Royal Canadian Air Force

The Royal Canadian Air Force is made up of six Commands, two Air Divisions and one Training Group, each of them functional in nature. Prime aims are training and defense.

The RCAF carries out its own training programs throughout for all personnel, air-crew and non-flying.

The force maintains 12 fully operational squadrons in Europe. Basic aircraft is the Canadair-built F-86 Sabre, with four of the squadrons now in the process of being re-equipped with Canadian built and designed Avro Aircraft CF-100s. (Two of the CF-100 squadrons are now on duty overseas).

In Canada there are nine fully operational CF-100 squadrons operating as Air Defence Command's main force. The Government has indicated its intention to boost the number of ADF squadrons to 12. These units will be re-equipped with the Mach 2 CF-105 Arrow which is now under development at Avro Aircraft. Reports are that the Arrow will begin flight tests this year.

Following is the organizational detail of the RCAF, with the names of senior officers and their commands:

Headquarters Organization

Chief of the Air Staff: A/M C. R. Slemon.

Assistant to the Chief of the Air Staff: G/C W. L. Gillespie.

Scientific Adviser the Chief of the Air Staff: Dr. J. W. Abrams.

Vice-Chief of the Air Staff: A/V/M C. R. Dunlap.

Air Member for Personnel: A/V/M J. G. Kerr.

Comptroller: A/V/M W. E. Kennedy.

Air Member for Technical Services: A/V/M H. M. Hendrick.

Chief of Personnel: A/C W. E. Bennett.

Chief of Personnel Services: A/C J. G. Stephenson.

Director General of Medical Services (Air): A/C A. A. G. Corbet.

Chief of Material: A/C Cornblat.

Chief of Aeronautical Engineering: A/C G. G. Truscott.

Director of Systems Engineering Group: G/C E. C. Poole.

Chief of Construction Engineering: A/C R. B. Whiting.

Deputy Air Member for Technical Services: A/C D. S. Blaine.

Chief of Plans and Intelligence: A/C M. D. Lister.

Chief of Air Operations: A/C W. R. MacBrien.

Chief of Training: A/C V. H. Patriarche.

Chief of Telecommunications: A/C C. L. Annis.

Chief of Operational Requirements: A/C J. A. Easton.

Chief of Organization and Management: A/C K. L. B. Hodson.

Chief of Finance: A/C R. W. Desbarats.

Field Organization

Training Command Headquarters—Trenton, Ont. Air Officer Commanding: A/V/M J. G. Bryans.

Air Transport Command Headquarters—Lachine, Que. AOC: A/C F. S. Carpenter.

No. 1 Air Division Headquarters — Metz, France. AOC: A/V/M H. B. Goodwin.

No. 1 Tactical Air Command Headquarters—Edmonton, Alta. AOC: G/C H. G. Richards.

Maritime Air Command Headquarters —Halifax, N.S. AOC: A/C M. Costello.

Air Material Command Headquarters —Rockcliffe, Ont. Acting AOC: A/C C. A. Cook.

Air Defence Command Headquarters — St. Hubert, Que. AOC: A/V/M L. E. Wray.

No. 5 Air Division Headquarters — Vancouver, B. C. Group Commander: A/C A. D. Ross.

No. 14 Training Group Headquarters —Winnipeg, Man. Group Commander: A/C H. H. C. Rutledge.

Royal Canadian Navy

Naval Aviation Branch

Strength of the Royal Canadian Navy Naval Aviation Branch is concentrated in seven operational squadrons.

Two fighter squadrons are now equipped with McDonnell F2H-4 Banshee all-weather jets procured from the United States Navy. Three antisubmarine squadrons are to be completely re-equipped with CS2F-1 Trackers. This twin-engine hunter killer aircraft was designed originally by the Grumman Company and is now being produced in a Canadianized version by de Havilland Aircraft of Canada. The Tracker project was widely subcontracted throughout the Canadian aircraft industry.

The remaining two squadrons are equipped with helicopters. One squadron is designated as an antisubmarine unit, but has been extensively used in recent months for Mid-Canada Line supply. The second helicopter squadron is a general utility squadron, responsible mainly for training of personnel.

With the exception of the helicopter pilots the Navy does not carry out its own aircrew training. RCN flyers now receive the bulk of their training at United States Navy establishments.

The aircraft carrier HMCS Magnificent is being replaced by HMCS Bonaventure which was commissioned early this year.

Following is the organizational detail of the RCN Naval Aviation Branch with the names of senior officers and their commands:

Naval Headquarters, Ottawa

Assistant Chief of the Naval Staff (Air): Commodore H. P. Sears, RN.

Director of Naval Aviation: Capt. G. C. Edwards, RCN.

Staff Officer Air Personnel: Cmdr. V. J. Wilgress, RCN.

Deputy Director of Naval Aviation: Cmdr. J. D. Lowe, RCN.

Assistant Director of Naval Aviation: Lt. Cmdr. (P) V. J. Murphy, RCN.

Flag Officer Atlantic Coast

Assistant Chief of Staff (Air): Cmdr. R. A. Creery, RCN.

HMCS Shearwater

RCN Air Station near Dartmouth, N.S.

Commanding Officer: Capt. D. G. King, DSC, RCN.

Commander (Air): Cmdr. D. W. Knox, RCN.

Lt. Cdr. (Flying): Lt. Cmdr. (P) R. A. Lyons, RCN.

HMCS Bonaventure

Commanding Officer: Capt. H. V. M. Groos, RCN.

Commander (Air): Cmdr. J. B. Fotheringham, RCN.

Lt. Cdr. (Flying): Lt. Cmdr. (P) W. J. Walton, RCN.

Canadian Army

Air Branch

The Canadian Army's present air strength consists of two observation post flights.

There are indications of considerably more army activity in the aviation field. The force has shown definite interest in the new DHC-4 Caribou twin-engine utility transport under development at de Havilland Aircraft of Canada. The Army and the Department of Defence Production are participating with de Havilland in design and manufacture of the prototype aircraft which will be evaluated by the Army.

The Army is also known to be inter-

Aviation News Digest

Trans-Canada Air Lines has ordered three more Vickers Viscount airliners for delivery early in 1957. This brings TCA's total Viscount order to 25, valued at $24 millions, including spares.

* * *

Consolidated Diesel Electric Corp., Stamford, Conn., has formed a Canadian company known as Consolidated Diesel Electric Corp. of Canada Ltd., with offices in the National Building, 18 Rideau St., Ottawa. A Canadian plant is planned to manufacture ground support equipment, aircraft component testing equipment and generator sets.

* * *

Aluminium Castings Co., Glasgow, Scotland, has taken over full control of the Cockshutt Aircraft Ltd. plant, Renfrew, Ont., on behalf of Aluminium's subsidiary — Burnelly Aircraft Products Ltd., Burnelly, England. The new company will be known as Renfrew Aircraft & Engineering Co.

* * *

The addition of geometric boundary layer control to the leading edges of a Beechcraft Bonanza has added an extra 12 m.p.h. to the cruising speed at 8,000 ft. The job was done by the **Garrett Corp.'s AiResearch Aviation Service Division,** Los Angeles.

* * *

A $3.5 million **supersonic wind tunnel** is to be built for the National Aeronautical Establishment at Ottawa's Uplands Airport.

* * *

Winnett Boyd Ltd., Toronto, has been appointed sole Canadian representative of the D.S.D. Mfg. Co., Hamden, Conn., manufacturers of Toruseal hollow, stainless steel "O" rings.

* * *

Canadian Aeronautical Institute's Toronto branch announced the election of the following officers for 1955-56: W/C J. N. Brough, RCAF, chairman; F. H. Keast, Orenda Engines Ltd., vice-chairman; M. D. Willer, Avro Aircraft Ltd., secretary; F. H. Buller, de Havilland Aircraft of Canada Ltd., treasurer; J. C. Floyd, Avro Aircraft and W. D. Hunter, de Havilland, two-year councilors.

U. S. Navy S2F foreshadows the DH CS2F-1, now being built in Canada for the RCN. Note the extended radome housing and MAD boom, shown here for the first time.

Restyled 'Mite' now available

Cockpit design improvements, with no sacrifice to performance, are a feature of the new 1955 Mooney Mite, now in production. Price here is $3,995.

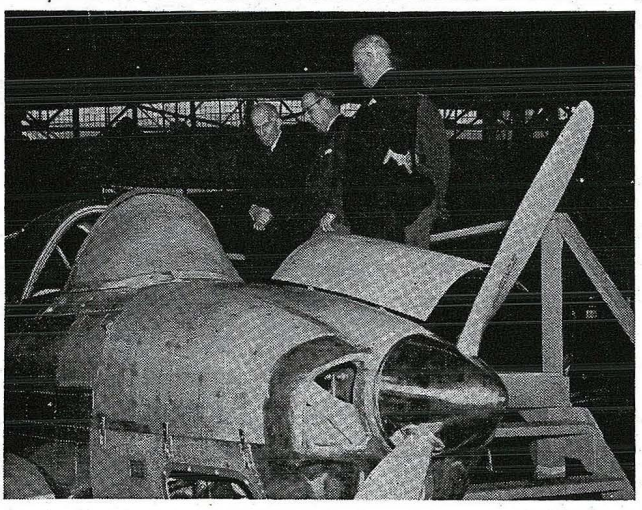
The little Mite now has the most comfortable cabin of its life; plenty of leg space, and head clearance for even the largest pilots. The new seat is adjustable fore and aft and is cushioned with new springs and thick foam rubber. The windshield and hatch canopy are larger and thicker than before.

Instrument panel is much larger, with accommodation for more instruments. The landing gear retraction lever has been relocated 20 in. rearward for ease of operation from a sitting position. Soundproofing and thermal insulation has been greatly improved with the installation of insulating upholstery throughout the cabin.

On the exterior, the Mite with the "new look" has a new scheme of colors to choose from—flare red and Arctic white. Also, a complete line of electrical accessories such as starter, generator, battery, lights, instruments, radio, and horn warning system are now available for factory installation.

Canadian sales are handled by Frank Ogden, 17 Cliffside Dr., Toronto.

TCA Reports Surplus and Revenue, $62,236,564



ONE OF FIRST CANCAR T-34 TRAINERS being examined at the Company's Fort William plant recently by Rt. Hon. Vincent Massey, Governor-General of Canada, R. E. Henderson, Division Plant Manager, and E. J. Cosford, President and Managing Director.

Cancar's First 34A Accepted by USAF

The first T-34A two-seat primary trainer produced by Canadian Car and Foundry at Fort William, Ontario, for the USAF has been accepted. The order for an unspecified number of T-34's was placed with Can-Car last spring.

"The aircraft was completed on schedule and has passed with flying colors the very exacting requirements of the customer," said Plant Manager R. E. Henderson. "An inspection team from the USAF recently visited the Fort William plant and thoroughly inspected the new aircraft. Production will continue on schedule."

It is understood the second aircraft will be ready early this month and full assembly-line production is expected to follow shortly afterward.

It is reported that 25 T-34A's are to be taken by the RCAF from Can-Car on a trial basis to determine the aircraft potentialities for initial flying training in Canada.

Although Can-Car's production of Harvard trainers, which reached a total of almost 600 for the RCAF, USAF and NATO countries, is now at an end, the company will continue to produce and supply spare parts for the aircraft's various users.

The company is expected to start work later this year as a major sub-contractor to de Havilland Aircraft of Canada on construction of the Grumman S2F twin-engine sub-hunter to be produced for the Canadian Navy. Can-Car is expected to get the contract for most of the airframe fabrication on this multi-million dollar contract, which will extend over approximately three years.

J. B. McCullum

Canadian Westinghouse Company Limited announces the appointment of J. B. McCullum as manager of its Aviation, Marine and Transportation Division. He joined the Company after graduation from the University of Toronto in 1948 and was formerly manager of Marine and Transportation Sales.

The operation of TCA during 1953 resulted in a net surplus of $256,230 after taxes, according to the company's annual report.

The report showed operating revenues amounting to $62,236,564, an increase of 13% over 1952. However, operating expenses totaled $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 one per cent over 1952, while the volume of mail carried increased by 11%. Air express and air freight revenues totaled $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. The report attributed this 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 airline 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's routes totaled 9,916 miles in North America and 9,078 miles overseas.

Once again there was reported 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 per cent 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.

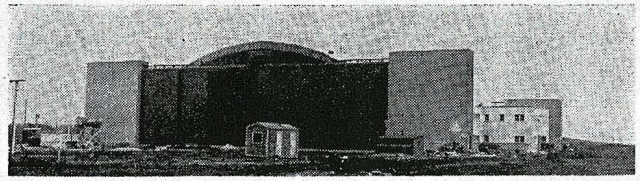
During the year, TCA carried 7,947,113 ton miles of air express and air freight on its domestic and overseas routes.

A 30% reduction in freight rates, approved by the Air Transport Board late in 1953, coupled with the use of Bristol Freighters, will further expand the scope of the Company's commodity transport.

Stop the Press!

DOT BUYS VISCOUNT

A Vickers-Armstrong Viscount turbo-prop airliner has been purchased by the Department of Transport for use on D.O.T. business in Canada, it has been learned. This brings to 93 the total number of Viscounts sold. The first of 15 TCA Viscounts, first turboprop to go into service in North America, is due to be delivered later this year.



RCAF hangar being constructed at Winnipeg, 200 feet long with a 160-foot clear span.

whole flight between Los Angeles and Copenhagen, the flight across the territory surrounding the north magnetic pole.

The flight from Edmonton to Thule was planned as a grid-flight on directional gyro.

In the vicinity of the north magnetic pole there is a large area where the horizontal component of the earth's magnetic field is so weak that the magnetic compasses have no sense of direction. Consequently a means of steering independently of magnetic influences had to be used.

Eclipse-Pioneer had constructed a special gyro-system for this flight called the "Polar Path" control system.

The "Polar Path" control system consisted of an extremely precise directional gyro which could be linked electrically to the PB-10 Automatic pilot.

Shortly after passing over Waterways about an hour out of Edmonton our magnetic compasses started to hunt thereby indicating that they were not very reliable from then on. Consequently we switched over to our "Polar Path" control system which from here on controlled the Automatic Pilot all the way to the East Coast of Greenland.

The night was excellent for navigation. At 17,000 feet we topped all clouds and stars and planets stood crystal bright in the Arctic sky.

The planet Jupiter became our leading star by means of which we checked our grid-heading every 20 min. and at the same time we read off the heading of the "Polar Path" gyro.

If the grid-heading was higher than the heading of the gyro it meant that the gyro had a drift to the right and consequently we had to make a correction of this to the left.

With an uncorrected gyro of the type used in the "Polar Path" control system we could easily precompute the drift caused by the rotation of the earth as it always is 15 deg/h X sine of latitude.

At the North Pole we would get a maximum drift of 15 deg/h and at the equator we would get a drift of 0.

However, in addition to this apparent drift bearing frictions, gyro angular momentum, balance, etc. causes a random gyrodrift. In the "Polar Path" gyro this random drift was reduced to less than 1 deg/h. During the whole flight the "Polar Path" gyro had an average drift of 14 deg/h to the right which was exactly what we had precomputed.

When abeam of the north magnetic pole our compasses became sluggish and pointed to the tail of the aircraft.

Now the Thule radio-beacon came in very strong and gave a steady bearing on the radio compass. Already two hours out of Edmonton we were able to pick up the Thule beacon which showed the excellent radio conditions on this special night. However, we were too far away to get a steady bearing on the radio compass at this point.

About 50 miles out of Thule we suddenly could see the lights from the base which looked like a medium sized town from the air.

Passing in over the airbase we got landing number three, and seven hours twenty five minutes after take off from Edmonton we landed on the excellent runway at Thule. We had now reached the northern most point of the flight, 76° 30' N and we were 920 miles from the North Pole. Our landing at Thule seemed to be quite an event and had gathered a big crowd. Our lack of a stewardess seemed to be a great disappointment however. The temperature was only 15 deg. below zero and the weather was clear so we got a very agreeable impression of the base.

After a ground-stop of two hours "Arild Viking" took off from Thule and after climbing to 10,000 feet on a westerly course we turned back and set course southeast from Copenhagen climbing to 17,000 feet. As the huge ice cap of Greenland at some places in the centre is more than 9,500 feet high, this climb out procedure is necessary to be at safe altitude before crossing the ice cap.

A tailwind of more than 100 mph helped us speedily to cross this immense barrier and just when we reached the east coast of Greenland a beautiful red light in the south sky showed at the same time dawn and dusk. At this time of the year the sun never rises above the horizon

EDITORIAL

Eyes on the Target

THERE is some comfort in the forecast of a three-year $5 billions preparedness program outlined by Defense Minister Brooke Claxton and summarized in this issue (page 16). It is reassuring to note that Canada's logical and traditional role as an air power is recognized, that the RCAF strength will be boosted to 40 squadrons, with 3,000 additional aircraft, and that this country is opening its airdromes to the aircrew trainees of the Atlantic Pact countries.

The aircrew training program calls for a rate of 3,000 trainees per year and will involve expenditure of $64,500,000 in the current fiscal year. To support this unprecedented peacetime undertaking, Harvards to the value of $65 millions will be manufactured in Canada. To power these trainers, engines too probably will be manufactured here. Even at the peak emergency of the last war, Canada did not venture to manufacture piston engines. The relative stress on air power is measured by the fact that the RCAF appropriation will be almost equal to that of the other two services combined.

It is quite apparent that the aircraft manufacturing industry will face a stiff challenge. Meeting the requirements for air training and for operational flying equipment to supply the RCAF and aid the NATO nations will call for a concentrated effort comparable to the aircraft production build-up from 1942 to 1945. During the first nine months of the 1950-51 fiscal year, 80,000 industrial defense orders were placed, with a total value of $701 millions. More than half of this dollar volume, $331 millions, was assigned to the aircraft industry.

The Dept. of National Defense is to be commended for its recognition, however belated, that we are in an extremely precarious situation. But let us not make the tempting mistake of being lulled into a mood of complacency by the assurance that billions of dollars will be spent on defense. Until that expenditure can be converted into security, we are in no position to take our eyes off the target.

"Arrived Dead on Time!"

LONDON, England—Revision of the operating rules at London Airport has been recommended as a result of the crash of a British European Airways Viking while attempting to land at the airport in a fog last October. Under present conditions, London Airport is open for emergency landings at all times, but each airline lays down certain weather minimums below which the pilot may not land except in dire emergency. In his report based on investigation of the operating procedures at this world terminal, Lord Brabazon concedes that this system should continue but recommends that airline operating limits be subject to agreement with airport controllers. He further advises that a pilot who attempts to land against the advice of airport operators, except in dire emergency, should be liable to prosecution.

The report emphasizes that being forbidden to land when the pilot feels he could do so safely is no reflection on his professional ability. It is noted that frequently there are conditions of dangerous visibility at runway level not apparent from the higher altitude of an approaching airliner. On the question of pilot's responsibility, the report says:

"Although there is no known instance of a company placing pressure on a pilot to land rather than diverting when conditions were below minimums, it has been indicated to me that the procedure adopted by certain companies when diversions do take place have just this effect. These companies require a pilot, in case of a diversion, to submit a report to headquarters . . . It often transpires that a pilot believes . . . this indicates that his professional capabilities are in question. A natural corollary . . . is that he is averse to diverting in marginal conditions . . . Every step must be taken . . . to rid the pilot of this outlook. It would appear to me that as a general principle companies should insist most strongly on reports from pilots who land at their intended destinations below established minimums. This is particularly important since there is an implied if unintended slur on the ability of a company pilot who diverts in conditions comparable to those in which another lands safely, though the decision of the former may well be the correct one."

This latter recommendation seems to me to be most important, for as pilots are human, they must at times have such feelings which might make them take what they deem to be very slight risks rather than inconvenience passengers by landing them at an airport 100 or more miles from the intended landing point where perhaps the passengers own cars and friends are awaiting them. It would be a good motto for all airlines to drill into their air crews that it is better to arrive alive behind schedule when necessary than DEAD ON TIME!

—Geoffrey Dorman.

Special Effort Required

NO purpose would be served by nagging the D.O.T. editorially on the subject of the approved course for commercial pilots. The comments of operators on our February editorial, "Action is Overdue," needling the Department for sluggishness in implementing the approved course leave no doubt as to the urgency of the matter. (See page 21.) This is just a reminder that the spring school-flying season is almost at hand. A special effort would be justified to get this program into motion promptly.

CANADIAN AVIATION

Ronald A. Keith

Editor

EDITORIAL

IT IS most important that Canadian representatives at the International Civil Aviation Organization work in close liaison with our manufacturers and operators. This is particularly true on the assumption that the air regulations developed by ICAO will become part of Canadian air law. Technical representatives from the airlines and factories have been consulted on occasion on matters concerning international flying and multi-engined aircraft. Apparently there has been a surprising disregard, however, for the interests of domestic aviation, with particular reference to single-engined aircraft (Category D).

We are not sure why ICAO should be bothering with single-engined aircraft at all. But in any case our representatives have a duty to watch out for the interests of our domestic manufacture and operation. In specific instances, apparently they have slipped up.

We refer, in particular, to a strange clause in Annex Eight (Second Edition), Airworthiness of Aircraft, issued recently by ICAO. Paragraph 2.3.2. 6-D rules that the stalling speed of a single-engined aircraft at maximum loading shall not be more than 56 mph. This pronouncement came as a shocking surprise to Canadian aircraft designers. They were not consulted in the decision. Yet it is a matter of the greatest concern in the design, operation and export sale of Canadian aircraft.

This 56 mph figure evidently was chosen because its ICAO equivalent, 90 kph, is a good round number. Unfortunately it threatens to be a serious drag on the design and development of Canadian bushplanes if incorporated into our air regulations. Furthermore, it is just plain silly to peg safety performance to a single, and arbitrary, stalling speed criterion, with no consideration for other features such as rate of roll, pitching moments, etc.

In the same document there is another pronouncement limiting the all-up weight of a single-engined aircraft to 12,500 lb. No mention is made of power, wing design or other relevant factors. Apparently it has been decided that any single-engined aircraft over this weight figure is unsafe. Canadian designers dispute this assumption.

ICAO is serving a necessary and valuable purpose in the simplification and standardization of regulations applying to international flying. We believe, however, there is a danger that devotion to uniformity may be leading our representatives into the error of regulating our domestic aviation without proper regard for common sense.

Note—The following editorial is particularly significant because it appeared in a U. S. publication, American Aviation. It is encouraging to see this evidence that the Canadian plea for two-way defense buying has found a strong advocate south of the border.—The Editor.

