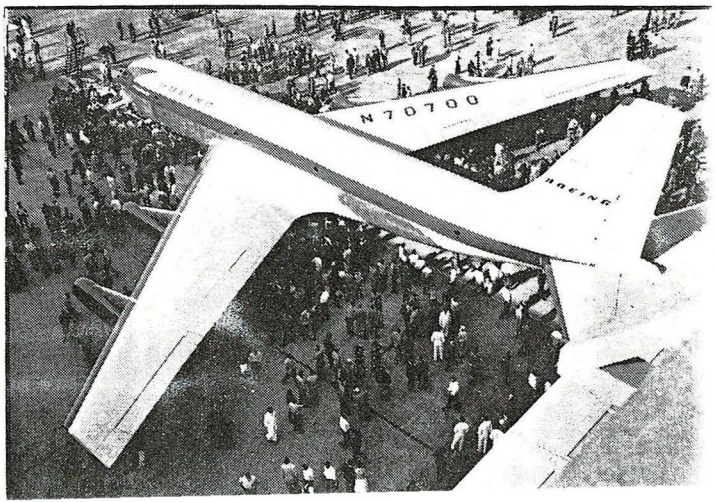
Time in Hand: Boeing expects that necessary repairs (and though not mentioned, possible redesign of basic structure around undercarriage attachment points) will involve a delay of several weeks. In spite of this, it is still possible that the prototype may be in the air before or shortly after the original scheduled date, since the aircraft left the shops some two months ahead of time.

This unfortunate accident, embarassing to say the least, in the long view will probably do little to dim the lustre of this promising aircraft, which is the first U.S. entry in the jet transport field. While Boeing is justifiably proud that the 707 represents a private investment of $15,000,000, the fact that it is publicizing the machine first as military tanker/transport and second as a commercial airliner would indicate that the company is alert for the rustle of Uncle Sam's money and is confident that a covey of million dollar bills will be flushed by the sound of four Pratt & Whitney turbojets screaming at take-off rpm.

Officially christened "Jet Stratotanker" for the military version and

Pictures show the Boeing 707 just after it was rolled out of its assembly hangar recently. Note size compared to military KC-97, lower left photo.





WORLD GLIDING CONTEST

Canada's Entry

When the World Gliding Contest gets under way at Camphill, England, July 20, Canada will be among the 22 competing nations.

The chances of the Canadian team will rest on the capable shoulders of Albie Pow (above L), one of Canada's top glider pilots, who will fly a British Olympia sailplane (below) which is being loaned for the purpose by Major C. G. Dorman of Laisham, England.

Al Pow's team mates will include Dick Noonan (above R) as team captain; Guy Joyce, Bill Pound, and Peter Stickland as crew members. Mr. Stickland will also double in brass in a public relations capacity. Team organization and travelling arrangements are being managed by Frank Brame, though Mr. Brame will not travel with the team.

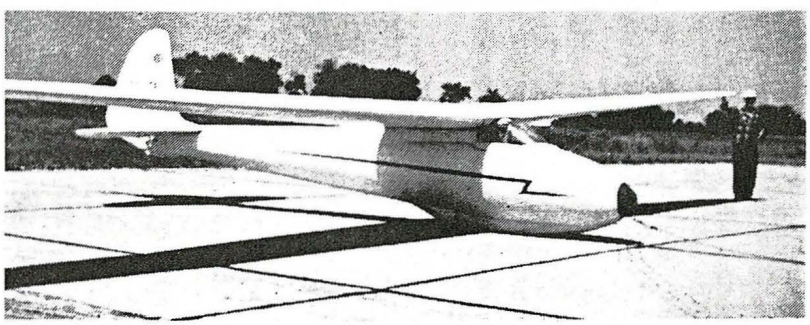
The participating nations, who will fly some fifty sailplanes in such events as free distance, goal flight, speed race, and goal and return, will include: Argentine, U.S., Austria, Belgium, Brazil, Australia, Canada, Spain, Denmark, Finland, France Sweden, Germany, U.K., Holland, Israel, Italy, South Africa, Jugoslavia, and Switzerland.

Most of the types of aircraft to be used are one-place, though any two-place types will undoubtedly be flown solo during the contests. The location of the competition is a hill site and the flights will all be winch launched.

The last time (and also the first, it is believed) Canada participated in an international gliding meet was at the International Contests in Spain in 1952. Al Pow was the competing Canadian pilot on this occasion, too. At that time, he placed 32nd in a field of 38.

Mr. Pow, who now lives in London, Ontario, has been gliding since 1943, when he joined the de Havilland Club in Toronto. He was associated with this club until 1946 and the following year he stepped out on his own by purchasing an LK.

In 1949 he won the Canadian National Contests, held that year at Kingston, Ontario, and set a new Canadian duration record of 6 hours 15 minutes. That year also he won his Silver "C", the seventh Canadian to do so. In 1951 he set a new Canadian distance record of 137 miles, flying from Kitchener to Selfridge Field. The same year he again won the Canadian National meet and the British Aviation Insurance Company trophy. This performance was repeated in 1953 with a new distance record of 256 miles, and once again, the winning of the Canadian National championship, and the BAIC trophy.



"Jet Stratoliner" for the civil model, the aircraft has an initial maximum gross take-off weight of 190,000 lbs. (the Boeing Stratocruiser, heaviest passenger airliner in regular scheduled use today grosses just slightly over 145,000 lbs.) Wing span is 130 feet and length is 128 feet. The tricycle undercarriage comprises two main units each mounting a four-wheel bogie, and a nose leg with a double wheel. The plane surfaces of the fuselage sides are broken throughout their entire length by only four smallish, horizontal elliptical windows, which are widely spaced.

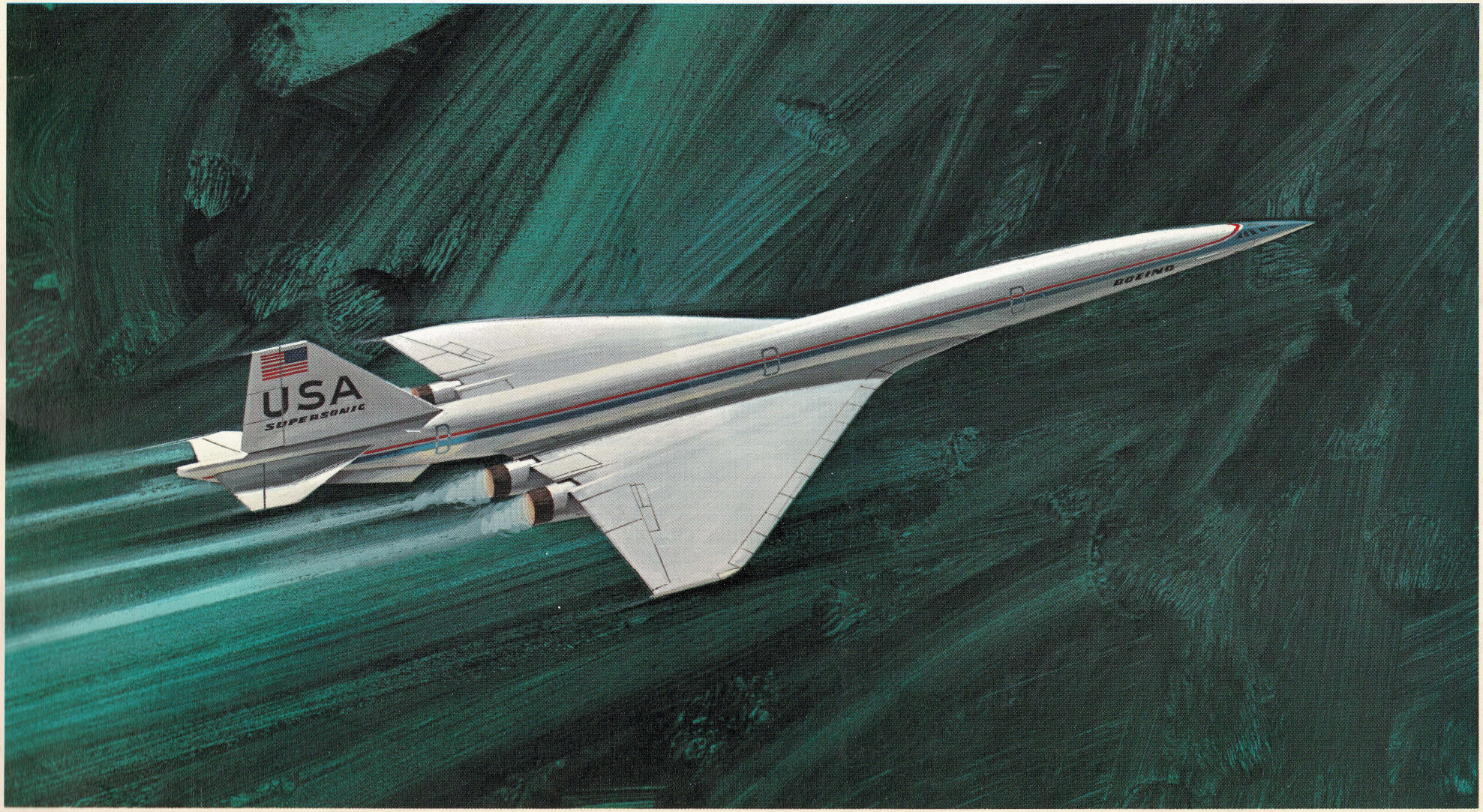
Long Range: Designed to cruise at 550 mph, the Jet Stratoliner will carry between 80 and 130 passengers, depending on range and payload requirements. Optimum cruising altitude is between 30,000 and 40,000 feet. Boeing says the airliner will be capable of regular U.S. transcontinental nonstop flights of less than five hours, and non-stop New York-to-London schedules of less than seven hours.