THE CANADIANS are beefing that the U. S. is not living up to the high-sounding words in the Canadian-U. S. pact of economic co-operation by which production facilities and skills of the two countries would be freely exchanged in the interest of hemisphere defense.

A look at the record would indicate that they have every reason to beef. So far the "economic co-operation" pact has been a one-way street leading south.

Canada agreed to standardize on aircraft, training, ordnance, planning—everything, right down the line. This was a sensible move. When it comes to defense the two countries have everything in common. Not to standardize would have been foolhardy.

But Canada is buying about $900 millions worth of war material including airplanes, engines and parts, from the U. S. over a period of three years. At the moment the total orders placed by the U. S. in Canada are about *one-fifteenth of that.* All the orders we've placed north of the border consist of one order for guns, one order for about 500 de Havilland single-engined Beavers, and a share of the Beech T-36 trainer contract which will involve a few hundred airplanes plus some designing and subcontracting. This is the total extent of reciprocation.

It isn't a matter of sentiment. Canada needs dollars. She's getting short. She can't continue to buy far more from us than we buy from her without running into exchange trouble.

She can't cut down on her military purchases because she agreed to standardize on all war equipment. So now when she needs a particular type of airplane, and lacking something of her own, she has to buy in the U. S.—and the plane must be completely standard.

Thus when Canadair began to build the North American F-86 Sabre for the Royal Canadian Air Force, Canada didn't benefit her dollar situation one iota. Engines and parts and accessories have to be bought in the U. S. If Canada were building the F-86 *for the U. S. A. F.,* then her dollar situation would be vastly improved. Building a U. S.-designed airplane is only beneficial dollar-wise when the airplane is being built *for* the U. S.

Canadair, Ltd. entered its own design in the advanced trainer competition at Wright-Patterson Field recently. It came within an ace of winning. Had the prime contract been given to Canada, the 15 to 1 ratio of reciprocation would have been eased materially.

We certainly are not advocating that the U. S. aviation industry be sacrificed or diluted in order to maintain a trade balance with Canada, but high defense officials will have to find some means of spreading the production work now that it has been agreed that we are to spread the work of defending the hemisphere. If not airplanes, then other defense work. There is plenty to do and Canada's facilities are reasonably diversified.

Standardization and reciprocation must be more than mere words. A one-way street on procurement simply won't work economically.

The NEWS

MAY CANADIAN AVIATION 1951

Jet Trainers from U. S. In $300 Million Plan

A number of two-seat jet trainers may be part of a $300 millions 1951-52 Canadian defense purchasing program in the United States, according to reports from Ottawa. Speaking in New York, Hon. Brooke Claxton, defense minister, said firm orders placed in the U. S. by Canada for the last nine months of 1950 amounted to $159 millions.

Aircraft and accessory purchases in the U. S. over the coming year will be in the neighborhood of $100 millions. It is considered probable that a trainer version of an American jet fighter might be purchased in sufficient quantity to fill the gap until quantity production of the CF-100 has been achieved. Presumably a dual-control CF-100 will be produced at a later date.

North American Aviation and Lockheed have been mentioned as suppliers of a jet trainer to Canada. Lockheed has a trainer development of the F-80. Known as the T-33 (TO-2), it is powered with a J33-A-23 jet of 5,200 lb. ST. Maximum speed is over 600 mph.

RCAF Orders Beeches For Training Plan

The Royal Canadian Air Force has signed a contract with the Beech Aircraft Corporation, Wichita, Kansas, which will provide Beechcraft twin-engine airplanes (D18S) for pilot training, navigation training and short-range communications work of the RCAF.

While the exact numbers of aircraft and total dollar amount of the contract have not been revealed, a "substantial number" of the planes have been purchased. First deliveries of the twin-engine Beechcrafts to the RCAF are scheduled to begin in May.

The planes are for navigation training, completely fitted with astrodomes, plotting tables, and other navigational aids and instruments; for the pilot training; and for transport. For navigation purposes the new Beechcrafts will supplement Dakotas now used in this RCAF program.

The Beechcraft Model D18S is powered by two 450-horsepower Pratt and Whitney engines, carries seven-to-nine persons, has a top speed in excess of 230 mph and a maximum range of 1420 miles.

During World War II, Beechcraft production lines turned out a total of 7,000 military versions of this twin-engine Beechcraft. Military and commercial versions of this plane are now in operation in 17 countries of the world serving in varied training and transport capacities.

Defense Contracts To Be Dispersed

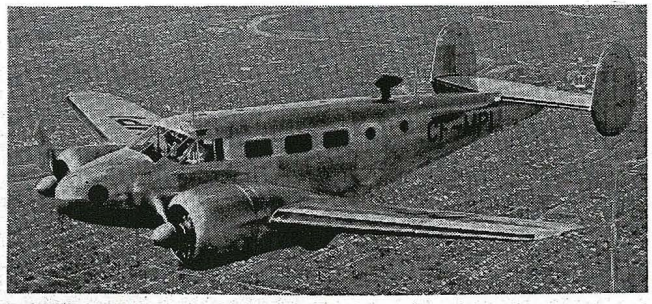
The distribution of defense contracts to small enterprises across the country will concern a special advisory council to operate with the recently created Dept. of Defense Production at Ottawa, according to a Government announcement. Its purpose will be to help small plants to get into the picture by showing sub-contractors where to farm out their work.

Absolve Curtiss-Reid In "Pilgrim" Crash

The French board of inquiry investigating the crash of the Canadian Pilgrim, DC 4 airliner operated by Curtiss-Reid Flying Service, has issued a preliminary report that it had discovered no evidence that the company or the aircraft were responsible for the disaster. The airliner crashed in the French Alps on Nov. 13.

Canadian Car Tools For Harvard Output

Tooling for Harvard manufacture is in progress at Montreal, pending transfer to the Fort William plant of Canadian Car & Foundry Co. Ltd., according to a statement by J. T. Asquith, vice-pres. and general manager of the company. It was indicated that production rate would reach 25 trainers a month, with at least 1,000 planes on the order.



BEECH FOR RCAF—A quantity of Beechcraft 18S trainers and transports, as shown above, have been ordered by the RCAF.

Burnelli Loadmaster Gets U. S. Evaluation

Prospect that the Canadian-built Burnelli Loadmaster might be purchased by the U. S. military services was seen in reports that the aircraft is in the United States on a demonstration tour.

The Burnelli freighter features an airfoil-shaped fuselage, unusually large loading doors on either side, and a spacious interior. Based on the design by Vincent Burnelli, long an exponent of the airfoil-fuselage principle, the aircraft was engineered and built by Canadian Car & Foundry Co. Ltd.

It is being flown on its current demonstration tour by Clyde Pangborn, famous pioneer pilot. It is being evaluated by the USAF and the Airborne Division of the U. S. Army.

TCA to Look at Jets In Four Years

It will be "at least four years" before Trans-Canada Air Lines will acquire jet or turboprop airliners, according to a statement of President Gordon McGregor, speaking at Calgary. There is still four years' depreciation life in the North Stars, but after that time, "we should be able to form a reasonable decision on turboprop or jet aircraft," he said.

Stuart Graham, formerly supt. of air regulations in the Dept. of Transport, will head a four-man technical assistance mission being sent to Ethiopia by the International Civil Aviation Organization.

RL-870-MISC

The NEWS

APRIL CANADIAN AVIATION 1951

NEW COMMERCIAL COURSE APPROVED

SCHOOLS TO HAVE TWO PLANES, CLASS I OR II CFI

60 HOURS IN APPROVED COURSE, MINIMUM TOTAL 150

An "approved course" for commercial pilots, to include 30 dual and 30 solo hours in addition to prior qualifications for a private license and a minimum total of 150 hours' flying, has been announced by the Dept. of Transport.

This special course, which reduces the commercial license requirement by 50 hours flying, must be taken at an approved club or school. Such approval is to be obtained by application to the local district controller of air services. Following are the requirements for an approved club or school:

1. A Class "C" operating certificate valid for night and day.

2. A chief flying instructor with Class I or Class II rating valid for instrument flying instruction.

3. At least two aircraft must be available for training. There must be adequate provision for night and instrument flying training, including two-way radio. The instrument training aircraft must have: a. Airspeed indicator; b. Sensitive altimeter; c. Turn and bank indicator; d. Compass; e. Directional gyro.

4. Adequate lecture room accommodation must be provided.

5. A certificate of enrollment for each trainee must be submitted to the district controller.

6. On completion of training, the club or school must submit a "course report."

7. Duration of the approved course shall not exceed 12 months.

AIR TRAINING — The approved course of commercial pilot training shall consist of a minimum of 60 hours of flying training as follows:

A. Dual Flying—30 hours:

8 hours—Advanced instruction directed at the improvement of general flying ability and skill of the trainee including cross-country as necessary.

20 hours—Instrument flying including elementary radio range flying and orientation procedures. (Note—A maximum of five hours' Ling Trainer time may be substituted for instrument air time.)

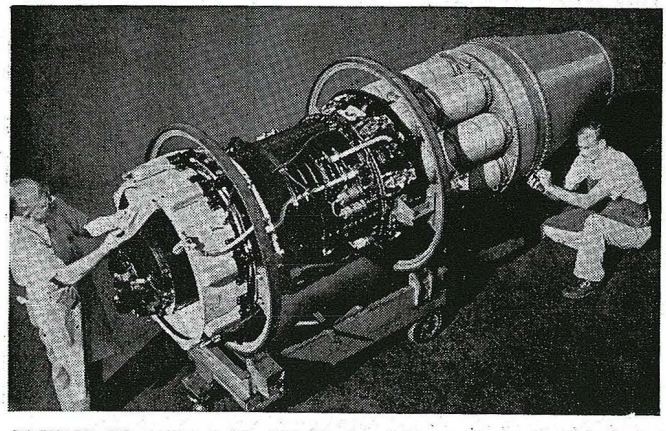
B. Solo Flying—30 hours:

25 hours—General practice and cross-country including one flight of 300 nautical miles with two landings.

5 hours—Night flying.

Note — The times shown above are minimum. When trainees enroll with less than 90 hours of flying experience,

(Continued on page 83)



PACKARD TO BUILD J-47—This is the General Electric J-47 turbojet (which powers the Sabre). It will be built on license by Packard Motor Car Company in the Detroit area, to supplement GE production.

Output 70 Planes a Month Estimate by C. D. Howe

Specific aircraft production estimates were made public by Rt. Hon. C. D. Howe in the House of Commons in the following statement:

"We are now in production on the **F-86E** at Canadair. We have arranged for government-furnished equipment at the rate of 20 planes per month; and it is expected that over the next few months that figure will be the production output of the plant.

"As soon as our own jet engines are in quantity production and as soon as the supply of gfp (government-furnished property) can be had in greater volume, that production figure can be stepped up to 50 planes a month if required.

"At Malton the **CF-100** is coming into production. It is expected that production there will be stepped up to 20 planes a month. Offhand I cannot tell just what month the first plane will be off the assembly line. The Canuck is expected to be powered with the **Orenda engine** which has now been thoroughly flight-tested and which will be in quantity production by midsummer.

"An agreement has been entered into to produce **Harvard trainers.** One thousand of them are to be produced for Canadian account and it is expected that a substantial order will be added to that number for the United States account.

"The Harvard is powered with the **Wasp engine.** Preparations are being made to produce the Wasp engine in Canada so that everything to do with the Harvard aircraft will be a Canadian product.

"Recently a competition among plane manufacturers has resulted in the de Havilland company submitting the successful prototype and a substantial order for **Beaver aircraft** is being placed by the U. S. Government with the de Havilland company.

"Arrangements are being made for the production of **aircraft accessories** in this country. We are stepping up the production of magnesium castings and a great variety of products that go into the Orenda engine, into the CF-100 and into the other aircraft that I have mentioned . . . "

Streamline D.O.T. Administration

(Continued on page 26)

rador: also remainder of Northwest Territories excepting Magdalen Islands.

Moncton district — Maritime provinces plus Magdalen Islands and associated interests in Newfoundland.

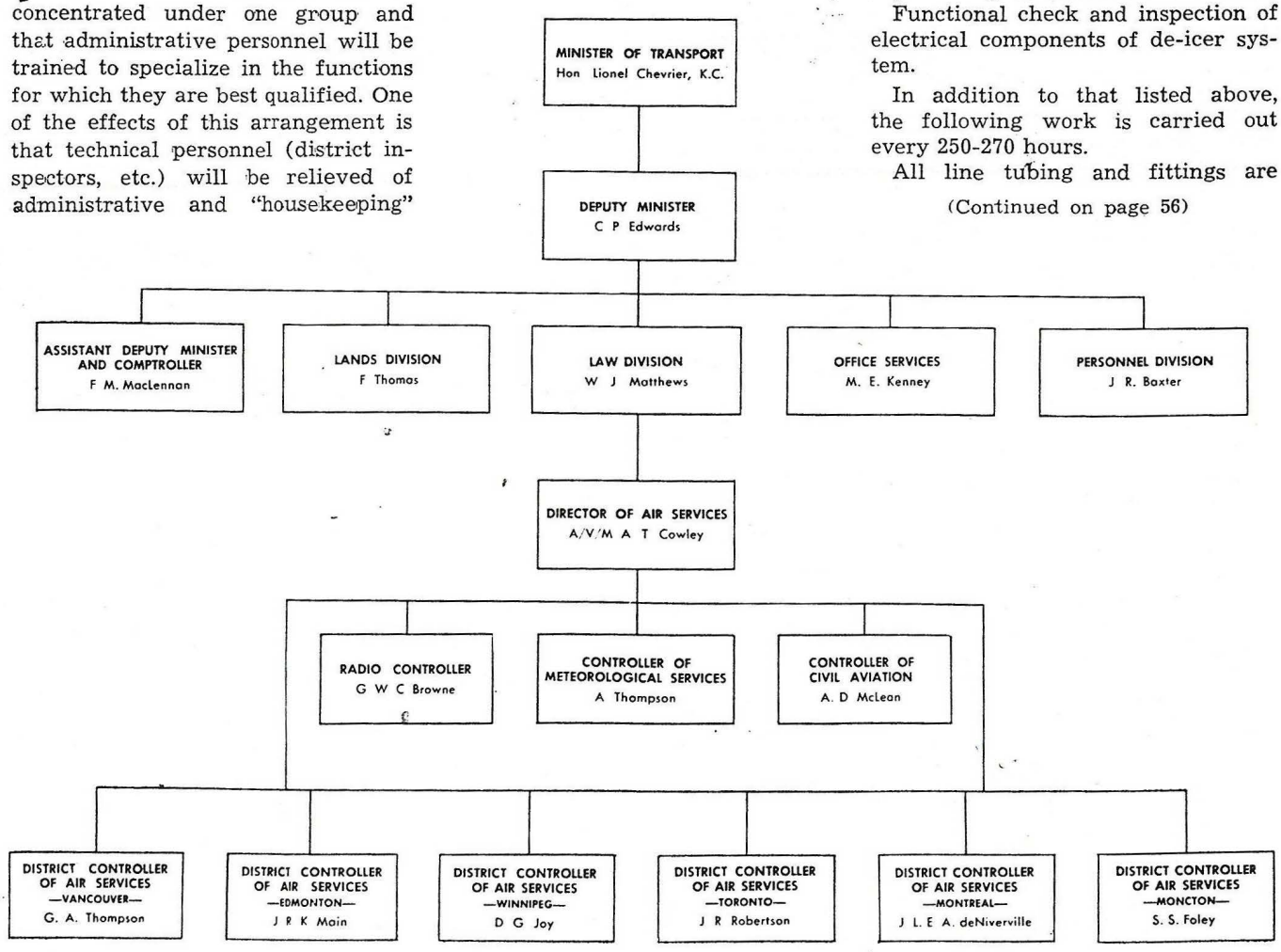
Correspondence on aviation matters should be addressed to the district controller of Air Services, Department of Transport, in the appropriate city.

According to a directive issued recently by the Air Services Branch, duties of the district controllers will be to correlate the work of the three divisions of the branch; to supervise administration, records, personnel, publicity, correspondence, accounting, etc., throughout the district; and generally to handle all matters which do not have to be referred to Ottawa for policy decisions. The controllers have been instructed to appoint a district supervisor over each of the three services as well as a district administrative officer.

It is intended that, within the near future, all district officers will be concentrated under one group and that administrative personnel will be trained to specialize in the functions for which they are best qualified. One of the effects of this arrangement is that technical personnel (district inspectors, etc.) will be relieved of administrative and "housekeeping" duties and will therefore be free to concentrate on the purely technical aspects of their work.

During the existing transition period, certain functions of the district offices will remain under the control of branch headquarters. For example, district supervisors of radio will continue to report directly to Ottawa and the meteorological communications system will remain under the control of meteorological headquarters for the present. Furthermore, it is likely that meteorological services specifically associated with national defense will remain permanently under Ottawa control, as will the Arctic meteorological stations.

There seems little doubt that once the new system is completely in effect there will be a noticeable streamlining of D.O.T. affairs. It is emphasized, however, that during the interim period all notices and instructions issued previously will remain in effect until new orders are issued.



Anti-icing By TCA

(Continued from page 44)

neutral soap and water solution. If found necessary, oil deposits are first removed by wiping the de-icer surface lightly with a rag soaked with petroleum solvent. When petroleum solvent is used the surface is wiped dry immediately to prevent the solvent from penetrating into the rubber.

Extreme care must be taken during the cleaning of de-icer boots in order to avoid "scrubbing" the surface, as this will tend to remove the graphite surfacing provided to afford electrical conductivity for the elimination of static electrical discharges.

A detailed inspection is made of the wing and empennage de-icer shoes for tears, abrasions, or weather checking, with repairs being made as necessary.

The de-icer distributor valve is inspected for condition and security.

All oil separators are inspected for condition and security.

Control linkage to distributor valve is checked for proper functioning and any binding or lost motion corrected.

Functional check and inspection of electrical components of de-icer system.

In addition to that listed above, the following work is carried out every 250-270 hours.

All line tubing and fittings are

(Continued on page 56)

Oct 1951 RL.870-

SPEEDS UP TO 5,000 MPH CAPACITY OF NRC TUNNEL

A NEW WIND tunnel capable of speeds up to 5,000 mph has been installed by the National Research Council. With a working section only 10 inches square, the tunnel achieves the high air speeds by sucking air in through a venturi passage to occupy the void of a 35-ft.-diameter vacuum sphere.

Air enters the intake throat and is drawn through a nozzle box. Here the curving shapes of the roof and floor form a venturi-like nozzle which determines the speed of air flow past the model. Nine interchangeable nozzle boxes are provided, each having a different venturi shape. Thus the air speed through the tunnel may have nine separate values, depending on which box is in use.

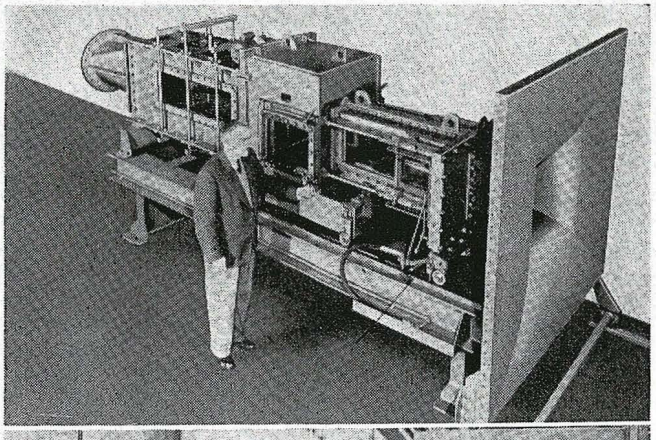
Box No. 1 is rated to give an air speed of Mach. 1.4, or 1.4 times the speed of sound. Boxes 2 to 6 are designed to give a progressive range of air speeds up to Mach. 3.47. The venturi shapes for the remaining boxes will be built by the National Research Council and it is estimated that with them, air speed equivalent to 5,000 mph at sea level will be reached.

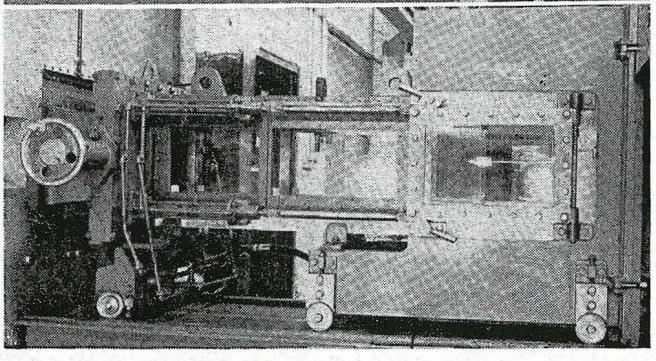
The nozzle box projects into the balance box, where the model is mounted, and which contains the apparatus for measuring the wind effects on the model.

Both the nozzle boxes and the balance box have optical glass windows, 1.25 in. thick, through which shock waves, boundary layers and other flow phenomena can be observed and photographed by means of a schlieren apparatus.

When the nozzle box is removed, the balance box is capable of being moved forward to allow easy access for mounting the model and adjusting balance apparatus. The air leaving the balance box flows through the "adjustable throat" section. Here the roof and floor of the tunnel consist of flexible aluminum plates, capable of being flexed by a system of screw jacks to give varying tunnel heights, ranging from 12.5 to 6.25 inches. The purpose of this device is to provide means of pressure adjustment inside the balance box (i.e. in the space around the high speed jet) and to increase the efficiency of pressure recovery. Connected to the adjustable throat is a transition piece which transforms the tunnel cross section from a rectangle to a circle. A 15-inch-diameter globe valve is bolted to the transition piece from which a conical diffuser leads to the vacuum sphere.

Two views of the new wind tunnel being installed at the National Research Council.





MUFFLER FOR DC-3

An exhaust muffler for DC-3 airplanes which reduces noise on takeoff by some 60% has been perfected by the Aero Sonic Corp. of Brooklyn, N.Y., and given preliminary approval by the Civil Aeronautics Administration.

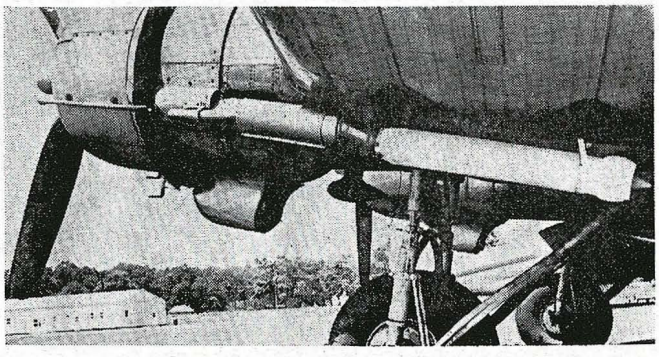
The new mufflers have been service-tested on a C-47 operated by Meteor Air Transport, Teterboro Air Terminal, Teterboro, N.J. Tests on the Aero Sonic muffler on the C-47 of Meteor Air Transport have included both day-in and day-out use of the plane's regular cargo flights and special tests under severest engine operating conditions to determine that the mufflers cause no excessive back pressure nor high head temperatures.

The basic design of the Aero Sonic muffler consists of a tube mounted within a tube with a Venturi-shaped tail pipe to induce a jet action in scavenging gases from the muffling chamber. The outer stainless steel pipe is insulated with quarter inch of steel wool blanketing with the inner wall of the pipe perforated to let sound be absorbed more readily.

The inner pipe is in effect a tube of steel wool running the length of the muffler with perforated outer casing and inside wall. This provides three surfaces of 1,200 sq. in. and nearly 50,000 perforations to absorb noise as it passes through the muffler.

The danger of backfire has been eliminated by the incorporation of a vent which draws in fresh air by means of a small funnel-shaped scoop forward to the muffler. Piped directly into the head of the muffler, this fresh air automatically creates a "wall" of air between explosive fumes which might collect in the muffler and any exhaust fumes which might try to enter the muffler from the engine after intermittent operation, idling or other cause.

SILENCER FOR DC-3: A new lightweight exhaust muffler installed on a DC-3 is shown here (white section). Developed by Aero Sonic Corporation of Brooklyn, the muffler attaches to the end of a standard Douglas exhaust pipe. The pipe running forward along the cowling scoops in cool air to eliminate backfiring. Specially designed tail pipe section employs jet principle to scavenge exhaust gases and eliminate back pressure. Noise reduction of 60% is claimed.



NEW RESEARCH CENTRE AT UPLANDS TO SPARK CANADIAN DESIGN EFFORT

CONSIDERABLE progress has been made in setting up facilities for the National Aeronautical Establishment, which was announced by the government last January and is to be located at Uplands Airport, Ottawa. Development of the airport has already commenced. The plan calls for two runways this year, one 200 by 8,800 ft., the other 200 by 6,000 ft.

Meantime, the design of the flight research facilities is nearing completion and construction is expected to commence this summer. A concrete arch hangar is planned, with administrative, laboratory and workshop facilities integral with the hangar and extending around three of its sides. A heating plant, a storage and motor transport building and a cafeteria will complete the first stage of the Flight Research Unit, with occupancy planned for the summer of 1952.

As the need for new research equipment or new laboratories develops, these will be located on the new site at Uplands where sufficient land is available for development over the years of an aeronautical research centre which can meet the major requirements of Canadian aviation.

The decision to create the NAE had its origin in the changing character of our postwar aircraft industry. During the war, considerable expansion took place in the industry but the effort was devoted almost to the contruction of military aircraft designed and developed initially in the United Kingdom or the United States.

Since the war, however, it has been felt that grave risks would be involved in any policy that left Canada fully dependent on the U.K. or the U. S. A. for her defensive aircraft. Accordingly, the government established a policy of supporting the design and development of transport aircraft, military aircraft and engines in this country.

The aircraft industry has always leaned heavily on its own and government research facilities. The extremely rapid development of military aircraft and the science of aeronautics in the last five to 10 years has placed military aviation on the threshold of a new era of unbounded possibilities. At the same time, the problems facing the aircraft designer have grown in magnitude and in many cases he is working in hitherto unknown territory.

If the industry is to progress, the designer must be more than ever dependent on the results of aeronautical research. On the other hand, if they are to serve the needs of industry, the research facilities must be of the highest order.

The impressive postwar growth of the aviation industry to its present high level of activity and the present world situation have produced an urgent need for increased effort in aeronautical research for defense purposes. In view, however, of the mutual dependence of military and civil aeronautical development and the importance which civil aviation now enjoys in its own right in Canada, it is necessary to provide continuing research and development support for the problems posed by civil aviation.

There has been therefore an awareness of the need for a co-ordinated plan for the improvement of aeronautical research facilities in order that the maximum benefit may be derived for both military and civil aviation.

The aeronautical laboratories of the National Research Council came into being in 1929 but, mainly because of the depression of the 1930's, they remained undeveloped until the war necessitated their growth and expansion. These laboratories are still modest in both equipment and staff in relation to the overall importance and magnitude of aviation.

With the object of achieving an orderly development of the facilities and a closer integration of the requirements for military and civil aeronautical research and development, the National Research Council and the Defense Research Board had for some time been exploring the possibilities of creating a National Aeronautical Establishment which could be administered as a joint military and civil establishment.

It was finally decided that the National Research Council would operate the Establishment as a separate agency along lines somewhat similar to those on which it operates the Atomic Energy Project at Chalk River.

Detailed administration will be the direct responsibility of the NRC, with policy determined by the National Aeronautical Research Committee. This committee was made responsible to a subcommittee of the privy council committee on scientific and industrial research.

On defense matters, however, the National Aeronautical Research Committee will report directly to the Cabinet Defense Committee.

As in other countries, Canadian aeronautical research was confronted with the problem of obtaining expanded airdrome facilities to cope with new aircraft projects. Hence the decision to select, and expand, the Uplands airport as the site for the NAE.

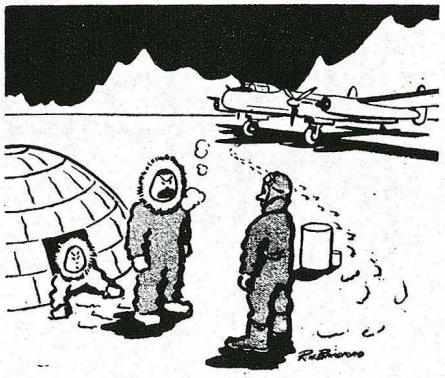
The existing aeronautical laboratories of the Division of Mechanical Engineering, together with new flight research facilities to be provided at Uplands by the Defense Research Board, will form the nucleus of the National Aeronautical Establishment which will be operated by the NRC.

J. H. Parkin, C.B.E., the present director of the Division of Mechanical Engineering, National Research Council, has been appointed Director of the new Establishment.

The National Aeronautical Research Committee, which provides the direction on broad policy matters for the National Aeronautical Establishment, is a four-man committee consisting of the president of the National Research Council, the chairman of the Defense Research Board, the Chief of the Air Staff, RCAF, and the chairman of the Air Transport Board.

The Committee has already held its

(Continued on page 40)



"Don't tell me you forgot to bring my copy of Canadian Aviation!"

NEW JET TRAINER FOR CANADA

(Continued from page 16)

heads of the two occupants and it is locked in position.

The push-pull rod also contains an explosive charge which will jettison the canopy during flight if the instructor and student have to make a parachute jump from the plane. The charge is set off when a handle is pushed down by the pilot. When the canopy blows off the plane, the two occupants pull up on the handles of their seats, and other explosive charges shoot them out of the aircraft.

Seven months after work was started on the prototype, the trainer made its first flight.

In addition to its training functions, the T-33 can be used for VIP transport and, with fighter performance, could be used in combat if necessary. For long-range escort duties, a 200-gal. fuel tank can be installed in the rear seat, increasing the combat radius to 580 miles.

The trainer version was developed after more than 1,000 P-80's had been delivered. As of last August, combined deliveries of the single and two-place versions had totalled nearly 2,000.

The T-33 has been designed for ready accessibility of all major components. The entire tail cone is removable, permitting engine work to be accomplished with a minimum of structural interference. A complete engine change actually has been made in six and a half minutes.

The low position of the airplane on the ground assists maintenance as well as fuelling operations and gun servicing. The guns are located in the nose and are reached by raising the side of the nose.

PLAN DEVELOPMENT AIR RESEARCH

(Continued from page 32)

first meeting, with Dr. C. J. Mackenzie appointed as the chairman. A technical advisory panel of deputies under the National Aeronautical Research Committee will be responsible for the consideration of technical matters involving policy and will serve as an advisory panel to the directors of the Establishment.

This panel will be composed of the Director of the Establishment; the Chief of Division (B) of the Defense

(Continued on page 46)

rop's F-89 Scorpion, where it is used to control automatic selection of fuel tanks, according to the manufacturer.

Results of qualification testing, now complete, indicate that Meletron's new pressure switch is extremely rugged, yet sensitive to a high degree, as well as being resistant to high frequency vibration, say Meletron officials. It meets AMC environmental and qualification requirements, and is explosive proof per U. S. A. F. spec. 41065-B.

Other applications of Meletron Model 431 include installation across fuel filters to control alcohol deicer pump; to control fuel tank pressurization; and in jet engine fuel control systems.

PLAN DEVELOPMENT AIR RESEARCH

(Continued from page 40)

Research Board, who is also the scientific adviser to the Chiefs of the Air Staff; the Air Member for Technical Services of the RCAF, and the chief aeronautical engineer of the Department of Transport.

Correspondence should be addressed to the Director, National Aeronautical Establishment, Montreal Road, Ottawa.

ORENDA JET ENGINE FIRST DETAILS

(Continued from page 22)

2. Fifth Stage Air: (a) centre bearing; (b) front face of turbine disc.

3. Tenth Stage Air: rear face of turbine disc.

Starting—Starting is effected by a 32-volt electric motor housed in the nose bullet. An over-riding clutch disengages the starter motor when the engine reaches self-sustaining speed. The rest of the starting system consists of the booster coils for the torch igniter spark plugs and the control circuit for the torch igniter reducing valve. An external sequence control is necessary to ensure that starting current, fuel for the torch igniters, and power for the torch igniter spark plug are provided at the correct times to permit clean starts.

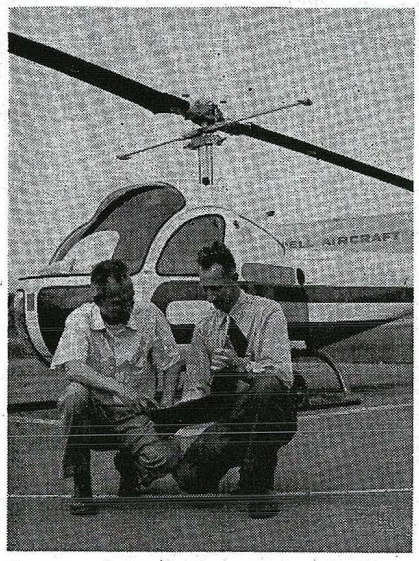
Historical Highlights

Layout commenced ... Sept. 3, 1946
Layout design finalized & detailing commenced Dec. 6, 1946
Detail drawing issue commenced ..... May 1, 1947
Detail drawing issue completed Jan.15, 1948
First engine delivered to Test House ..... Feb. 8, 1949
First run ..... Feb. 10, 1949
100 hrs. running completed ..... Apr. 4, 1949
Engine first ran at design take-off speed May 3, 1949
Engine first delivered design performance .. May 10, 1949
500 hrs. running completed ..... July 21, 1949
1,000 hrs. running completed ..... Sept. 23, 1949
2,000 hrs. running completed ..... Feb. 10, 1950
First official flight clearance at design rating . Mar. 2, 1950
First flight (in Lancaster flying test bed) ..... July 13, 1950
First flight in service type aircraft ..... Oct. 5, 1950
First 100 hours flying .. Oct. 20, 1950
5,000 hrs. running completed ..... Feb. 5, 1951

Background — The beginnings of the Avro Orenda extend much further back in history than the discussions which produced the first design layout. To appreciate the project fully it is necessary to start in 1942 when reports about the Whittle jet-propulsion engine began to reach Canada.

The information received through

business trends



NEW PWA BELL 47H. Pacific Western Airlines helicopter division is leasing this new helicopter bought by Uranium Corp. of B. C.

Radio Lease

Technical Enterprises, Ltd., Malton, has come up with a painless way for business aircraft operators to own the best communications and navigation equipment available on a monthly rental basis calculated on a basis of $40 per month per $1,000 of equipment including free service. The monthly rental decreases each year over a period of four years to a base of $20.

Orders for Canadair

Canadair Ltd., Montreal, has received an order for 12 more CL-28 MR patrol bomber versions of the Bristol Britannia bringing the total ordered to date to 25 with an order for a further 12 expected in the next fiscal year. The first one is nearing completion and is expected off the line by the fall and ready for test flying by early winter.

In addition Canadair has received an order from the Colombian Government to operate overhaul, maintenance and repair facilities in Colombia for the Colombian Air Force's six Sabre VI's (recently delivered by Canadair), C-54's, T-33's and F-86's.

AITA Meet

At a recent meeting of associate manufacturer and associate members committee of the Air Industries and Transport Association of Canada it was proposed that an up-to-date and reliable over-all estimate of available manufacturing facilities in Canada be drawn up. Purpose is to urge increased utilization of Canadian facilities by DDP rather than order defense equipment abroad.

It was also decided to bring to the attention of DDP for correction the "unfair" practice of DDP of using manufecturers' designs and specifications for the purpose of securing competitive bids.

White Paper

Highlights of the latest White Paper on defense are:

- New commitments for the RCAF an Navy which will result in increases in service strengths. At April 30 they were, with ceilings shown in brackets: air force, 49,875 (51,000); navy, 19,014 (20,000).
- Bulk of RCAF releases are non-voluntary "largely for reasons of inefficiency."
- All new pilots in training are obliged to take T-33 jet training.
- New plans for the auxiliary are to be announced in near future.
- In current fiscal year total defense funds appropriated are $1,775,000,000, about the same as last year. Of this, last year 42.2% went to the air force, 26% to the army and 16.7% to the navy.
- During the past year $46,327,000 was spent on the Mid-Canada radar line, in the 1956-57 year this spending has been forecast to rise to $100 million.
- Defense Research Board expenses for current fiscal year are forecast at $78 million compared to $52.6 million last year. The increase is attributed to development costs of the CF-105, development of the Sparrow air-to-air missile and the Orenda PS-13 Iroquois engine.
- Both the CF105 and CF-100 Mark V are to be fitted with the Sparow missile.
- Design work is progressing on Canada's first large high-speed wind tunnel for the National Aeronautic Establishment.
- An increase in flight pay is under consideration from the present $30 per month.
- Mutual aid to NATO will amount to $143 million in the current fiscal year, some $32 million less than the previous fiscal year.

CDC Expansion

Computing Devices of Canada Ltd., a pioneer Canadian firm in the fields of electronic data processing, instrumentation and automation recently opened an 80,000 sq. ft. head office and plant just outside Ottawa. The company now has 500 employees of which over 25% are graduate engineers.

At the same time the company has entered into association with Bendix Aviation Corp., so that it will act as agent for the U. S. company in Canada. Among the many Bendix products CDC will handle in a major way is the Decca Navigator line.

CDC will now have full sale and manufacturing rights of the Decca Navigator ground station equipment and airborne installations in Canada following an agreement recently signed between Bendix and Decca in the U. K. Bendix has had these rights in the U. S. for some time.

Export Gain

Canadian airframe, engine parts and accessories manufacturers exporting to the U. S. will face a lower U. S. tariff (2½% down to 12½%) by June 1958 as a result of the tariff agreements negotiated at the recent Geneva conference on the General Agreement on Tariffs and Trade. The U.S. tariff (para 370) will be lowered by 1% June 30 this year and by another ½% by June 30, 1957, to reach 12½% in 1958. However Canadian aviation importers will not find any new reductions on import duties affecting U.S.-made goods at this time.

Canadian Vickers

Vickers Ltd. of the U. K., builders of the Viscount and Supermarine Swift, has purchased controlling interest in Canadian Vickers Ltd., Montreal.

Canadian Vickers was set up as a subsidiary of Vickers Ltd. in 1911, but in 1927 Canadian interests bought control. The Canadian firm has engaged in aircraft manufacturing (during World War II), shipbuilding and heavy engineering. Sir Ronald M. Weeks, chairman of Vickers Ltd., has stated that at least 45% of shares in Canadian Vickers is to remain in Canadian hands with the British firm holding the other 55%. There's a strong indication the change of ownership will mark the entrance of the Canadain firm into electronics, a field in which the parent company is heavily engaged in defense fields.

DDP Contracts

During the period May 1-15 seven contracts were placed by the Department of Defense Production for $1 million or more each, amounting to $10,245,000 placed with various firms for airframe spares and repair, overhaul, modification of airframes, airframe spares, engines and aircraft instruments: Canadair Ltd., Montreal, $2,000,000 for spares and $3,200,000 for repair and overhaul; Northwest Industries, Edmonton, $2,758,000 for instrument and airframe service, repair and overhaul; Bristol Aircraft (Western) Ltd., Winnipeg, $1,000,000 for airframe overhaul; Lucas-Rotax Ltd., Mount Royal, $1,000,000 for repair and overhaul of engine and electrical systems; Phoenix Engineered Products Ltd., Toronto, $1,500,000 for repair and overhaul of aircraft instruments.

Wings to Trucks

An agreement concluded between Leyland Motors Ltd. of the U. K. and A. V. Roe Canada Ltd. will result in the manufacture, sales and distribution of the "Canada" truck by A. V. Roe subsidiary, Canadian Car & Foundry Co. of Fort William and Montreal. Can-Car, already a bus and trolley bus body manufacturer will now be able to offer a truck powered by the Leyland diesel engine.

EDITORIAL COMMENT

Mr. Drew off the Beam

MR. DREW is at it again. It is too bad that the Leader of the Opposition has weakened his effective attack on Government defense policy by a repetition of wild and irresponsible attacks on the North Star aircraft. This time Mr. Drew has condemned the aircraft in strong terms. It is, he asserts, a "travesty" on the laws of aerodynamics and aero design, a "haphazard" combination of a British motor and an American-designed airframe. On his authority we are asked to believe that the aircraft has proved completely unsatisfactory for military or commercial use.

It is hardly necessary to dignify these irresponsible charges with a detailed contradiction. Anyone associated with the aviation industry knows that the North Star and the Canadair airliners are of sound design. To describe the several years of intense engineering effort that went into wedding of the airframe to the specially-developed Merlin 620-624 power plants as "haphazard" is utterly ridiculous.

We hope that Mr. Drew continues to prod the Government on the subject of air policy and defense. But he would be well advised to check his facts more carefully.

Shun the Flying Circus

WITH SPRING on the wing and air shows in season, let's consider safety. There is something about this time of year that stirs the urge to "slip the surly bonds of earth," to wheel and soar and swing "high in the sunlit silence" of the sky. Like love, to which a young man's fancy is supposed to turn at this time of year, this wild-blue-yonder impulse is a healthy one. But let's work it out HIGH in the sky and stay healthy.

The sad record of lightplane crashes last year, the tragic repetition of low-flying disasters, should be required reading for the tree-level wonders on wings. If potential Pylo Terrors were obliged to study the grim lessons of the accident reports there might be fewer crack-ups.

Let's face it. Some of the responsibility for the flying fool must be credited to the "thrilling" air show. There is a strong temptation to lure crowds to the airport with a flying version of the midway wall-of-death. Low-level aerobatics, "crazy flying," and all the other stunts have headlined air show programs ever since the first world war. It is time we grew up. Let's stop trying to sell the flying circus. Scaring the customer out of his britches may make the turnstiles click at the annual airshow, but the proceeds are a sorry mess of pottage for selling the birthright of the aviation business. If we can't dramatize the safety, speed, convenience and exhilaration of intelligent flying, let's forget about air shows entirely. For the havoc of the dare-devil air show goes beyond its scare effect on the public. It inflames the novice with the desire to match his skill against the laws of gravity, with the familiar and fatal consequences.

Churchill on Air Power

DURING his speech at the mid-century convocation of the Massachusetts Institute of Technology, Winston Churchill gave his estimate of air power. His words are more than superb oratory. They carry all the weight of the wartime British prime minister's experienced judgment. Hon. Brooke Claxton please note:

"The conquest of the air and the perfection of the art of flying fulfilled the dream which for thousands of years had glittered in human imagination. Certainly it was a marvelous and romantic event.

"Whether the bestowal of this gift upon an immature civilization . . . was a blessing or a curse has yet to be proved. On the whole, I remain an optimist.

"FOR GOOD OR ILL, AIR MASTERY IS TODAY THE SUPREME EXPRESSION OF MILITARY AIR POWER, AND FLEETS AND ARMIES, HOWEVER NECESSARY, MUST ACCEPT A SUBORDINATE RANK."

Should Lift Import Ban

NOW THAT the Government has raised by 25% the quota on import of U. S. cars, perhaps Ottawa can see fit to remove the nuisance restrictions on aircraft. When quotas and restrictions on import of capital goods started, aircraft were not subject to this control, presumably because the U. S. currency involved was relatively insignificant. Subsequently, after protests from automotive interests that aviation was being favored, a ban was placed on import of pleasure aircraft.

As the matter now stands, operators are required to fill out the CG-101 Form (Revised), six copies please, and have this application approved in Ottawa for each aircraft imported. Evidence must be supplied to show that the aircraft is essential for business reasons. All this to screen out comparatively few lightplanes. In view of the Government's avowed policy of stimulating civil aviation, as evidenced by the subsidy plan, it would seem logical to remove this unnecessary barrier.

CANADIAN AVIATION

Ronald A. Keith

Editor

aviation news digest

Defense Estimates

Defense estimates for the next fiscal year (1956-57) total $1,775,000,000, which is the same amount as was requested for 1955-56. From preliminary forecasts available it seems that the actual expenditure up to March 31 will not be significantly different from the estimate. The breakdown of expenditures is about the same as last year's with an $8-million increase for the air force, a $26.5-million increase for defense research and a $32-million decrease for mutual aid.

The figures are: defense administration, $13,700,000 (0.69% of gross total); defense research, $79,032,389 (4%); mutual aid, $143,000,000 (7.27%); air force, $872,382,925 (44.3%); navy, $325,000,000 (16.5%); army, $476,739,000 (44.3%).

* * *

New Company

A new Canadian company, Philips Canadian Industrial Development Co., has been formed by N. V. Philips concern of Eindhoven, Holland. President of the new firm is R. M. Brophy, who has been associated with the parent company's Canadian interests since 1945. Philips has extensive research facilities at Eindhoven and has contributed a number of important items in the electronic field over the years.

* * *

TCA Choice

Trans-Canada Air Lines is reported close to a decision between the Electra and the Vanguard. It is understood that if the Lockheed model is chosen it will be equipped with the Rolls-Royce RB 109 Tyne.