Power for the aircraft is provided by four Pratt & Whitney JT3-L turbojets, commercial version of the USAF's J-57, which is rated at over 10,000 lbs. th. The engines are arranged in the now familiar pods, almost a Boeing jet trademark. This power plant is undoubtedly the most advanced American-designed turbojet engine to reach volume production and is comparable with the best engines available anywhere. The high regard in which it is held by the U.S. military is clearly indicated by the number of top aircraft in which it is in use, or scheduled for use: North American F-100, Convair F-102, Douglas F4D Skyray, and the Boeing B-52 Stratofortress.

The prototype machine features an unusual color scheme. The upper portion of the fuselage and most of the top side of the wings and tailplane are painted a bright canary yellow; the undersurfaces and leading edges of the flying surfaces, a deep chocolate brown. A broad band of chocolate brown also runs down both sides of the fuselage, being separated from the yellow section by a narrow white stripe. The main portion of the under half of the fuselage remains in its natural aluminum state.

The christening ceremony was carried out by Mrs. William E. Boeing, wife of the founder of Boeing Airplane Company.

THE BOEING SUPERSONIC TRANSPORT / may 1969



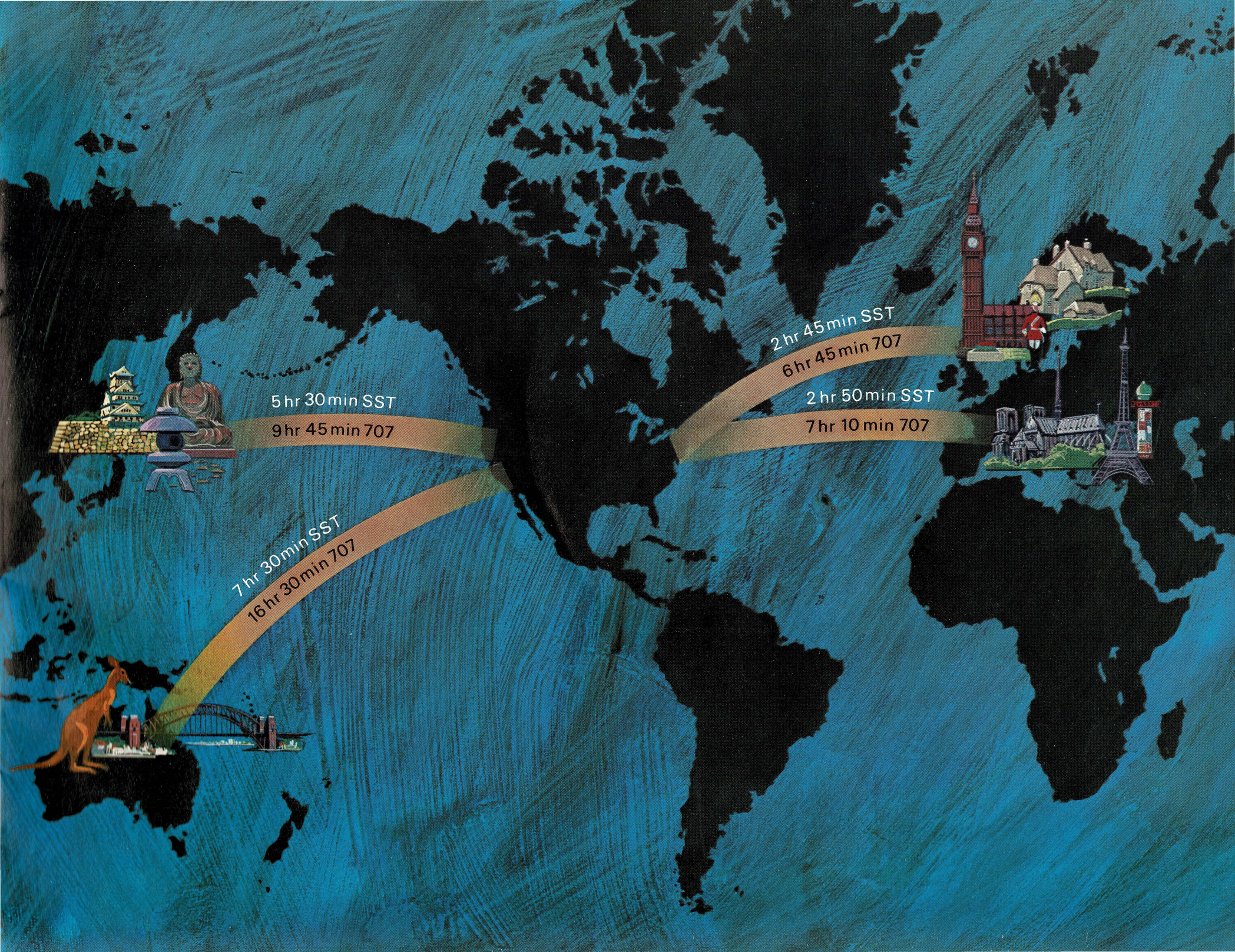
THE SUPERSONIC ERA IS NOW

On the last day of 1968 and on March 2, 1969, the Russian supersonic transport (TU-144) and the Anglo-French supersonic transport (Concorde) made their respective first flights. There can no longer be any doubt—air transportation's supersonic age has arrived!