* * *

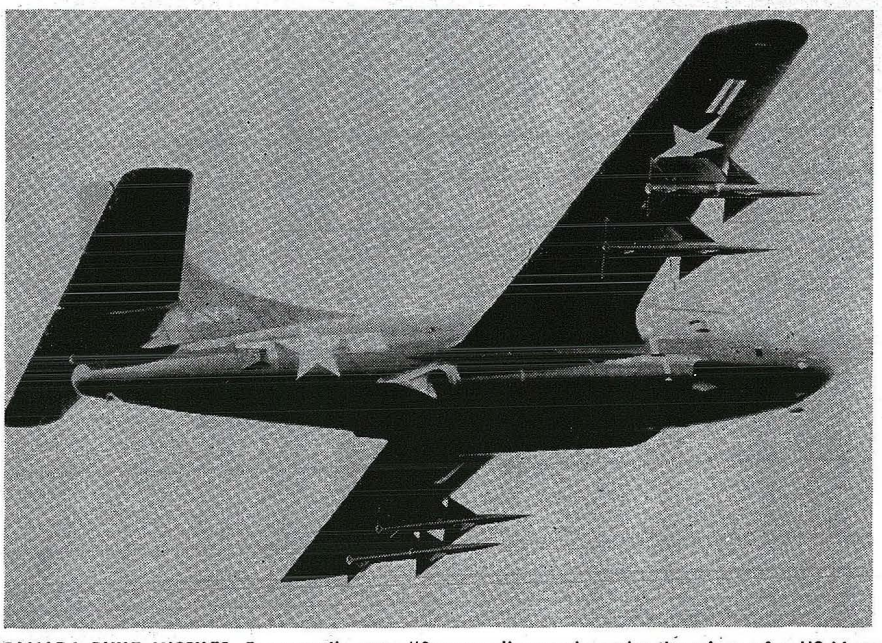
New Scholarships

Avro and Orenda, members of the A. V. Roe Canada Ltd. group, are offering fourteen $500 scholarships, together with other forms of student assistance at eastern universities. Eight scholarships, an aircraft design prize and a $3,000 students' loan fund are being established at the University of Toronto. The other six scholarships are divided equally between McGill University in Montreal and Queen's University at Kingston. Nine of the scholarships are accompanied by grants of $300 to the universities. In addition, Avro is offering three $500 scholarships each year to a child or ward of an employee of the company to provide four years tuition at the University of Toronto.

* * *

Egyptian MIGs

The Egyptian Air Force is said to have taken delivery of some of the 200 to 300 MIG-15s it has on order.



CANADA BUILT MISSILE? Four needle nose "Sparrows" snuggle under the wings of a US Navy F3D. The supersonic air-to-air guided missiles are said to be Canada's choice for a guided weapon to be built in this country as armament for the new Avro CF-105. The Velvet Glove project is now described as strictly an experimental and familiarization venture which gave Canada the nucleus of a missile industry.

PSC Contract

Photographic Survey Corporation of Toronto has a contract to assist in 225,000-acre aerial survey along the Caroni River in Venezuela. The survey is to help develop power in the South American country in the vicinity of the rapidly expanding industrial area around Ciudad Bolivar. An official of the Canadian firm estimated it would take just over a year to complete the work. PSC, Aeromapas Nacionales of Caracas, an associate company of PSC, and Cartographia Mercator, another Caracas firm, received the contract jointly. The project will be carried out by largely the same team which did the detailed mapping over an area of 90,000 acres on the lower reaches of the Caroni in 1954-55.

* * *

DDP Reorganization

In future contracts for repair and overhaul of engines and accessories as well as propellers will be dealt with by No. 2 Division of the Aircraft Branch of the Department of Defense Production. The division is under the supervision of P. J. Hebert.

* * *

Westland S-58

Westland Aircraft Ltd. has extended its licensing agreement with the Sikorsky Division of the United Aircraft Corp. to produce a new helicopter based on the S-58. It will be called the Wessex and will be powered by the Napier Gazelle gas turbine engine.

MEXICAN JUNKET. In distinguished company at the International Aeronautical Federation held recently in Mexico City is Vic Symonds, sales manager of the Bristol Aeroplane Co. of Canada. Left to right are Jacques Allais, president of the French Aero Club, Mr. Symonds, Mme. Jacqueline Auriol, daughter-in-law of the former French president, and Canadian pilot Charles Parkin. Mme. Auriol flew the Bristol Sycamore helicopter in the background. The aircraft was flown from Winnipeg to Mexico City for the occasion.

Gamble Plotter

The Type T301 Gamble Stereo Plotter, invented by Samuel G. Gamble, chief topographical engineer of the Department of Mines and Technical Surveys, will be shown in the U. S. for the first time at the meeting of the American Congress of Surveying and Mapping and American Society of Photogrammetry. It will be demonstrated by Don Ross, photographic project manager with PSC Applied Research, Toronto.

EDITORIAL

WHAT IS A VITAL SECRET?

DEFENSE "security" is one of the strictest and most frustrating features of a democracy. While all men of good will concede the necessity of guarding vital secrets, there is extreme difficulty in defining "vital secret" fairly and accurately. In our recent experience, there is no formal government censorship applied to the publication of information. There exists, however, a devious and capricious censorship applied through the workings of the Canadian Commercial Corporation which is the Federal Government's purchasing agency.

Let's take an example. Soon after the Canadair Sabre production program got started, the CCC gagged the Canadair personnel with a directive forbidding, in particular, any discussion of plant capacity, actual production, or potential output. The same rule was applied to Avro Canada. Presumably this information qualified under the "vital secret" definition. Then, in March, Rt. Hon. C. D. Howe, speaking in the House of Commons, made the following statement:

"We are now in production on the F-86E at Canadair. We have arranged for government-furnished equipment at the rate of 20 planes a month; and it is expected that over the next few months that figure will be the production output of the plant. As soon as our own jet engines are in quantity production . . . that production figure can be stepped up to 50 planes a month if required . . . At Malton the CF-100 is coming into production. It is expected that production there will be stepped up to 20 planes a month . . ."

Apparently this information was not a vital secret after all. Mr. Howe's statement must have been quite frustrating for the aircraft industry personnel, after their months of tight-lipped caution.

Consider another instance of inept censorship in action. The writer was able to obtain certain details concerning the Sabre for publication in an article heralding the first flight of the Canadian-built fighter. Acting under instructions, the company's officers had released the information only after our assurance that the manuscript would be cleared at Ottawa. It was submitted to CCC. It was slashed to a few newsless paragraphs. There was considerable horror because we had recorded the fact that the Sabre is equipped with fuselage dive brakes. There was chagrin because our report described detachment of the rear fuselage section to give access to the engine. We received a phone call from Ottawa conveying the CCC request that we promise to burn the original manuscript and all copies.

We had quite a little ceremony burning the manuscript. The solemnity of the occasion was relieved, however, by the knowledge that U. S. aviation publications already had published pictures and captions describing: 1. the Sabre's fuselage dive brakes; 2. the detachable rear fuselage section.

Confused, over-zealous, or poorly-informed efforts at censorship not only clog the channels of public information. They sap the effectiveness of legitimate security safeguards.

During the last war there was voluntary censorship which provided editors with broad directives defining the boundaries of vital secrecy, then placed on them the responsibility of avoiding transgression. This system worked because it was administered by qualified personnel. It was successful because it was realistic. If we are to have censorship now it should be clearly-defined, it should be stripped to essentials, and it should be non-political.

WINGS FOR CIVIL DEFENSE

THE role of aviation in civil defense will be one of the principal topics at the semiannual meeting of the Air Industries & Transport Association, about to convene at Harrison Hot Springs, near Vancouver, as this is written. It is fortunate that the AITA management has been able to obtain Major-General F. F. Worthington, M.C., M.M., civilian defense co-ordinator, from Ottawa, as a speaker.

It seems to us that the civil defense problem calls for clear thinking and the establishment of a sound basic organization rather than a sudden fever of enthusiasm and the creation of an intricate superstructure. All the indications are that the tension, and the danger, may last for years. The situation demands clear definition of the menace, the enlistment of vital services in a nucleus organization ready to expand and to cope with anticipated emergencies should they occur. It would be wasteful and futile, to marshal a vast corps of citizen volunteers rushing about with tin helmets and sand buckets. On the other hand, intelligent appraisal of potential target areas and planning of emergency services is of the utmost urgency.

In the event of a bombing attack on a target area, civil airplanes would be invaluable in maintaining communication and providing transport between the distress centres and the fringe or evacuation regions. This role of the airplane would be accentuated with the disruption of surface communication, liaison and transport. Civil defense is a provincial responsibility and it is probable that commercial operations will have an opportunity of working with local committees. The national co-ordinator of civil defense is charged with the responsibility of advising provincial groups and co-ordinating their efforts. It is fortunate that in Canada there are relatively few target areas tempting enough to attract the enemy. But this fact itself could be disastrous if it were to lull us into complacent neglect of civil defense preparedness.

CANADIAN AVIATION

Ronald A. Keith

Editor

The NEWS

NOVEMBER CANADIAN AVIATION 1951

Plan Swept-Wing Fighter For Production at Avro

Two new versions of the Avro CF-100 twin-jet fighter are planned for production in 1952 and 1953, it was reported from authoritative sources recently. The first of these, the Mark 4 CF-100, will have more powerful armament, improved radar, and a stepped-up Orenda engine.

The Mark 4 prototype will be ready for flight early next year and should be in production by the end of the year, according to plans.

This will be followed, on the production line at Avro Canada, by a swept-wing version of the Orenda-powered fighter to be known as the CF-103. (The CF-101 was a trainer aircraft project which was abandoned, the 102 is the Jetliner). The CF-103 will be powered with an Orenda development of much-increased thrust.

Meantime, the first 10 CF-100 aircraft delivered to the RCAF will be equipped with dual controls for use as trainers. The next 70 will be the standard long - range all-weather fighters.

The production plan for the CF-100, the CF-103 and the Orenda will involve stepping up employment at Avro from the present 7,000 to the 14,000 region.

HEADS AVRO CANADA—Crawford Gordon, Jr., until recently co-ordinator of defense production at Ottawa, who has been appointed president and general manager of Avro Canada Ltd. Walter N. Deisher has retired as general manager but remains on the board of directors.

Military Aircraft Program Totals $1,200 Millions

Investment in Canada's current military aircraft program will amount to $1,200 millions, or about one third of the total defense procurement program, according to Rt. Hon. C. D. Howe, minister of defense production, speaking in the House of Commons on Oct. 19.

Referring to F-86E Sabre production, Mr. Howe reported that 122 of these jet fighters had come off the Canadair production line, 72 of which had been delivered to the RCAF as of that date.

During a review of the aircraft program, Mr. Howe predicted that Canadian Pratt & Whitney would be producing engines in their new plant "by next summer." As for the new Beechcraft T36A, in which Canadair is participating, "production is not expected to get under way before 1953," he said.

Orders placed for military aircraft during the two and a half fiscal years from 1949 amounted to $803.5 millions out of a total defense program of $1,107.2 millions for the period. The aircraft expenditure amounted to $70.6 millions in 1949-50; $299.7 millions in 1950-51; and $433.2 millions in the first half of 1951-52, Mr. Howe revealed.

After mentioning the CF-100, the Orenda, the Harvard, the T-33 jet trainer, and the Beaver, Mr. Howe added:

"In addition to these production programs, we are now engaged in the reconditioning and modification of Lancasters, Harvards, Mitchells, Expediters, DC-3s and Avengers. This work is being done at Edmonton, Winnipeg, Toronto, and St. Johns, Que. In addition, aircraft maintenance and repair is being carried out at these cities as well as at Vancouver, Calgary, and Halifax."

Report Progress in U. S. Building Atomic Plane

The United States Air Force has awarded a contract for construction of an airframe for a proposed atomic-powered aircraft, according to a Washington announcement. The contract has been awarded to Consolidated Vultee Aircraft Corp., of San Diego, Cal. Meantime, the nuclear power plant for this aircraft is being developed by the General Electric Company.

Comet Proving Flight London-to-Singapore

On its 12th long-range proving flight with British Overseas Airways, a de Havilland Comet jet airliner covered the 7,748-mile distance from London to Singapore in 19 hours 8 minutes flying time. Elapsed time was 24 hours 35 minutes. Stops were made at Cairo, Karachi and Bangkok.

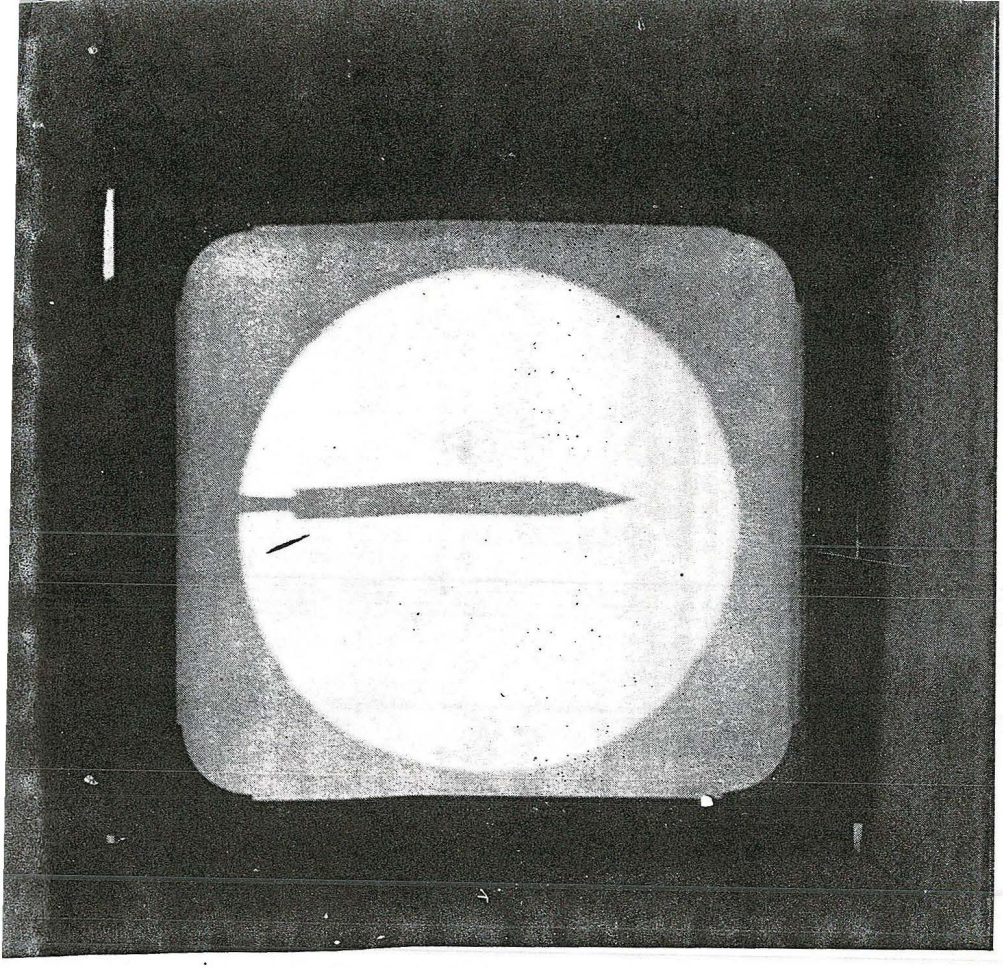
The Comet has already completed 11 overseas development flights in the hands of BOAC. Since the aircraft was first loaned to the Corporation on April 2 of this year, it has completed some 445 hours of flying. Over 80,000 miles have been covered in the course of the overseas tours along BOAC's Commonwealth routes.

Gordon New President of AVRO Canada

Crawford Gordon, Jr., until recently co-ordinator of defense production at Ottawa, has been appointed president and general manager of Avro Canada. He succeeds Walter N. Deisher, vice-president and general manager, who has retired but will remain a director of the company. He has been vice-president and general manager almost six years, approximately since the inception of the company.

The new president served in the Dept. of Munitions and Supply from 1941 to 1945 as director general of organization and assistant co-ordinator of production. He continued with the Dept. of Reconstruction and Supply as director general of industrial reconversion, and in 1946 was awarded the O.B.E. for his services. He is a former president of the English Electric Company of Canada and vice-president of the John Inglis Company.

Sir Roy Dobson, until now the company's president, becomes chairman of the board, a post left vacant by the recent death of J. P. Bickell.



Aeronautical Research in Canada

FROM IT SPRINGS KNOWLEDGE FOR AIRCRAFT DESIGNS OF THE FUTURE

PURE RESEARCH is the science of aeronautics in Canada is almost entirely a governmental activity. There is nothing unusual about this because pure research is such a long and costly business that few private organizations can undertake it. Thus it has become customary, even in the nations whose thinking runs along the most capitalistic lines, for governments to establish facilities and organizations for research. Even in the U.S., a land of some immensely wealthy private corporations, this phase of aeronautical activity is carried out mainly by such government bodies as the NACA.

In Canada, the main body for aeronautical research is the National Aeronautical Establishment, which was formed in January of 1951. However, this does not mean that there was no aeronautical research in Canada until the first of last year. Rather, the NAE was the outcome of many years of development of research facilities and organization. In fact, Canada had a wind tunnel as early as 1917, when the NAE's present director, J. H. Parkin, initiated, designed, and installed a four-foot unit for aerodynamic research at the University of Toronto. Since that time, there have been varying degrees of activity in this field in Canada and when considered as a whole, they provide the background leading up to the establishment of the NAE.

Profound Change: During World War II considerable expansion took place in Canada's aircraft industry, with the effort devoted almost exclusively to the construction of military aircraft that had been designed and developed in the U.K. or the U.S. In the postwar period, however, a profound change has taken place within the industry, due predominantly to military considerations. This change stemmed from the Government's policy of actively fostering the development of military aircraft and engines in Canada. As a result of this policy, considerable effort has been expended duing the last few years in building up in Canada an aircraft industry of high calibre. In time of war the high quality of the aircraft produced by such an industry will contribute materially to the efficiency of the RCAF.

The Aircraft Industry has always leaned heavily on its own and Government research facilities. The rapid development of military aircraft and the science of aeronautics in the last five to ten years has placed military aviation on the threshold of a new era of unbounded possibilities. At the same time, the problems facing the aircraft designer have grown in magnitude and in many cases he is working in hitherto unknown territory. If the industry is to progress, the designer must be more than ever dependent on the results of aeronautical research. On the other hand, if they are to serve the needs of industry, the research facilities must be of the highest order of excellence. They must be of suitable scope to tackle the new problems created by the needs of military aviation and they must be staffed by people with the best training and ability.

The impressive postwar growth of Canada's Aviation Industry to its present high level of activity and the present world situation produced an urgent need for increased effort in aeronautical research for defense purposes.

In view, however, of the mutual dependence of military and civil aeronautical development and the importance which civil aviation now enjoys in its own right in Canada, it is necessary to provide continuing research and development support for the problems posed by civil aviation. There has been therefore an awareness of the need for a co-ordinated plan for the improvement of aeronautical research facilities in order that the maximum benefit be derived for both military and civil aviation. The Aeronautical Laboratories of the National Research Council came into being in 1929 but, mainly because of the depression of the 1930's they remained undeveloped until World War II necessitated their growth and development.

Separate Agency: With the object of achieving an orderly development of

Thompson Products' new plant will cover an area of 150,000 square feet, just slightly less than the neighboring 175,000 square foot TP plant, which now turns out automotive parts for Canadian automobiles, trucks, and tractors. Employing more than 1,000 persons at present, the company will have a payroll of more than 1,600 when the new plant is in operation late in 1952.

Long a leader in the automotive parts industry in Canada, Thompson Products Limited is a subsidiary of the Thompson Products Company, whose six plants throughout the U.S. have made them what is claimed to be the largest manufacturer of jet component parts in the world. The American firm has been making aircraft engine parts since 1918.

Carriere and MacFeeters

Occupying nearly 5,000 square feet of shop space in downtown Toronto the specialist firm of Carriere and MacFeeters employs about 50 people on the overhaul and servicing of all types of aircraft electrical accessories as well as such specialist items as dynamotors used in connection with radar. While most of its work is for the RCAF, it also serves commercial customers from coast to coast.

Crystal Glass & Plastics

Crystal Glass & Plastics Limited produces molded Plexiglas cockpit canopies for use on Canadair-built F-86E and Avro Canada CF-100 aircraft. It also produced the bubble canopy used on all of the last production de Havilland Chipmunks. Located in downtown Toronto, it fabricates as well other plastic items for use on aircraft.

Inaerco Limited

Inaerco Limited employs about 40 persons on the production of high pressure hydraulic hose lines and fittings and allied products. Its plant is located in downtown Toronto.

Western Propeller

Specializing in propeller overhaul and repair, Western Propeller Company Limited, handles a large volume of propellers for the RCAF, the RCN, and commercial operators. Its up-to-date shop is located on Edmonton Municipal Airport.

Genaire Limited

Genaire Limited is currently carrying out a program of overhauling bomb release mechanisms for the armed services and is also negotiating to obtain additional aircraft contracts from this source. Located on St. Catharines Municipal Airport, it occupies a single hangar.

Cub Aircraft

At Cub Aircraft Company in Hamilton, a wide variety of aircraft bits and parts are being turned out for de Havilland, Avro Canada, Fleet Manufacturing, and Avco Manufacturing Co. of Williamsport, Pa.

Leavens Bros.

Leavens Bros. Air Services of Toronto, holding no large subcontracts at present (except for such Beaver parts as rudder pedals), is nevertheless well equipped for component manufacture.

AERONAUTICAL RESEARCH

(Continued from page 50)

recently it has been reported that a second wind tunnel has been added to the facilities at the Institute. This unit has been described as a "hypersonic" wind tunnel and is said to be capable of providing air velocities up to Mach 10. It will be used to study blast effect as well as high speed aerodynamics.

Avro Canada's Gas Turbine Test Establishment at Nobel, Ontario, while a development rather than a research centre, nevertheless supplies a considerable volume of basic information. It is engaged in testing, with a view to improving, the aerodynamic and thermodynamic characteristics of the Orenda. It also conducts long term programs to provide design information for future designs of jet engines. Included in the facilities at Nobel is a variable incidence cascade wind tunnel which is intended to provide basic information for the design of turbines and compressors.

Two Men: Although aeronautical research in Canada represents the product of the brains of many brilliant men, the responsibility of guiding this research along the most fruitful channels lies with two men—J. K. Parkin, CBE, Director of the National Aeronautical Establishment, and Dr. Gordon N. Patterson, Director of the Institute of Aerophysics.