The Boeing SST is the culmination of commercial airplane studies dating back to 1958 and takes advantage of over 16 years of the research, development, and flight experience of all United States supersonic aircraft. We have reached the point in our technical studies where further progress requires proceeding to flight hardware development.

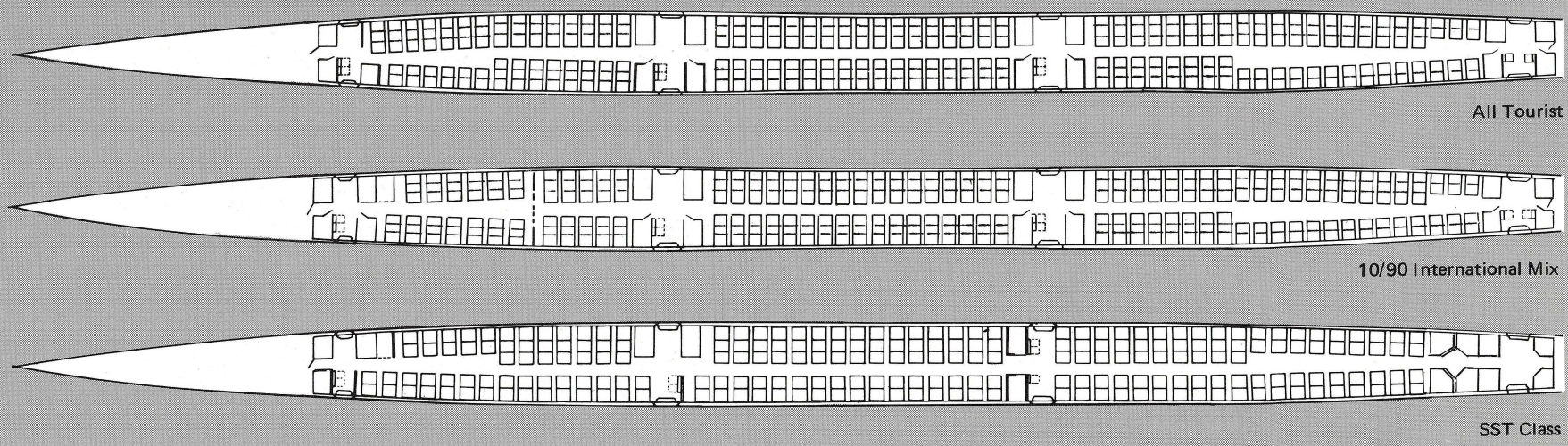
For several decades, the United States has been the leading manufacturer and supplier of commercial transport airplanes to the world's airlines. Now that position is threatened.

Maintaining our leadership requires continuing advances in aircraft efficiency, safety, and attractiveness to the traveling public. The Boeing supersonic transport will reduce trip time more than 60 percent compared with subsonic jets, will have improved safety, larger seats, and improved levels of passenger comfort. This new Boeing transport will ensure our leadership in the supersonic era.


5 hr 30 min SST
9 hr 45 min 707
7 hr 30 min SST
16 hr 30 min 707
2 hr 45 min SST
6 hr 45 min 707
2 hr 50 min SST
7 hr 10 min 707

The 2707-300's interior has been designed to meet the requirements of the traveling public. It features spaciousness for improved comfort, unexcelled safety standards (including the capability for rapid evacuation), and maximum use of the airplane fuselage.

As indicated in the accompanying illustration, the six-abreast arrangement provides maximum flexibility by means of spacious cabin seating with wider seats than on today's airplanes, a modular design allowing rapid substitution of seats for galleys and lavatories, and the capability to quickly change the ratio of first class to tourist seating by substituting seats and relocating the class divider.

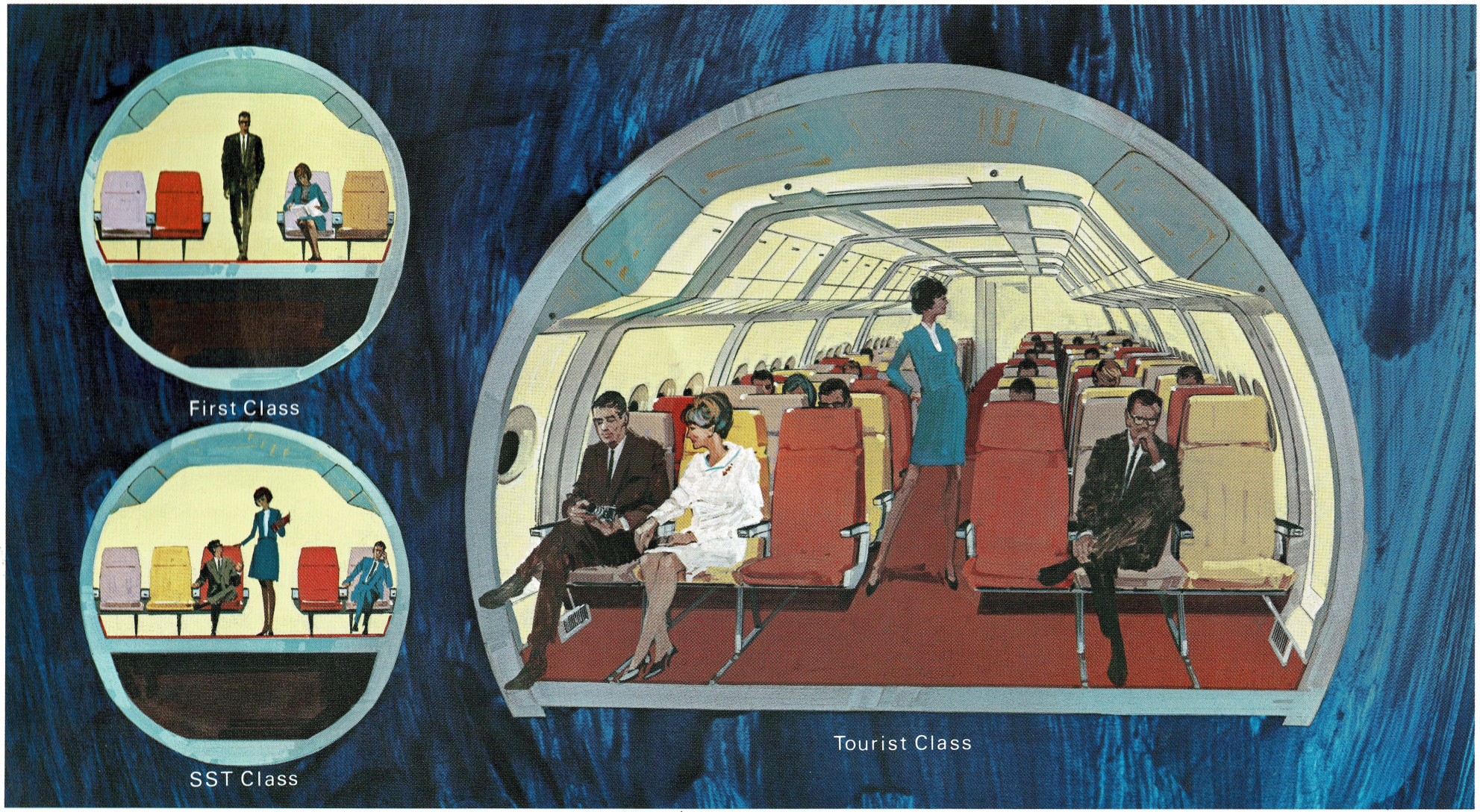


All Tourist

10/90 International Mix

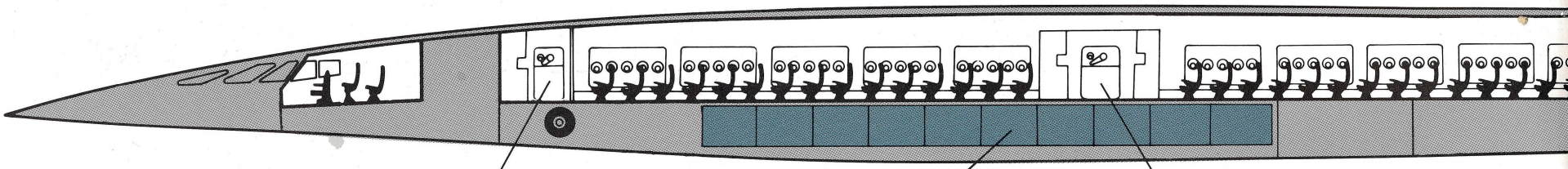
SST Class

INTERIORS



Modular lavatory service units permit optimum cabin arrangements for each airline.

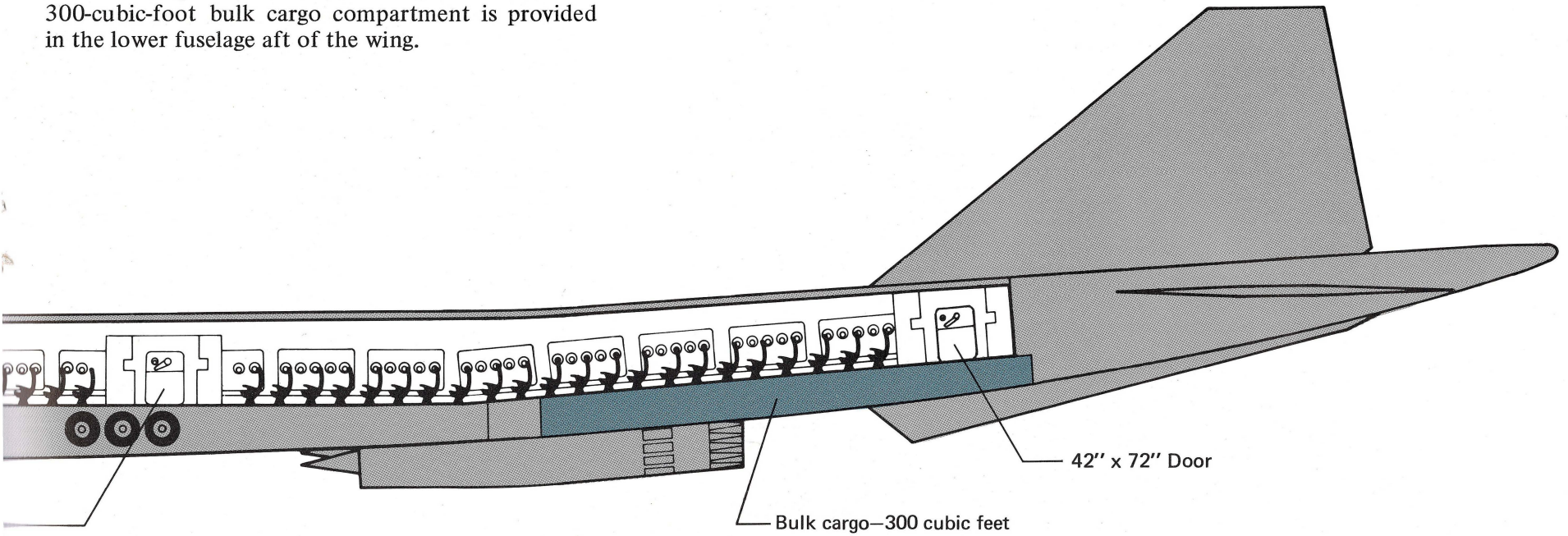
Galleys will employ the most advanced and efficient means of serving food in flight.