As already noted, in 1917 Mr. Parkin was responsible for Canada's first wind tunnel and from that year until 1929

he was responsible for its operation as well as for aerodynamic research conducted at the University of Toronto. In 1919 he gave the first course of lectures on aeronautics at the University. Nine years later, he initiated, planned, and instructed at Toronto the first undergraduate aeronautical engineering course in Canada. In 1929 he was appointed Assistant Director, Division of Physics, National Research Council, in charge of aeronautical research. In 1937 he became Director of the NRC's Division of Mechanical Engineering. He became the Director of the NAE when it was established in January of last year.

Dr. Patterson is not only the Director of the Institute of Aerophysics but also its designer. In addition he is Professor of Aerodynamics at the University of Toronto. Considered one of North America's leading authorities in supersonic research, Dr. Patterson is the Canadian who set up the Australian Government's aerodynamics laboratory during the war. Besides his work in Toronto, he is also a member of the aerodynamics panel at the USN Ordnance Laboratory, White Oak, Maryland, where he spends one week in four.

CANADA'S AIRCRAFT INDUSTRY

(Continued from page 24)

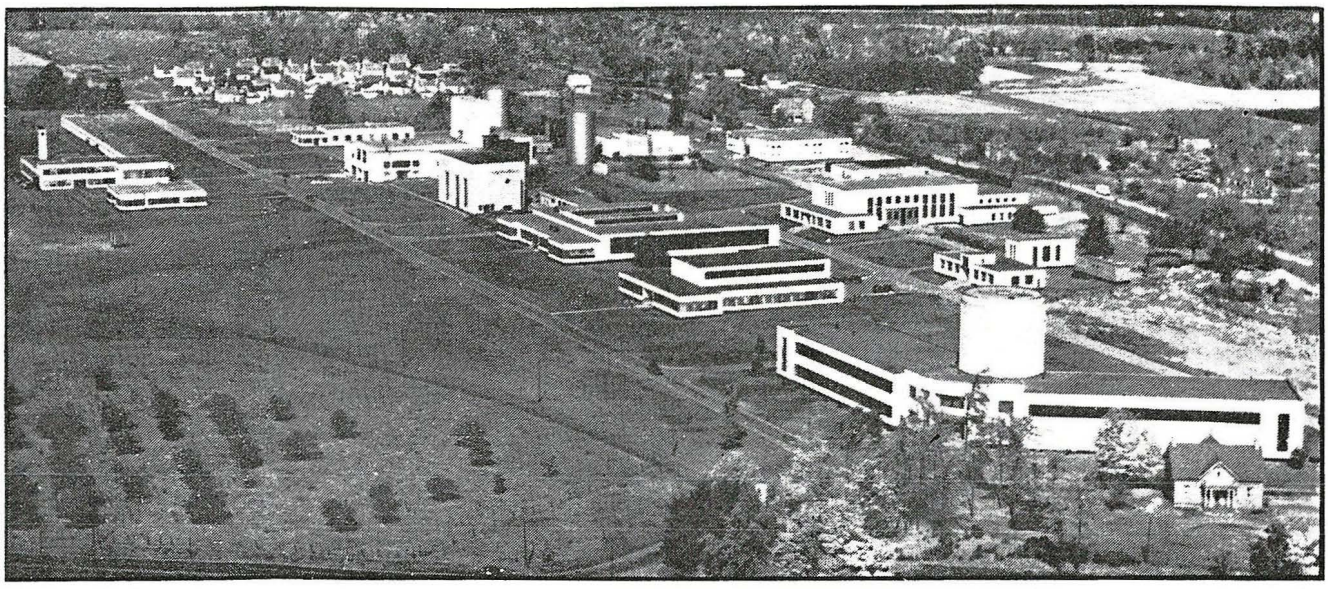
stocks. Production is well advanced on the hubs, however, and the first complete propellers (with CanCar hubs and government blades) will be delivered in August. In the following month, Canadian Car will be supplying the blades as well. Also at the Point St. Charles plant, undercarriages and hydraulic equipment for the Harvards are being produced.

Up to this point, little mention has been made of the repair, overhaul, maintenance, and modification phases of the Industry. While the dollar volume being expended on this work is small compared to the amounts being spent on new aircraft purchases, it is nevertheless comparable in importance. Most aviation companies concerned with these phases were active in this field long before Korea, and the aircraft program since has meant in the majority of cases an expansion to the full capacity of their existing facilities.

Overlapping: There is quite a high degree of overlap in the repair and overhaul work and manufacture of the end product or of parts for the end product. That is, many companies do both types of work. The de Havilland Aircraft, for instance, carries out a large Vampire repair program in addition to the manufacture of Beavers, the modification of Lancasters, and the overhaul of Goblin turbojets. In fact, Avro Canada and Canadair Limited are probably the only two companies in Canada whose efforts are devoted almost 100% to the development and manufacture of aircraft and engines.

At the present time, the Industry is employing over 27,000 persons (on manufacturing, repair, overhaul, maintenance, and modification), a figure that will possibly exceed 52,000 when peak production is attained in all phases. Naturally, any change for the worse in the international situation would mean that the whole aircraft program would be enlarged considerably, which would mean an upward revision of both the dollar value of contracts, a further expansion of the Industry's capacity, and an increase in the number of personnel.

A change for the better in the



NATIONAL RESEARCH COUNCIL'S . . .

Aeronautical Lab

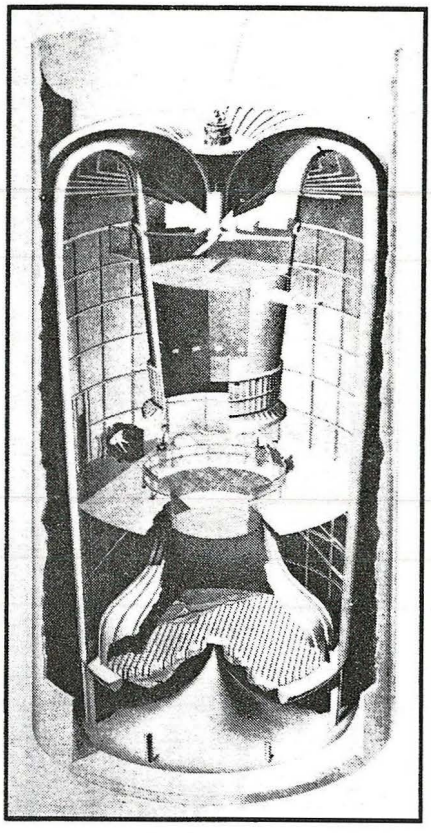
On April 1, 1936, the aeronautical and fire hazard laboratories, formerly part of the Division of Physics and Engineering of the National Research Laboratories at Ottawa and the instrument and model shops, were organized in a separate division designated as the Division of Mechanical Engineering with J. H. Parkin as Director. At that time the laboratories were housed in temporary quarters. Late in 1939, when the need for better aeronautical facilities to assist Canada's aviation industry became urgent because of war requirements, a new 120-acre site was secured just east of Ottawa and there the Montreal Road Laboratories were established. There are now some fourteen separate buildings on this site (See top photo).

Opening Attraction: "Open House" at these laboratories May 31, June 1 and 2, 1950, attracted more than 7,500 visitors, including many industrialists from distant points, as well as representatives of Government departments, including, of course, many Service personnel from the technical sections of the Navy, Army, and Air Force.

The facilities of the aeronautical laboratories are generally of a character and capacity not elsewhere available in Canada. In this way the laboratories fulfil their main function to provide Canada's aviation industry, both contractors and operators, with research, development and testing facilities and also function as the research organization of the Royal Canadian Air Force. Almost all phases of aeronautics are covered — aerodynamics, supersonics and gas dynamics, internal combustion engines and accessories, liquid fuels, lubricants and structures — and the facilities include atmospheric and spinning wind tunnels, model-testing basin, water tunnel, equipment for testing full-scale internal combustion engines and gas turbines, aircraft wings and components and for work on vibration, fatigue, photoelasticity, gasolines, turbine fuels, lubricants and aircraft and allied instruments.

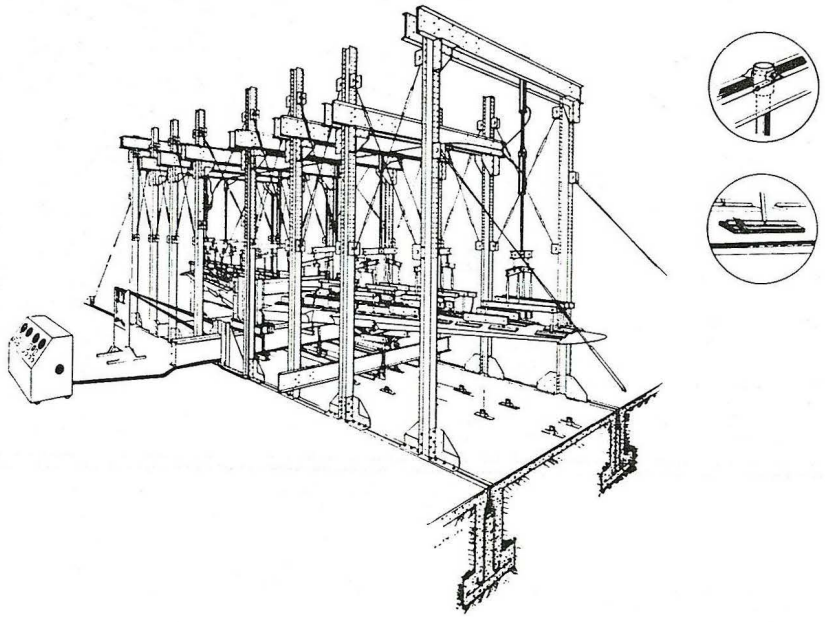
Performance Studies: The performance of newly designed aircraft and the effects of modifications to existing aircraft are studied in the wind tunnel; the effect of variations in attitude, control surface setting and of modifications on the stability and control of an aircraft can be determined and its performance predicted.

The vertical spinning tunnel provides a safe medium for studying the spinning characteristics of an aircraft. Motion pictures are taken of the freely spinning model and from the study and analysis of the films the spinning characteristics of the full-scale aircraft can be predicted. At the present time correlation tests are being carried out in this tunnel to determine how results here compare with the results in other spinning tunnels (i.e. the RAE tunnel at Farnborough and the NACA tunnel at Langley Field).



Vertical Spinning Tunnel

Structures Lab: In addition to the aerodynamic qualities of aircraft designs the properties of the structures must also be examined. The structures laboratory is equipped with a variety of testing apparatus and instrumenta-



Wing in Static Test Apparatus.

tion for indicating the effects of loading on various components of an aircraft under different flight conditions. The most recent addition to the facilities of the laboratory is the equipment for the static testing of full-scale aircraft components such as wings and tailplanes.

The Avro jet transport, C-102, designed and built by A. V. Roe Canada Limited, is at present under test in the structures laboratory. This is an example of the kind of service rendered by the laboratories to the aviation industry. Tests on the jet fighter, CF-100, designed by the same company, are also in progress.

Other Studies: An experimental study of curved plates subjected to end-wise compressive loading is being continued. Wing-flutter tests are also being made to obtain design data in regard to the thickness of skin required in aircraft wings. Another investigation is concerned with ground shaking tests and vibration measurements in flight. In addition to 600,000 lb. and 60,000 lb. machines, a 2,000-lb. Universal testing machine has recently been installed for tests of small specimens and for accurate calibration work.

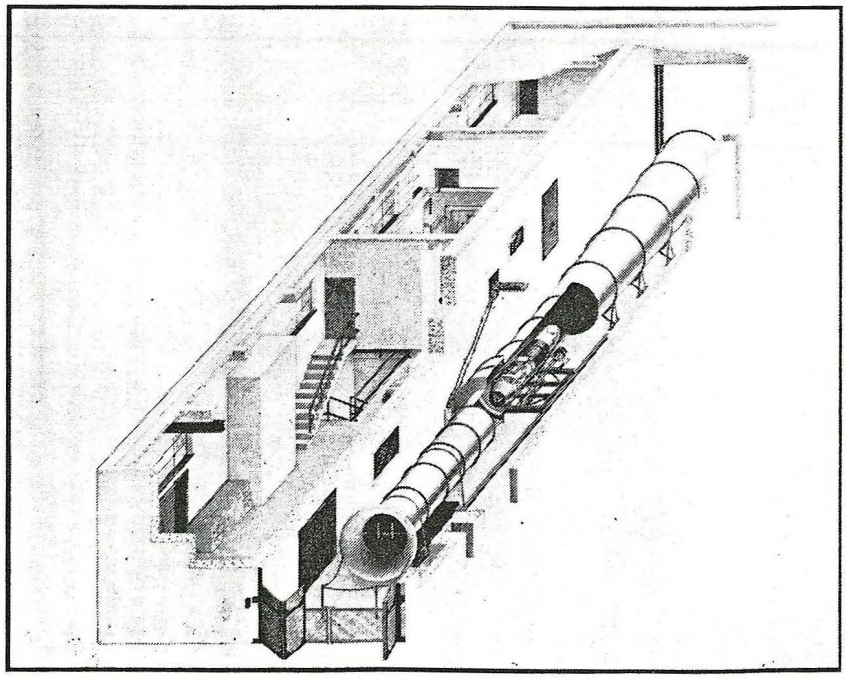
Problems peculiar to aviation in Canada are associated with cold weather and consequently a large amount of the work done in the laboratories is concentrated on the improvement of the low temperature operation of aircraft. The recently completed low temperature laboratory equipped with large cold chambers and an icing wind tunnel permits work on aircraft components, engines, fuels, structures, and many items of equipment. Icing, one of the great flying hazards, is also studied in flight by laboratory crews using a specially equipped North Star aircraft, provided by the RCAF

Low Temperatures: During a recent three-month period the cold chambers of the low temperature laboratory were in operation for a total of 507 hours on eight different projects. Three chambers are available one 50 by 15 by 15 ft, and two others, each 10 ft. cube. Temperatures as low as –85°F. can be attained readily.

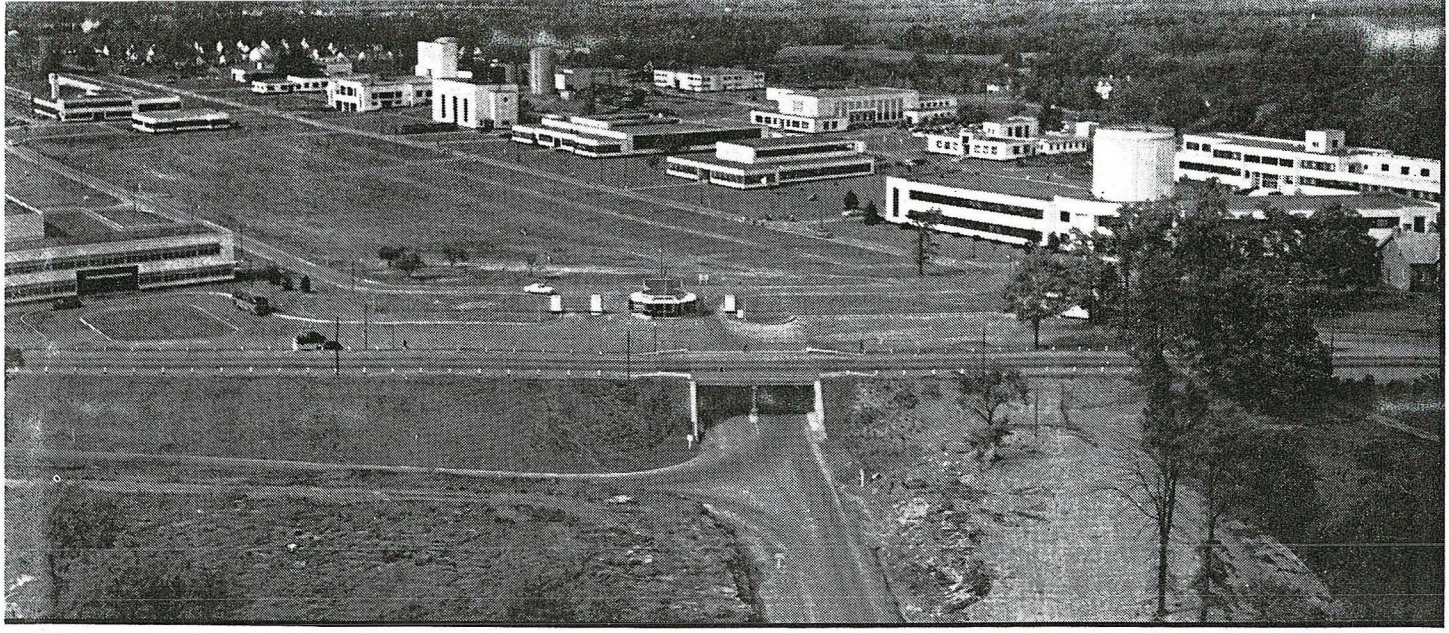
An icing wind tunnel has just been completed and put into operation driven by a 1,000 h.p. motor and having a working section 4½ ft. square in which an air speed of 260 m.p.h. at –40°F. can be attained.

Engine Lab: The engine laboratory is studying the low temperature operation of aircraft gas turbines and, in co-operation with the low temperature laboratory and the gas dynamics section, is investigating the icing of gas turbines and means of preventing ice formation, and ice removal.

Icing and anti-icing tests were carried on almost continuously in all five test cells during the winter season. In these tests natural icing conditions were simulated by spraying water into the inlet of a large duct mounted in front of the engine under test. Droplets of the required cloud particle size, about twenty microns diameter, were produced and allowed to supercool to the temperature of the air stream without freezing. When these particles impinge on any forward facing projection of the engine, they immediately freeze resulting in an icing condition very similar to that encountered in flight in icing cloud.



Jet Engine Test Stand.



Centre for Aeronautical Science

FROM THE NRC COME SCIENTIFIC ANSWERS TO AERONAUTICAL QUESTIONS

WHENEVER aeronautical research is discussed in Canada, first thoughts always turn to the "NRC". No other agency in Canada has had such a long unbroken association with research in the field of aeronautics.

Specifically, it is the Division of Mechanical Engineering of the National Research Council of Canada* which has for many years been making such important contributions to the aeronautical sciences. And significantly, the Division is headed by John H. Parkin, who is one of the pioneers of aeronautical research in Canada. Mr. Parkin has held this post since the inception of the Division of Mechanical Engineering in 1937.

Centre of the Division's activities is a group of neat, white buildings, dotted around a sprawling 400 acre site just outside Ottawa, on the road that leads to Montreal. (Top of page).

Emphasis on Aeronautics: The division carries out work for other industries besides aircraft, but about 75% of its efforts are directed toward research and development that is aeronautical in nature. Most of the jobs the Division performs are described as "investigations" rather than research.

Testing occupies much of the personnel's time, but the testing done is usually of specialized types. John Parkin says that whenever possible they try to avoid doing any routine type of testing, and no work that a commercial laboratory can do, is undertaken.

While wind tunnel testing to a large extent comes under the heading of straight testing, nevertheless the Division devotes a great deal of time to this area, the main reason being that though the testing itself is more or less routine, the data derived requires interpretation by specialists.

Only a limited amount of "research" as opposed to "investigation" is conducted by the Division. "We have to carry on a certain amount of 'research' to keep up morale," says John Parkin. "Morale is all-important in a research organization; if that goes, you might as well get out."

Flexible: The Division has two principal features which enable it to tackle problems and find solutions with a minimum of fuss and expense. The first of these is flexibility . . . flexibility of organization, finance, the mind, and even of the very buildings which the Division occupies. This flexibility makes it possible to get into action quickly and provides maneuverability. The second feature is that the Division is mainly restricted to the giving of advice. That is, it investigates problems, seeking solutions, then passes these solutions on to the interested parties. It assumes no administrative responsibility for the application of these solutions.

Not all investigation or research are carried out on the request of industry or other Government agencies. The Division frequently initiates projects on its own; sometimes the need for such an original investigation becomes evident when work is being carried out on another project.

Among the programs recently receiving attention were ones on reheat and application of the area rule to the Canadair Sabre. The reheat project has resulted in the successful development of an afterburner for the Orenda 14, and the loose ends are currently just being tied up on this application. Initial development work in this connection was carried out with the Rolls-Royce Derwent. The NRC reheat differs from earlier developments elsewhere in that the extra raw fuel is injected before the turbine, rather than after, as is usually the practice. Among other advantages is the extra cooling of the turbine blades that is provided.

The area rule project had no newsworthy outcome, having no effect on performance of the Sabre to which it was applied. However, the NAE Flight Research Section (which is currently administered by the NRC's Division of Mechanical Engineering), which carried out the flight tests on a Canadair-modified Sabre, regards the absence of effect on performance as a

*Few people are aware that the full name of the Council is the "Honorary Advisory Council for Scientific and Industrial Research". National Research Council is, however, the official short form.

tribute to the clean design of the type. At the same time, this absence of effect is also viewed as being practical proof of the area rule theory. Otherwise, the extra drag of the bumps added to the fuselage sides to give the area rule effect, would logically have reduced performance.

Since completion of this program, the Sabre concerned has been returned to Canadair for de-modification.

Source of Supply: One of the unofficial functions of the NRC, and hence, the Division of Mechanical Engineering, is to be a source of supply of scientific personnel to industry. This is probably not a popular function among the men who administer the NRC's various agencies, because it represents a constant drain of talent and of course makes it difficult to carry out responsibilities in the research and development area.

The effect of this drain is to be found, in the case of the Division of Mechanical Engineering, in the Division's inability to maintain or even reach its authorized establishment of 475. At present the personnel roster hovers around the 400 mark, with approximately 20% of these being classed as scientists (i.e., degree men). The Division shares with industry the problem of filling vacancies on its staff with qualified personnel of the right calibre.

The flow of NRC personnel to industry does not, of course mean that the talent of these people is forever lost to the country. For example, among the notable graduates of the Division of Mechanical Engineering are such as Thor Stephenson and Dick Hiscocks, now respectively of Canadian Pratt & Whitney and de Havilland Canada. The Defence Research Board's Director of Engineering Research, John Orr, is also a product of the NRC Division of Mechanical Engineering.

The attraction that industry has for Government scientific personnel is not, as might popularly be supposed, entirely financial. In many instances it is partially the feeling on the part of the individual that he should get some industrial experience. Consequently, there are infrequent cases where, after having a stint in industry, a scientist returns to Government research work.