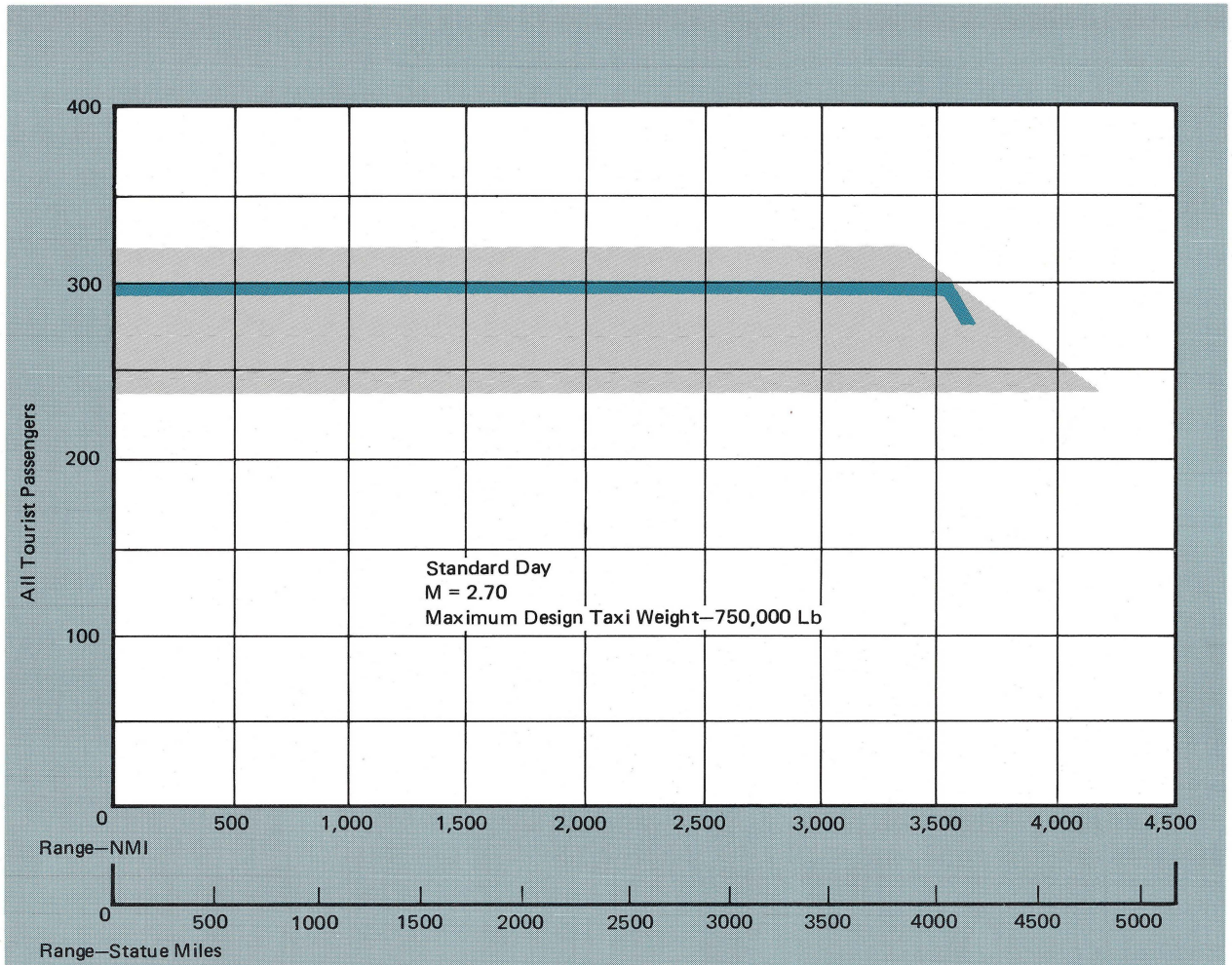


CARRYING PASSENGERS and CARGO

Passengers will normally board and deplane through the middle two of four doors located on the left side of the 2707-300. For emergency access and egress, the other two doors may be used. To expedite servicing, four additional doors are provided on the right side opposite those on the left. Door-mounted escape slides are installed on all eight doors for emergency egress.

A 1,344-cubic-foot cargo compartment is located beneath the passenger cabin and forward of the wing. It will accept nine identical cargo containers. A 300-cubic-foot bulk cargo compartment is provided in the lower fuselage aft of the wing.





Payload-Range Capabilities (Production Airplanes)

Potential Production Technology GE4 700 Lb/Sec Engines With Suppression

Payload Range

The 2707-300 will offer the airlines a distinct competitive advantage over present subsonic jets. The airplane can carry substantial payloads over most of the world's scheduled airline routes.

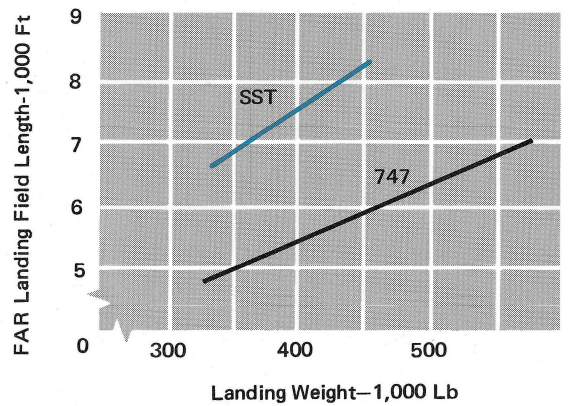
The productivity of the SST on long overwater routes is great. The total operating costs of the SST and the attractiveness of its speed and ride comfort to the passenger will combine to achieve reasonable airline profits at today's ticket prices.

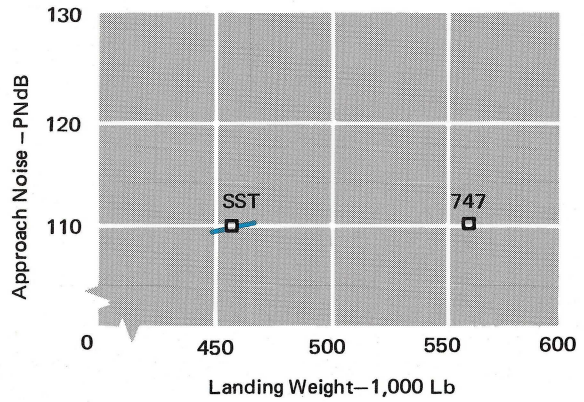
Performance

Full span leading and trailing edge flaps allow the 2707-300 to take off and land well within the runway distances provided by existing international airports. Special attention has been devoted to the landing gear design so that SST pavement loading capabilities will be equivalent to those of existing subsonic jets on today's airport runways.

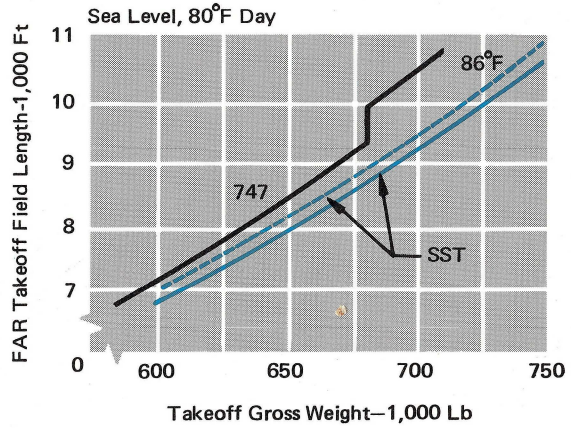
The noise levels achieved under the flight path in the airport community, both on takeoff and landing approach, will be below the levels observed with present intercontinental transports. These levels are also within the new lower noise standards proposed by the FAA. However, the airport noise levels require development of advanced sound suppressors. Boeing and General Electric are working on a major program of SST noise suppression for the production airplane. The program aims at containing the airport noise at the level of existing intercontinental subsonic jets.