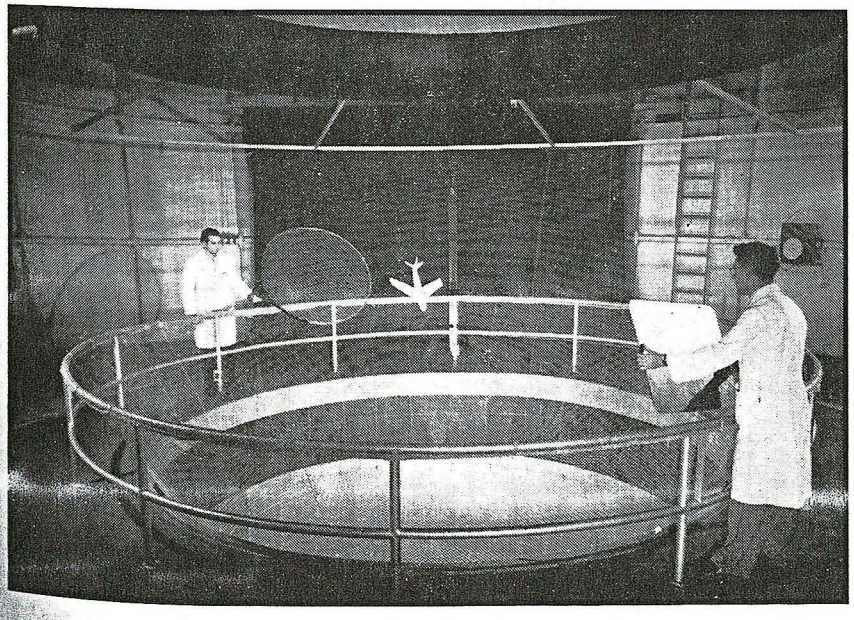
Supporting Industry

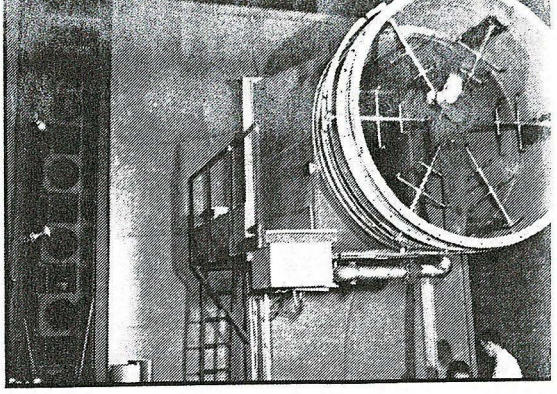
THE AERONAUTICAL research and development facilities operated by the Division of Mechanical Engineering have long been leaned on heavily by industry, which even now has only limited resources of this kind.

Discussing the relationship between research and aircraft design progress, John Parkin once said: "The extremely rapid development of military aircraft and the science of aeronautics in the last five to ten years has placed military aviation on the threshold of a new era of unbounded possibilities.

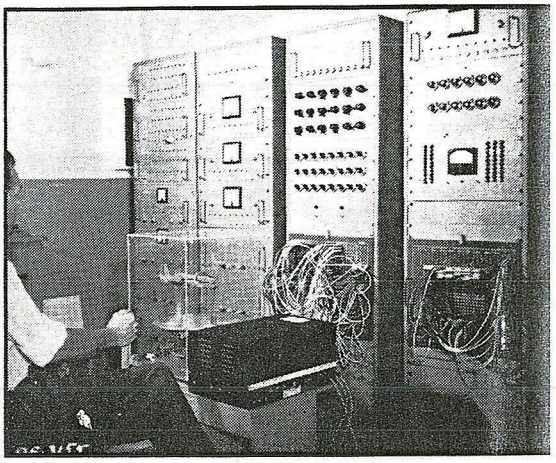
"At the same time, the problems facing the aircraft designer have grown in magnitude and in many cases he is working in hitherto unknown territory. If the industry is to progress, the designer must be more than ever

Below, NAE vertical wind tunnel, used for spinning tests with scale models.

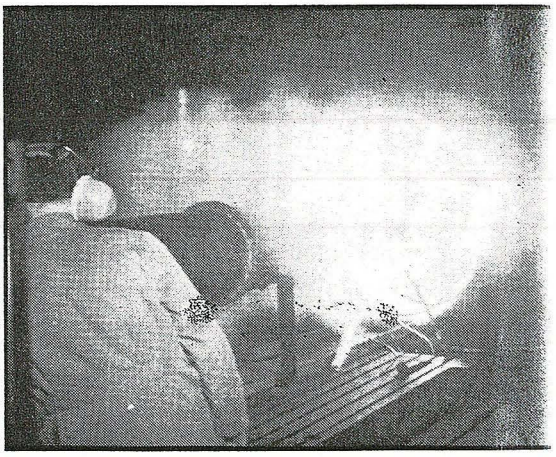




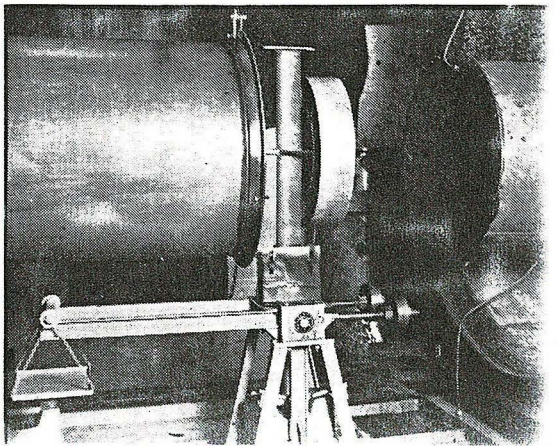
Above is shown the icing simulation spray equipment which is used in No. 4 test cell of the Engine Laboratory of the NAE, Montreal Road.

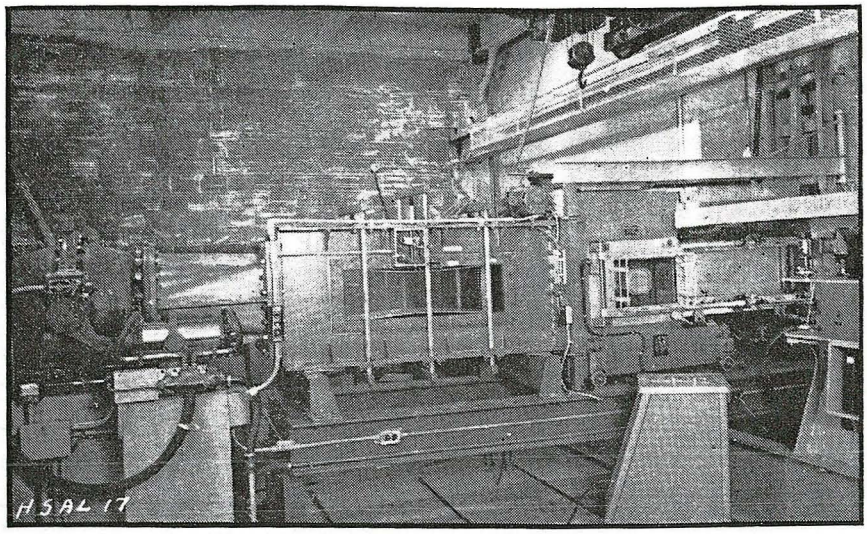


The NAE devised this simple flight simulator set-up on 'Ease' analog computer using servo-driven model to represent angular displacements.

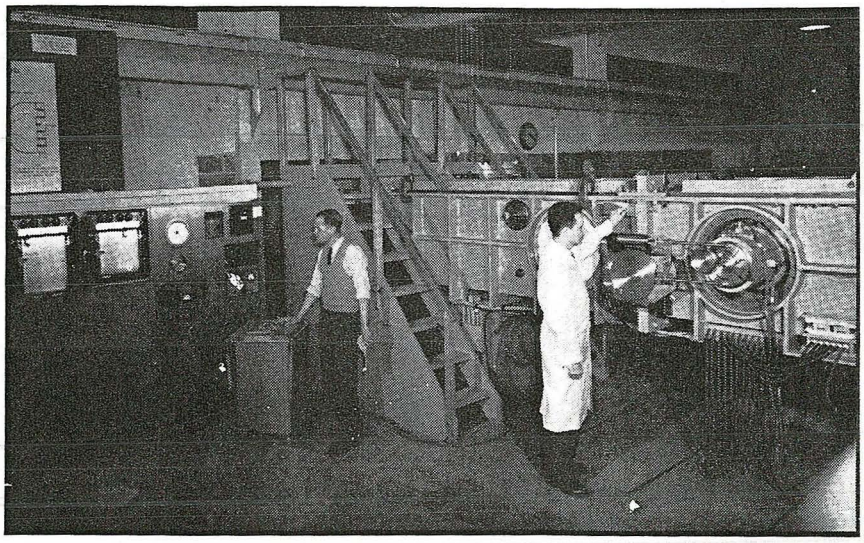


Above, rig for investigating screeching combustion, in screeching condition. Below, balance for measuring drag of different flame stabilizers.

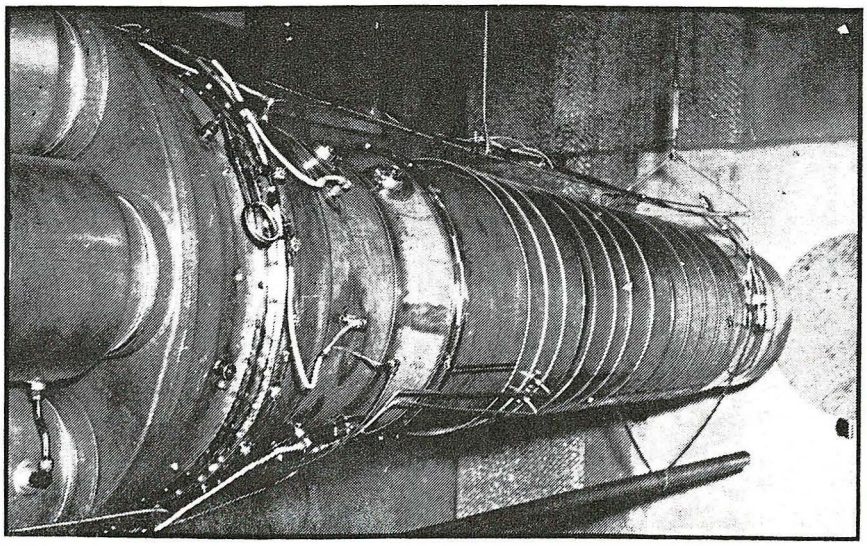




Above, NAE 10 inch supersonic wind tunnel. L to R, quick-operating valve, transition duct, variable diffuser, balance box and nozzle box. Tunnel control desk is in centre foreground. Below, 30 in. tunnel. Man at left is at tunnel control desk. Tunnel can be used for supersonic and transonic studies.



Below, the NAE-designed afterburner installed in an Orenda 14 turbojet. Engine is shown in the engine laboratory on Montreal Road. Flight tests have since been successfully carried out with engine installed in Sabre aircraft. First application of this unit was to R-R Derwents installed in a borrowed Meteor.



dependent on the results of aeronautical research. On the other hand, if they are to serve the needs of industry, the research facilities must be of the highest order of execellence. They must be of suitable scope to tackle the new problems created by the needs of military aviation and they must be staffed by people with the best training, experience and ability."

How close do the aeronautical facilities of the NRC come to meeting this description? Actually, they fall somewhat short insofar as equipment is concerned. There is a desperate need for a new supersonic wind tunnel such as is planned for construction at Uplands. Present wind tunnels at Montreal Road can still do useful work in the low speed regime, but the supersonic installations have definite limitations.

Working Tools: These are some of the tools the Division has for aeronautical research:

Wind Tunnels — (1) a low speed horizontal wind tunnel with a 10 ft. by 6 ft. working section and capable of a maximum airspeed of about 300 mph; (2) a vertical wind tunnel with an open working section some 15 ft. in diameter and a maximum speed of about 60 ft. sec., usually used for free spinning tests; (3) a high speed tunnel with a 16 in. by 30 in. working section, a running time of about 15 secs., and a speed range from Mach 0.5 to Mach 2.0; (4) a supersonic tunnel with a 10 in. square working section, capable of supersonic operation only at airspeeds up to approximately Mach 3.0 and having a running time of one minute or more.

The two low speed tunnels, which comprise the Low Speed Aerodynamics Laboratory, are both of the continuously operating type, while the other two tunnels, operated by the High Speed Aerodynamics Laboratory, are of the intermittent type, vacuum operated.

The 6 ft. by 10 ft. low speed unit, though regarded as obsolete, still is in constant use, even in connection with the development of the supersonic CF-105. As NRC scientists point out . . . "Such airplanes have to slow down to land and it is necessary to be familiar with their behaviour at such times." At the present time this so-called "obsolete" tunnel is in such heavy demand by Avro, Canadair and de Havilland Canada, that the NRC

THREE-WAY PARTNERSHIP FOR RESEARCH

To many in the aircraft industry, the relationship between the Defence Research Board, the National Research Council and the National Aeronautical Establishment is a confusing one. In the case of the latter two, especially, there is obvious overlapping of personnel and facilities. The following background is therefore presented by way of clarification.

Prior to 1951, the National Research Council and the Defence Research Board explored the possibilities of creating a National Aeronautical Establishment which could be administered as a joint military and civil establishment. The object of this was to achieve an orderly development of the facilities and a closer integration of the requirements for military and civil aeronautical research and development in Canada.

When the NAE was officially established in 1951, it was decided that detailed administration would be the direct responsibility of the NRC, with policy determined by a National Aeronautical Research Committeee. On civil matters, this Committee was made responsible to a Subcommittee of the Privy Council Committee on Scientific & Industrial Research. On defence matters, however, the National Aeronautical Research Committee would report directly to the Cabinet Defence Committee.

By organizing the NAE in this manner, the need for new legislation, was avoided and funds for the operation of the Establishment have since been regularly included in the estimates of both the NRC and the DRB.

The physical nucleus of the NAE has from the time its formation been made up of the NRC's Division of Mechanical Engineering on Montreal Rd., Ottawa, and the Flight Research Section at Uplands (formerly at Arnprior), near Ottawa. The director of the NAE since its formation has been J. H. Parkin, who has simultaneously continued as director of the NRC's Division of Mechanical Engineering.

Under the terms of the long range plan for the NAE, the Flight Research Section is eventually to be operated by the DRB. This transfer of administrative authority will take place following the completion of the new supersonic wind tunnel which is planned as part of the Upland operation.

Thus, the NRC's Montreal Road facility and the greatly-expanded Uplands facility, will together continue to form the physical components of the National Aeronautical Establiishment, with Montreal Road being operated by the NRC and Uplands being operated by the DRB. The costs are similarly to be divided between the two organizations.

scientists can rarely get it for their own purposes.

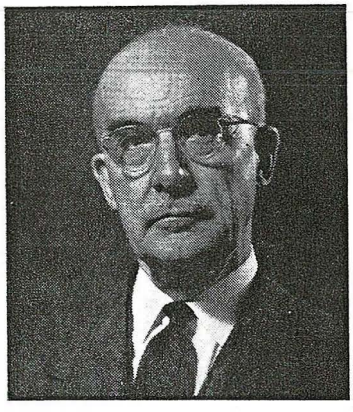
Round and Round: The spinning tunnel, in which the spinning characteristics of every type of Canadian built aircraft have at one time or another been tested, is currently being used to check out the CF-105 Arrow. Dimensionally and weight-scaled models are used to conduct these tests. The model being tested is thrown into the vertical air jet with its control surfaces preset to induce a spin. When the spinning characteristics have been noted, a magnetic field is set up in the tunnel. In the model is installed an electromagnetic device which is actuated by the magnetic field and "centres and controls", as it were. It is then possible to observe how readily the model recovers from its spin.

By varying the air speed of the tunnel, it is possible to simulate falling speeds of up to 60 ft./sec.

The models, usually of about 3 ft. span, were formerly fabricated of balsa wood, but recently the model builders of the Mechanical Engineering Division have been obtaining good results with moulded fibreglass.

The 16 in. by 30 in. high speed tunnel is used for dynamic model tests. The changes in Mach number are achieved variations in the size of the tunnel's throat. These variations are obtained through the use of replaceable throat sections which bolt in place on the floor of the tunnel; they are so shaped that they increase or decrease the restriction of the throat, as compared to the section used previously, thereby affecting the airspeed through the working section.

Model Tests: Two types of dynamic models can be used in this tunnel, one being the complete type, sting balance mounted; the other being the wall-mounted reflection plane kind. The latter is simply a half model, vertically split lengthwise. Shims are inserted between the model and the wall of the working section, holding it away from the wall and thereby clear of the effects of the boundary layer.



John Hamilton Parkin, CBE, BASc, ME, FRAS, FRSC, FIAS, MSAE, is one of Canada's foremost pioneers in aeronautical research. He has probably had a longer continuous association with this field than any other individual in Canada. Since 1937, Mr. Parkin has been Director of the NRC's Division of Mechanical Engineering, and since the formation of the National Aeronautical Establishment in 1951, he has also been its Director. He was responsible for the establishment of an aeronautical research program at the University of Toronto as long ago as the year 1917.

The 10 in. square supersonic tunnel is also used for testing of dynamic models. It was used extensively during the development of the Velvet Glove guided missile.

In addition to the foregoing, there is a 5 in. supersonic wind tunnel which is actually the one-twelfth scale "pilot" model of the 5 ft. square supersonic tunnel which will be built at the site of the NAE Flight Research Section at Uplands. Although the work so far done on this tunnel has been carried out by the Division of Mechanical Engineering, which will also. it is understood, see the project through the construction state, the tunnel will eventually be operated by the Defence Research Board*.

Of interest also is a small water tunnel which is operated by the Aerodynamics Section for flow visualization work. Flow visualization is achieved by means of aluminum particles in suspension in the water being directed past the model under surveillance. This particular piece of equipment is a German unit, captured when the Nazis were defeated, and regarded as one of the few useful things which the NRC got in the form of scientific booty from the conquest.

(Continued on page 109)

*The relationship between the NRC, the NAE and the DRB, and who is or will be responsible for the operation of what facilities, is explained elsewhere on this page.

And I noticed in last month's *Aircraft* Magazine that de Havilland of Canada are advertising that their Beaver aircraft are "operating in 50 different countries on 7 continents, from Pole to Pole." This is an impressive record. It's impressive, too, to see that at the foot of the advertisement is the note, "Designed and built by The de Havilland Aircraft of Canada Limited."

Other Facets: There are many other facets to this do-it-yourself diamond. I asked L. H. Kottmeier, vice president, Sales, for the Aircraft Division of Canadian Car & Foundry Co. Limited, about them. Les Kottmeier has had a wide and varied career in all aspects of airplane design, production, inspection, and sales, in both the U.S. and Canada. Said he, "First and foremost, any license agreement is usually restrictive in territory, which cuts down your scope of action. Moreover, in the past many such deals have been of the 'one shot' variety. This means that the licensee is in a difficult position to supply continuing spares, since the spares market is based on the number of aircraft produced in the single run. Spares are a continuing and important part of any aircraft company's business, and in well established firms often account for 50% of the gross profit."

On the development side he points out an interesting sidelight: there are always "by-products of designing aircraft, as there are in all development fields. The Hi-shear rivets, the chem-mill process, and many other ideas are real money makers for their owners."

If we're going to reap dollars from our own developments, both from the major products and the side lines, we must have a preparedness program that leaves no point in doubt. Even the old Vickers Vedette depended on the University of Toronto's new, 1924 model, wind tunnel to establish its aerodynamic characteristics. So we, in this age of complexity, must have modern wind tunnels, static test rigs, and research facilities. We must also be prepared in the economic field.

Commercial Sales: I was talking to W. Stanley Haggett, Director of the Bristol Aeroplane Company of Canada, recently. He was telling me about some aspects of selling airplanes on the commercial market. One airplane may be technically better than another. But it the manufacturer making the better airplane doesn't have an easy payment plan to finance the sale, he may lose out to the firm that has the poorer plane, but the better payment plan.

All in all, then, we need to be prepared technically and economically, if we are going to get dollars from our own developments. I firmly believe that we are. However, there are many that are not so sure. As R. H. Guthrie, Engineering Manager for Canadian Pratt & Whitney once told H. C. Luttman, Secretary of the Canadian Aeronautical Institute, as the latter reported it in an issue of the *C.A.I. Log*, "The trouble in Canada is that we don't know what we know.

"Dick Guthrie is right. But it's time we found out. For there are dollars in development. As an editorial in the *Montreal Gazette* put it, "All these sales mean that Canadian design and workmanship are becoming recognized throughout the world as first rate. There is no reason why Canada should not develop aircraft production as a major national industry; the Swiss, after all, did not invent the watch."

COMING EVENTS

April 8-12—Welding Show & Annual Meeting American Welding Soc., Convention Hall & Hotel Sheraton, Philadelphia, Pa.

April 22-24—Vickers Inc. Annual Jet Engine Hydraulic Symposium, Hotel Statler, Detroit.

April 25-26 — AITA Semi-annual Meeting, Empress Hotel, Victoria, B.C.

May 6-10—Industrial Tool & Production Show, Exhibition Park, Toronto.

May 22-24—Annual Convention, American Society for Quality Control, Masonic Temple, Detroit.

June 8 — Air Force Day across Canada.

June 24-25—29th Meeting, Aviation Distributors & Manufacturers Assoc., Grove Park Inn, Colorado Springs, Colo.

September 9-13—IATA Annual General Meeting, Madrid, Spain.

Sept. 30-Oct. 4—Canadian National Materials Handling Show, Show Mart, Montreal.

October 2-4—Annual Meeting and Forum, National Business Aircraft Assoc., Cosmopolitan Hotel, Denver, Colorado.

NATIONAL RESEARCH COUNCIL

(Continued from page 37)

Simulated Ice: In the Division's Low Temperature Laboratory is an icing tunnel in which models or full-scale components (e.g., jet engine air intake) may be subjected to conditions existing in flight through icing clouds. This tunnel is a closed circuit facility with a 4½ ft. square working section and a maximum airspeed of 200 mph. Refrigeration equipment can lower the temperature in the tunnel to 40°F. at maximum speed. Water injected through an array of nozzles and atomized to controlled droplet diameters duplicates the conditions of icing cloud.

In this same laboratory is a smaller icing tunnel, having a working section of only 8 in. by 10 in., but capable of speeds up to 500 mph. This is mainly used for work on instruments and other small equipment.