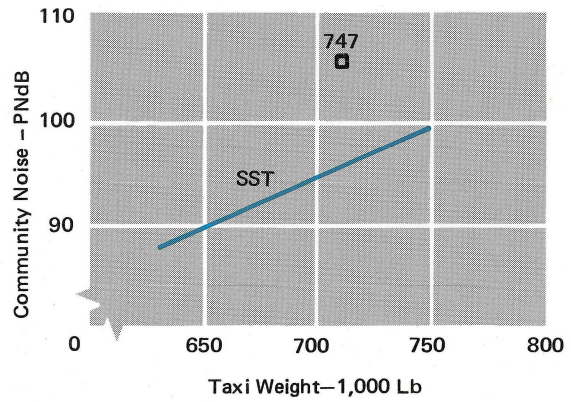
LANDING

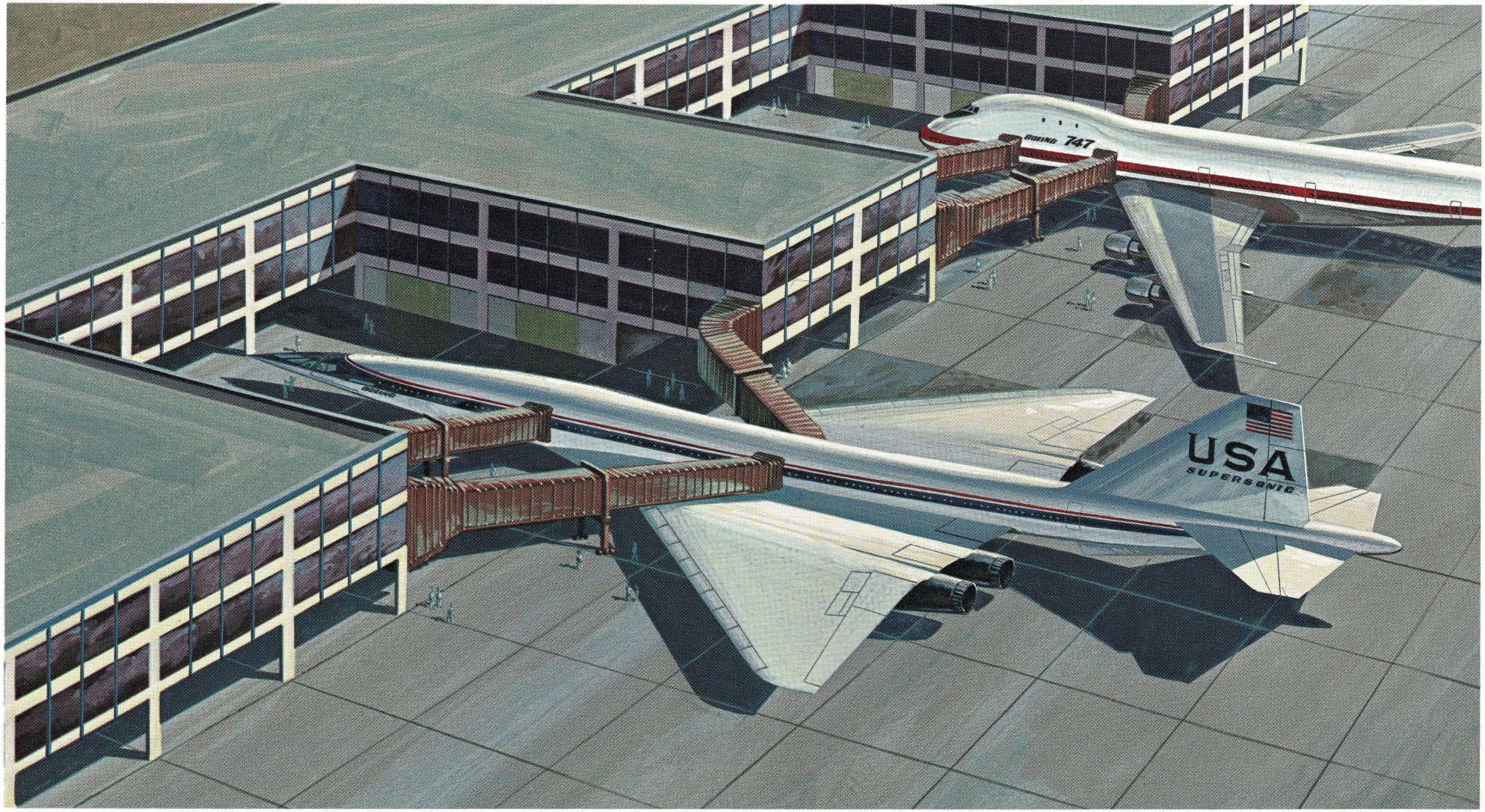




TAKEOFF






BOEING 747
USA
SUPERSONIC

DESIGNED TO USE EXISTING FACILITIES

The SST's impact on major airports will be minimal. The passenger loading system has been designed to use the same or equivalent facilities and ground equipment as those now under construction for the large subsonic jets.

Because servicing and cargo loading doors are on the opposite side and under the passenger doors, servicing and cargo movement can be carried on concurrently—away from the passenger loading zones.

Relief of Airport Congestion

The SST will bring relief to airport congestion in several ways:

- More airports will be serviced on a point-to-point basis, thereby reducing the traffic congestion at major transportation hubs.
- Automatic flight management will allow closer and more accurate scheduling.
- The short flight times introduce new arrival and departure options for the SST which will reduce traffic peaking at certain times of the day.

The SST's high cruise altitude of over 60,000 feet will create a new plateau for traffic movement. This new flight regime not only reduces the congestion at the subsonic altitudes of 30,000 to 40,000 feet, but provides smoother air which will result in a more comfortable ride than at the subsonic jet altitude.

The 2707-300 satisfies the goals of increased aircraft efficiency, safety, and attractiveness to the traveling public. With this airplane, we are ready and able to advance this country's leadership in the supersonic era.