There are as well, three cold chambers where equipment under test can be subjected to temperatures ranging from as low as — 85° F. to +167°F., at winds up to 40 mph. The largest chamber, which is big enough to be used for cold soaking of large equipment such as fire trucks, tanks, etc., is 50 ft. long, 15 ft. wide and 15 ft. high. The two small chambers are 10 ft. square by 8 ft. high.

The helicopter spray rig located at Uplands, though regarded as part of the Low Temperature Laboratory, is operated by the NAE Flight Research Section. It is used for testing helicopters in free flight in simulated icing conditions. The spray rig is 70 ft. high and produces a large icing cloud 15 ft. by 30 ft. by atomizing water with steam in spray nozzles. It is useable during the winter months only, being located outdoors.

Structures: The Division of Mechanical Engineering's Structures Laboratory has well equipped facilities for work in the areas of statics, dynamics, aeroelasticity, and aircraft hydraulics.

Statics includes research on aircraft structures, civil and marine structures and a wide variety of structural components, as well as work on structural and plastic materials. The most imposing single piece of equipment used in connection with this phase of the laboratory's work is a testing machine which can apply tension, compression, or bending loads of up to 600,000 lbs.

Dynamics work includes investigations on aircraft landing gear, the determination of dynamic loads on military equipment, a variety of structural vibration problems and fatigue investigations and research. Fixed fatigue testing equipment provides facilities for flexure, direct stress and torsion fatigue tests. The load capacity of this equipment is slated to be increased to 130,000 lbs. Ancillary equipment includes a range of accelerometers up to 200 G's.

(Please turn page)

The aeroelastic work is at present devoted to a study of the vibration modes and frequencies of swept wings and is assisted by facilities for the production of plastic and metal models. Experimental equipment includes a variety of experimental jigs and fixtures, transducers and dynamic recording equipment.

Subjects of Attention: Aircraft hydraulic, fuel and oil systems are the subject of a great deal of attention in the Structures Lab. The problems under study relate to the design and performance of such components as flexible and rigid conduit, valves, actuators, pumps, seals and rings. In terms of capacities the laboratory has equipment to handle static pressures up to about 35,000 psi., fluid temperatures from —80°F. to +500°F., flow rates up to about 20 gpm., and impulse pressures up to 12,000 psi.

The theoretical and analytical work of the laboratory is assisted by electrical computing machines and also by an electronic analogue computer, this having sufficient capacity to solve 12 simultaneous equations. It also includes function generators and multipliers.

Another important divisional laboratory is the Aircraft & Allied Instrument Lab., which designs and constructs special instrumentation and automatic control systems as required by other laboratories of the Division. It also conducts development tests of navigational instruments for the RCAF. The performance of these functions by the laboratory is backed up by comprehensive environmental testing facilities.

Powerplants: The Engine Laboratory is equipped for research and test work on reciprocating and jet engines. It has five test cells, the largest of which can handle any known jet engine, in existence or contemplated (up to 50,000 lbs. th.). This cell can also be used for work with the largest of turboprop engines, the only limiting factor in the case of this class being the size of the propeller which the engine swings. Originally designed for testing propeller engines, the cell has a diameter of 25 ft.

When used for turbojet testing, this particular cell is usually reserved for the most powerful types, those with lower thrust ratings generally being placed in one of the other cells, which vary in cross section between 15 and 20 ft.

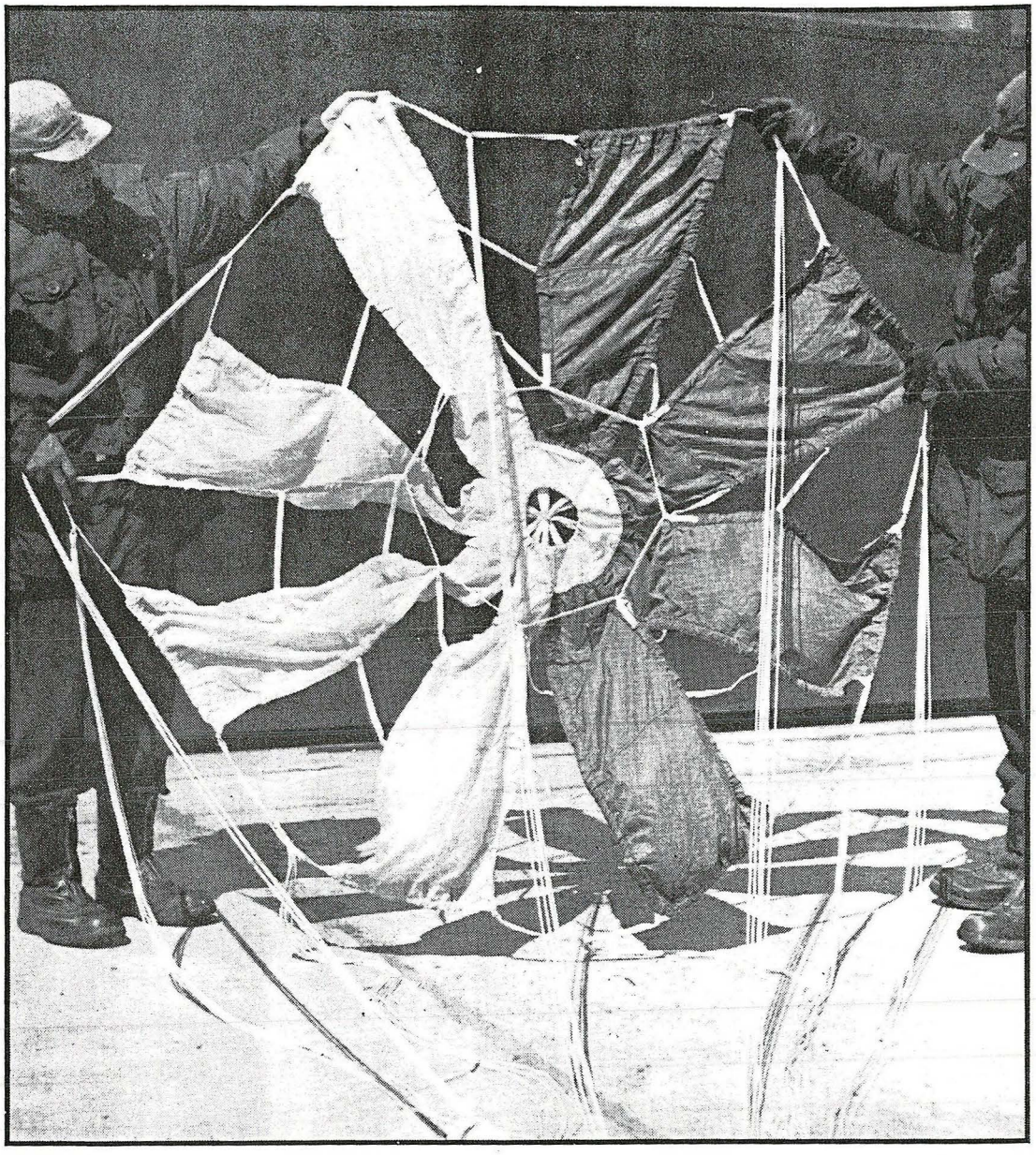
The large cell is currently being used in connection with tests of the Orenda Iroquois. Prior to the beginning of work on the Iroquois in February, an investigation was completed into the icing troubles which were encountered in service by the Bristol Proteus turboprop engine.

The Division was able to duplicate in the laboratory the conditions which were causing the icing difficulties of the Proteus. This was accomplished in a relatively simple manner; blocks of ice were subjected to rough treatment by some 120 circular saw blades which were bolted together in two sets; the resultant fine ice crystals were blown into the intakes of the Proteus while it was running, and the engine proceeded to accumulate ice in the same manner as encountered in high altitudes flight in the tropics.

Interestingly enough, an NRC scientist, C. K. Rush of the Low Temperature Laboratory, several years ago predicted the eventual occurrence of icing trouble of the type experienced by the Proteus, but it has taken two or three years for the first case to turn up.

Mutual Advantage: The Engine Lab has also recently carried out tests on a Bristol Olympus. The NRC frequently performs low temperature engine tests of British engines because it finds it mutually advantageous to do so. An opportunity is given to study the latest British engines and get up to date information on new developments, as well as to see what mistakes can be made. From the British standpoint, the alternative to having the tests performed by the NRC would be to build expensive artificially refrigerated test cells. Whereas, as one NRC scientist puts it, "We have refrigeration by God."

In all, two of the test cells are especially equipped for icing tests on jet engines. The special equipment comprises banks of nozzles and of auxiliaries such as pumps, filters, controls, etc., for spraying water to simulate icing clouds. The nozzles are located inside ducts through which the engines draw in the cold winter air. One of the cells is, in addition, to be artificially refrigerated, using the plant capacity of the Low Temperature Laboratory, so that air temperatures below the winter ambient can be obtained.



OPEN AND SHUT

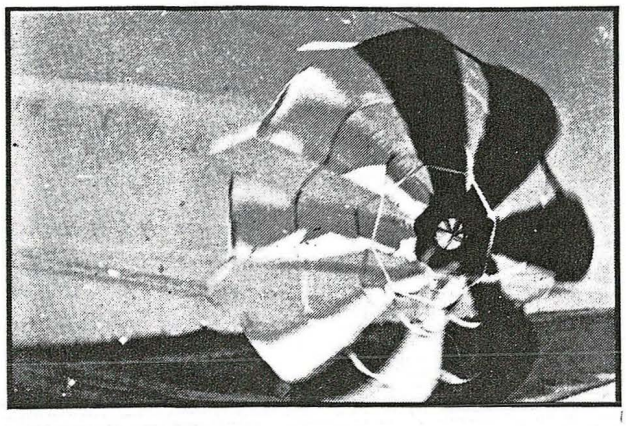
A Repeating Parachute

A NEW, self controlling type of parachute that can open and close itself repeatedly in a preset fashion and is hence known as a "repeating" parachute, was described in a paper (A Repeating Parachute) by the inventors, H. T. Stevinson and Dr. P. Mandl, at the CAI annual general meeting. Both men are associated with the National Aeronautical Establishment, Mr. Stevinson being head of the Flight Research Section's special projects group, while Dr. Mandl is an associate research officer in the Aerodynamics Section.

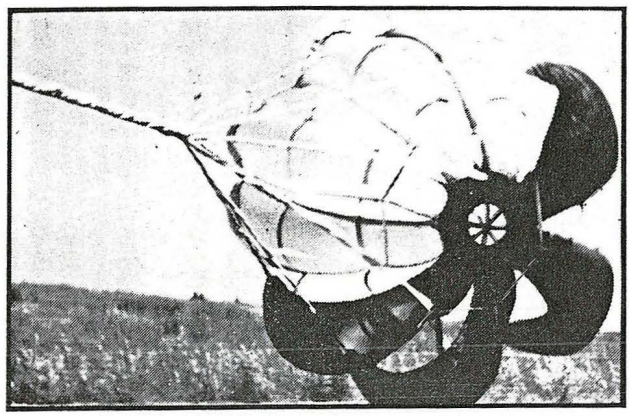
In one of its possible applications, the parachute may be used to increase the height from which supplies may be dropped accurately. In this case it would open until the forward motion imparted by the aircraft had been reduced to almost zero. The parachute would then close, allowing a rapid, nearly vertical fall. It would then reopen in time to insure a relatively gentle landing. The rapid fall while the parachute is closed allows greater accuracy in the presence of a shifting wind because the time of the fall is considerably shortened.

The parachute is made to control itself by means of a special canopy which rotates rapidly enough to wind up the shroud lines by which it is attached to its load. The winding causes the load to rotate and the canopy to collapse after a suitable distance. The collapsed canopy rotates slowly in the opposite direction, thus unwinding the shrouds during the fall. The canopy reopens and again reverses direction of rotation so that soon the

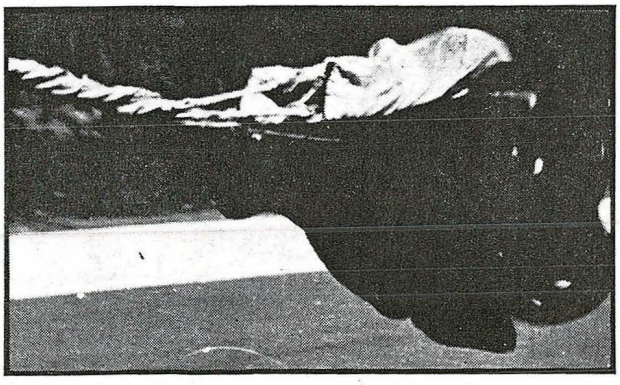
SEQUENCE: repeating parachute towing at 73 fps



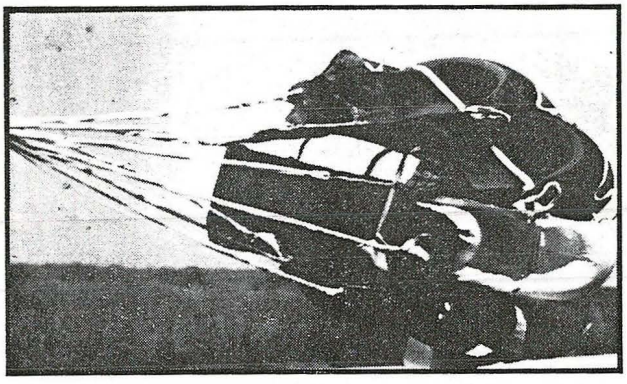
OPENING AND SPINNING.



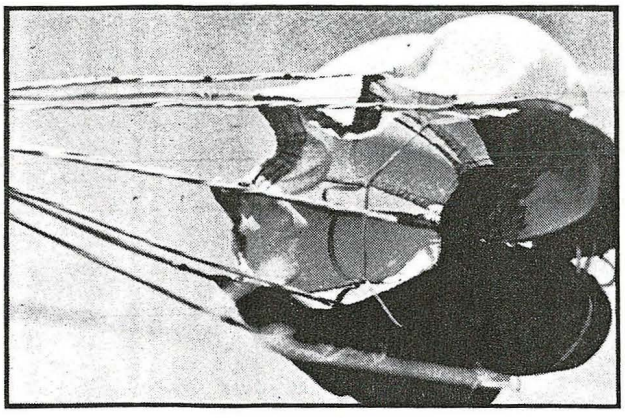
ABOUT TO CLOSE.



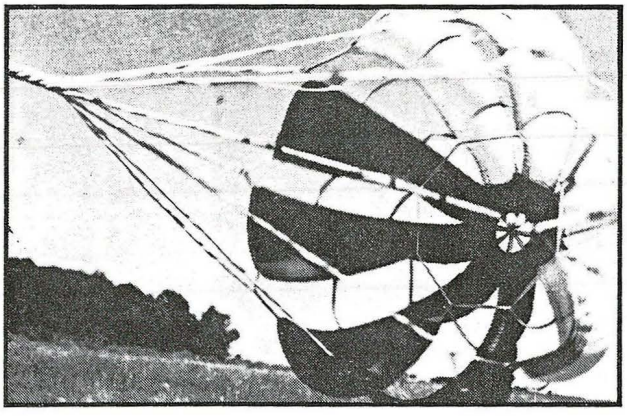
CLOSED AND REVERSING.



UNWINDING.



ABOUT TO REVERSE AND REOPEN.



REVERSED AND SPINNING.

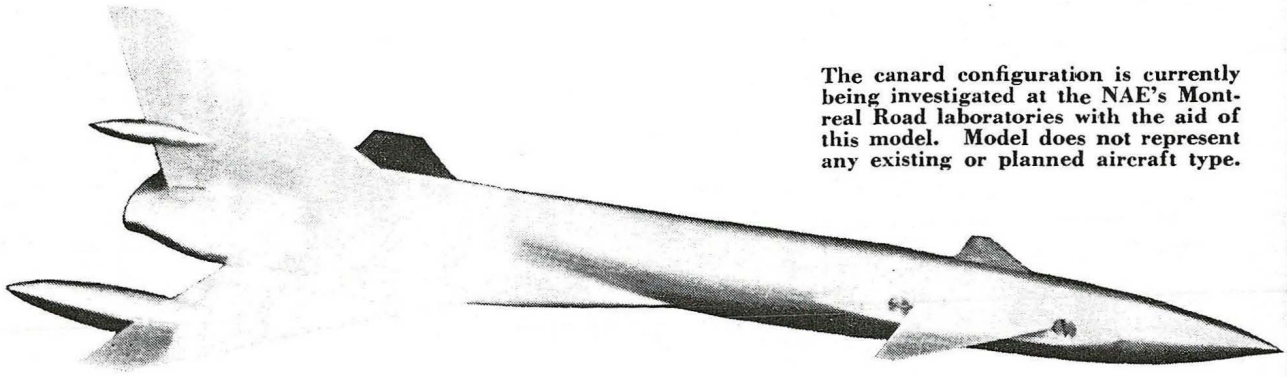
load and the canopy are rotating at the same speed. No further winding occurs and the canopy remains open to the ground, whereupon it again collapses . . . even in a strong wind . . . so that the supplies are not dragged.

The canopy is built so that when it is inflated it is like a windmill made of cloth. The gores are free along three sides, being spread like sails by the special forked shroud lines attached to the gore corners. The direction and speed of rotation is controlled by a flexible ring inside the canopy, which tilts the gores for rapid rotation when the parachute is open and becomes ineffective when the parachute collapses. In this case the rotation is controlled by the forked shroud lines which allow the gores to tilt in the opposite way.

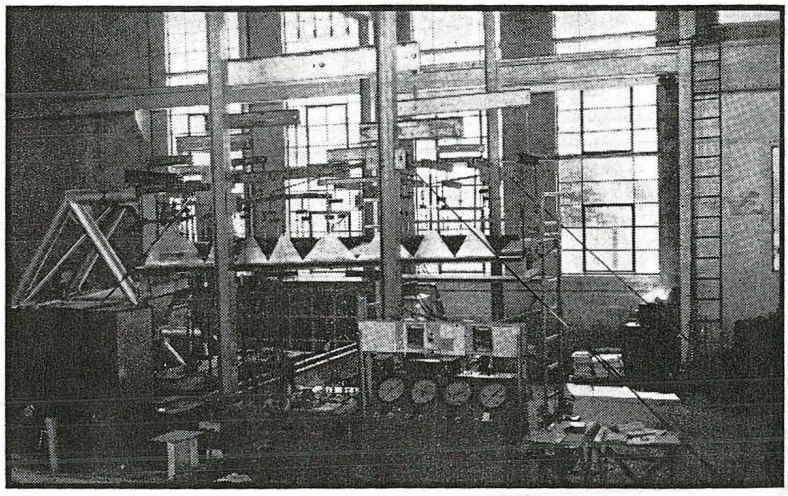
To adapt it to the solution of other problems the parachute can be designed to operate in many variations of the foregoing procedure. It may repeat several times or stop after only a part of a cycle. It may rotate while closed and not while open, or vice versa.

It is easy to make and comparable to a conventional parachute in size and weight, but may replace several parachutes, and heavy control equipment in some cases. To date it has been produced in small quantities and tested only under research conditions. Mr. Stevinson and Dr. Mandl feel that when the new freedom in behavior that this parachute offers is widely recognized, it may solve old problems more easily, and the solution of widely scattered new ones may become more practical.

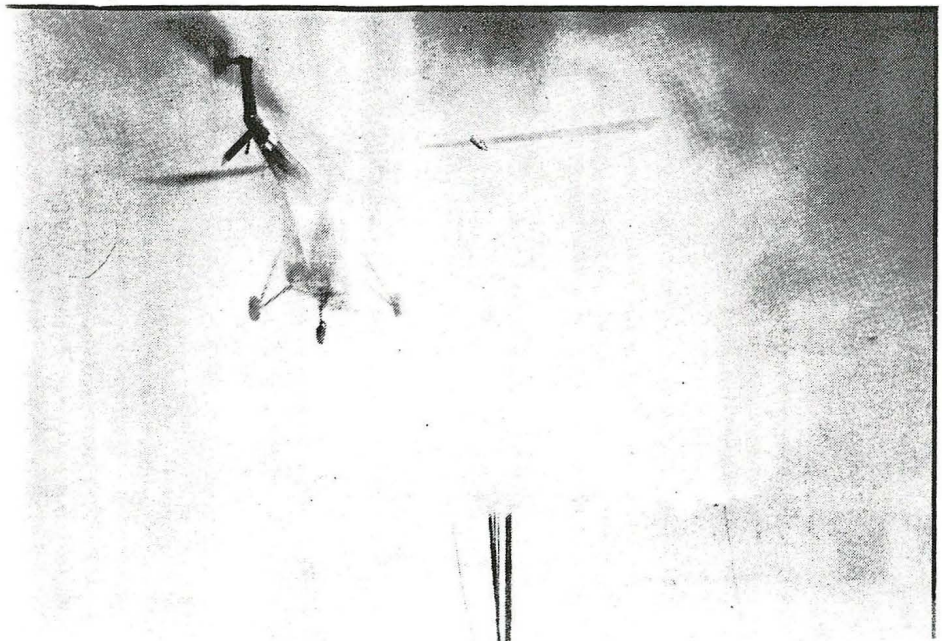
Around the Canadian



The canard configuration is currently being investigated at the NAE's Montreal Road laboratories with the aid of this model. Model does not represent any existing or planned aircraft type.

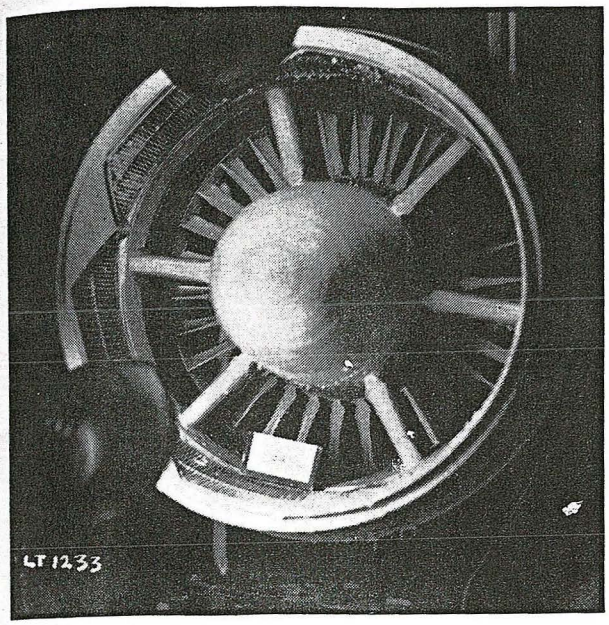


At right, a wing fatigue test under hydraulic loading, being carried out in the structures laboratory at the NAE's Montreal Road facilities. In this case, a fighter wing is supported in cantilever, and distributed normal load is applied to the upper surface from a group of hydraulic jacks.

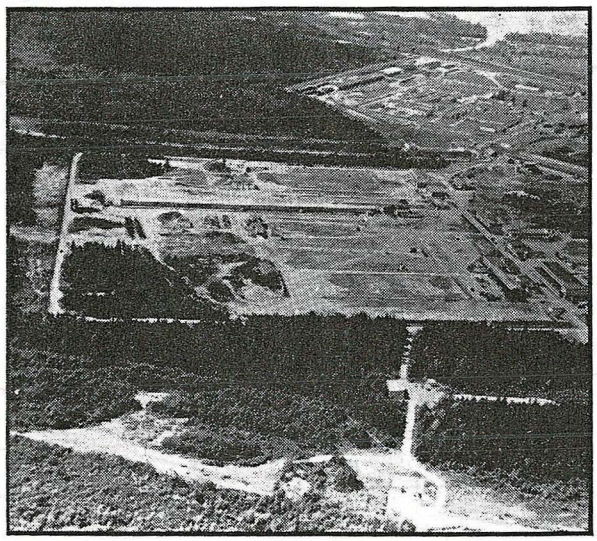


At left, an RCN Sikorsky HO4S hovers in the icing cloud generated by the helicopter icing rig at the NAE's Flight Research Section at Uplands. Machines so far used in connection with these tests have included the HO4S, Bell 47, and Bristol Sycamore.

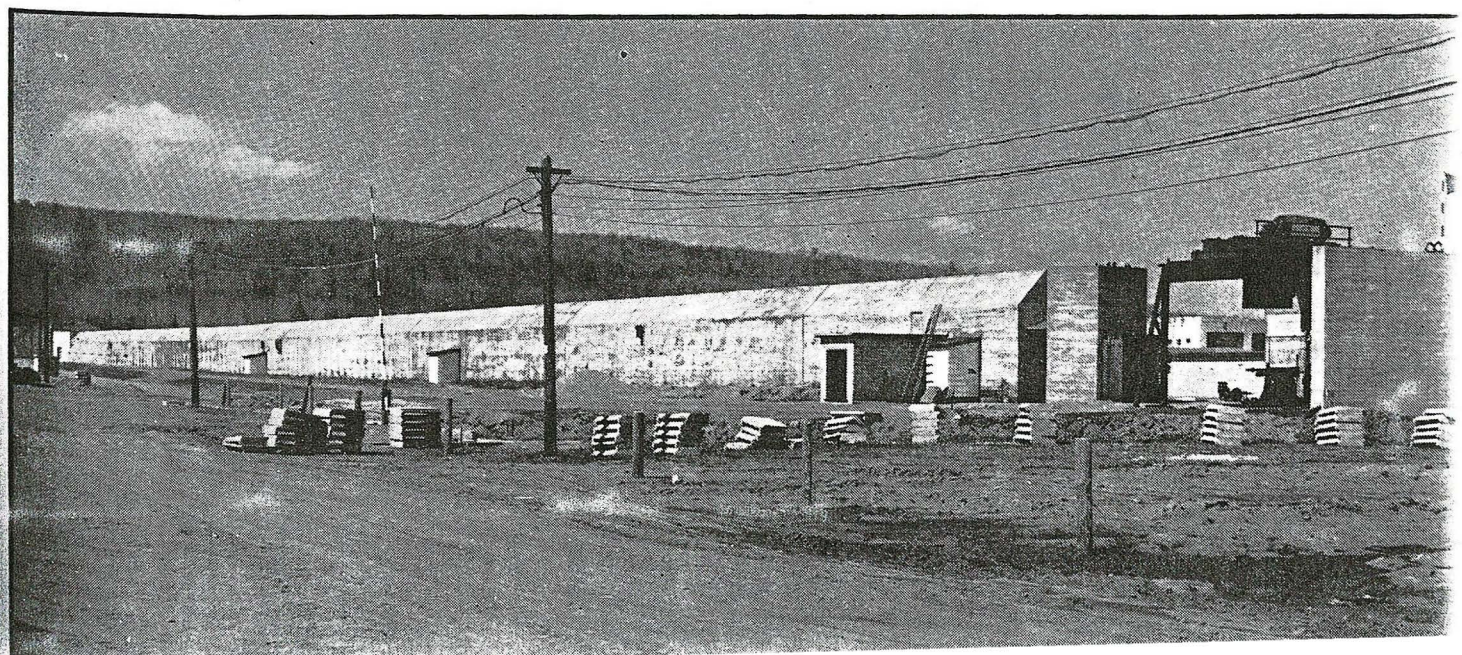
Research and Development Scene



At left, icing tests of a turbojet air intake underway in the icing wind tunnel in the NAE's low temperature laboratory. This icing tunnel has a four and a half foot working section.



At right, aerial view of the Canadian Armament Research & Development Establishment. Long building in the centre is the aeroballistics range, also shown below in a ground close-up view. The range is a concrete structure and is 760 feet in length.



Canada's Newest High Speed Wind Tunnel

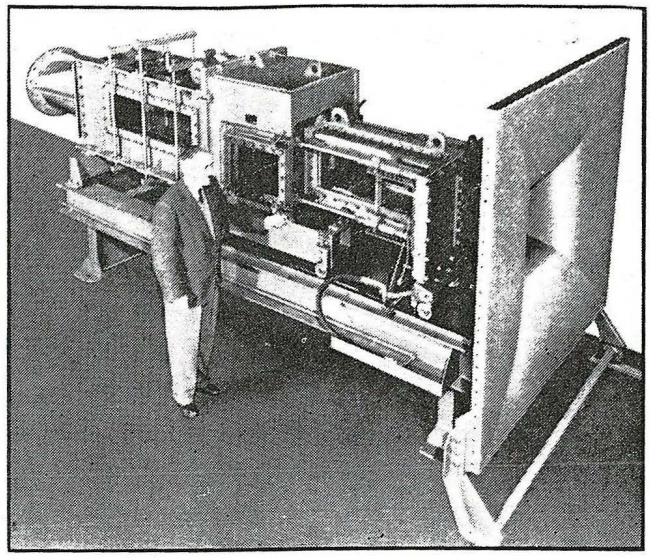


FIG. ONE

THE WORKING section of a wind tunnel for supersonic flight research, believed to be the most advanced yet constructed in Canada, has been completed for the National Research Council by the Dominion Bridge Company Limited, Lachine, P.Q. This newest tunnel is evidently similar to, and complements, the tunnel at the Institute of Aerophysics, at Downsview Airport, near Toronto (see *Aircraft*, November, 1950).

Although the cross section of the tunnel, where the test models will be mounted, is only 10 inches square, the air speeds are high. The equipment works on the air suction principle whereby air is drawn through the tunnel working section to fill the void of a 35-foot diameter vacuum sphere.

Operation: Air enters the intake throat at the right hand end of the tunnel as shown in Fig. 1 and is drawn through the nozzle box. Here the curving shapes of the roof and floor of the nozzle box form a venturi-like nozzle which determines the speed of air flow past the model. Nine nozzle boxes were provided, designed to be easily interchangeable, each having a different venturi shape. Thus the air speed through the tunnel may have nine separate values, depending on which box is in use.

Box No. 1 is rated to give an air speed of Mach Number 1.4. Boxes 2 to 6 are designed to give a progressive range of air speeds up to Mach Number 3.47.

The left hand end of the nozzle box projects into the balance box, where the model is mounted, and which contains the apparatus for measuring the airstream effects on the model. Both the nozzle boxes and the balance box have optical glass windows, 1¼″ thick, through which shock waves, boundary layers, and other flow phenomena can be observed and photographed

When the nozzle box is removed, the balance box is capable of being moved forward to allow easy access for mounting the model and adjusting balance apparatus, as shown in Fig. 2.

Adjustable Throat: The air leaving the balance box flows through the "adjustable throat" section. Here the roof and floor of the tunnel consist of flexible aluminum plates, capable of being flexed by a system of screw jacks to give varying tunnel heights, ranging from 12.5 to 6.25 inches. The purpose of this device is to provide means of pressure adjustment inside the balance box and to increase the efficiency of pressure recovery. Connected to the adjustable throat is a transition piece (extreme left, Fig. 2) which smoothly transforms the tunnel cross section from a rectangle to a circle. A 15-inch diameter globe valve, built by Dominion Engineering Works Ltd., will be bolted to the transition piece from which a conical diffuser leads to the vacuum sphere.

In Fig. 3 is shown a model in the working section (right). Fig. 4 shows one of the two special spherical valves used in connection with the new wind tunnel at the NRC laboratories. The requirements were for valves which would withstand 85 psi pressure and 15 psi vacuum, have absolutely leak-proof seals, minimum head losses and an opening and closing speed of only one second. The design was based on a type originated in Europe for impulse turine operation and the valves were built by Dominion Engineering Works Limited.

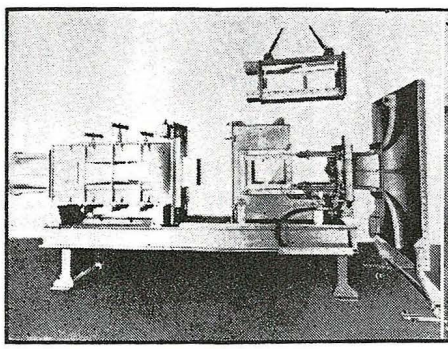


FIG. TWO

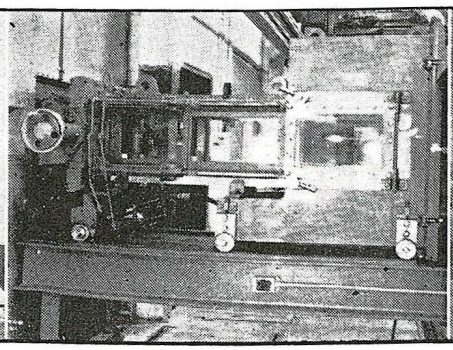


FIG. THREE

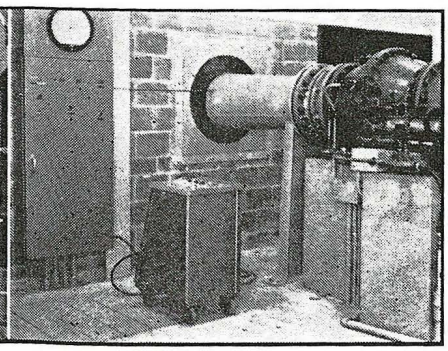
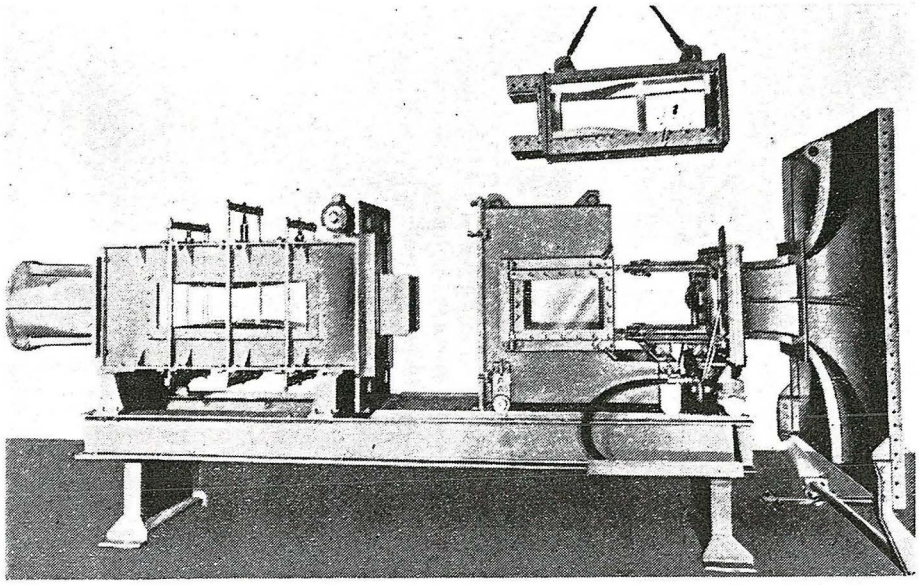
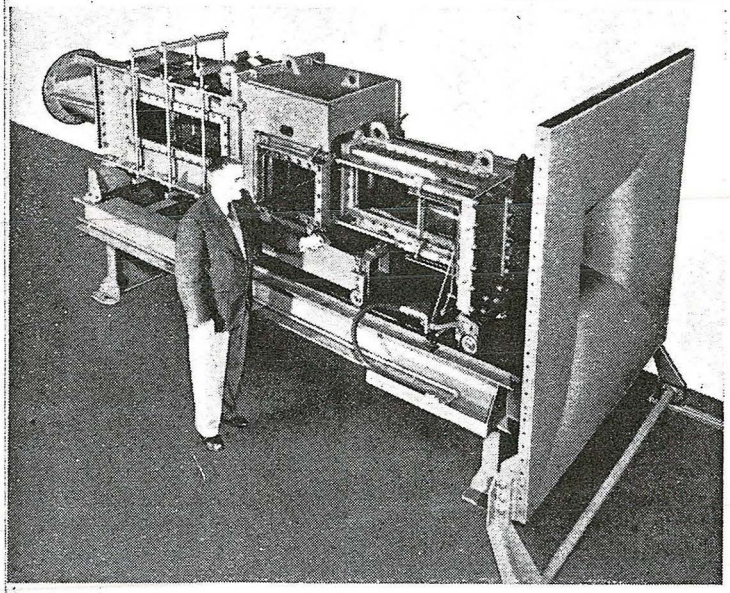


FIG. FOUR

A High Speed Canadian Wind-tunnel





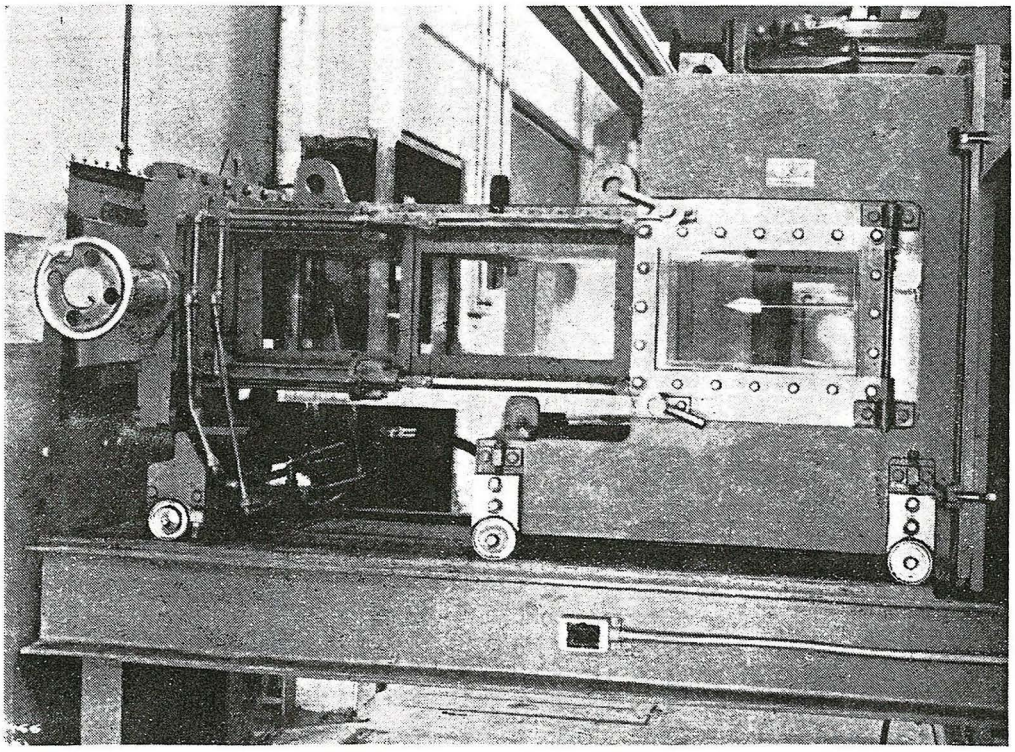
A SUPERSONIC WIND-TUNNEL has recently been completed for the National Research Council of Canada by the Dominion Bridge Co. This tunnel has a cross-section of 10 ins. square, and is provided with nine interchangeable venturi nozzle-boxes to give different speeds.

Only the first six venturis have so far been completed, giving speeds ranging from a Mach number of 1.4 to one of 3.47. The N.R.C. will build three more venturis, the fastest of which it is hoped will give an equivalent speed of 5,000 m.p.h. at sea-level.

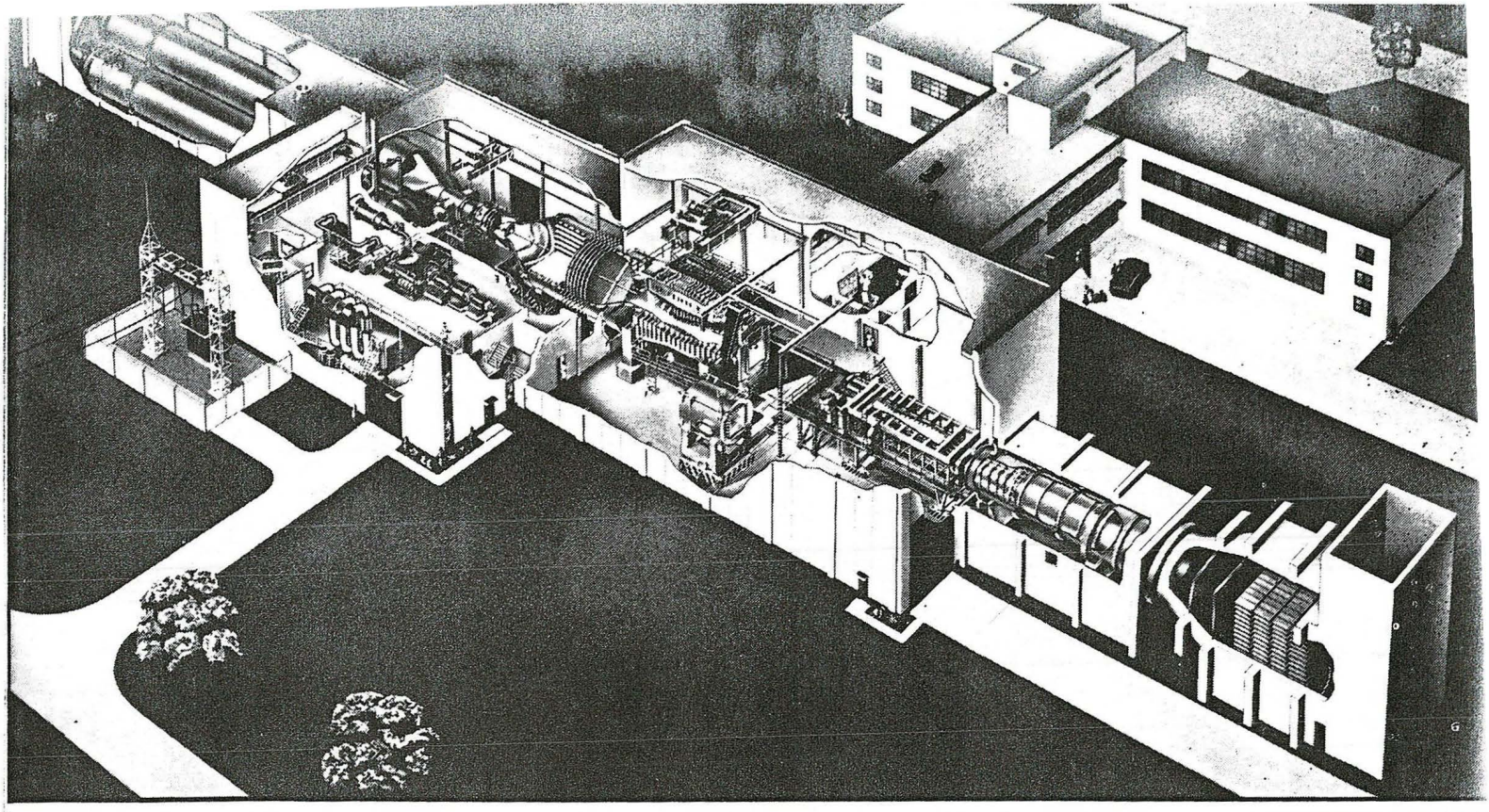
This interesting tunnel works on the suction principle, air being drawn through the working section to fill a 35-ft. diameter vacuum sphere, which has previously been evacuated. Both the venturi section and the balance box, in which the test section is mounted, have optical glass windows through which it is possible to watch progress of the test, or to take photographs using a Schlieren apparatus.

Downstream from the balance box is an adjustable throat, where the roof and floor of the section consist of flexible aluminium plates which can be flexed by means of a system of screw jacks to give varying tunnel heights. This provides for adjustment of the pressure inside the balance box.

Aft of the adjustable throat again is a transition piece which transforms the section from a rectangle to a circle; to this is attached a 15-in. diameter globe valve, from which a conical diffuser leads to the vacuum sphere.



Top, side-view showing nozzle-box removed and balance-box moved forward. Middle, general view. Bottom, the equipment in use at the N.R.C. laboratory with a model in the working section.



Cutaway drawing shows new wind tunnel. Pressure bottles are at extreme left; passage of air from left to right.

THE NAE FIVE FOOT BLOWDOWN WIND TUNNEL

A New Research Tool at Uplands

CANADA'S aviation community will soon have at its disposal the most important basic aeronautical research tool to be acquired by this country since World War II days.

The National Aeronautical establishment's long awaited high speed wind tunnel, now under construction at Uplands Airport, Ottawa, is quickly shaping into reality as a result of rapid progress made on the program during the past 12 months.

The blowdown* wind tunnel, which is due to begin operations in 1961, will be used by the National Research Council (of which the NAE is a division) for basic and applied aerodynamic research in the Mach number range between low subsonic and high supersonic. At the top end of this range, the tunnel will be capable of producing airflows of Mach 4.5 in the 5 ft. square working section.

Value of contracts let to date in connection with the project is $8,031,639, acording to a report tabled in the Commons March 2 by Trade Minister Churchill. It is expected that the total cost will be about $9 million.

A sectioned perspective drawing of the wind tunnel is shown at the top of this page.

Building Up Pressure: Atmospheric air is drawn into the compressor intake duct through inlet filters and silencers. An 11,250 hp synchronous motor driven ten stage air compressor, which runs continuously, delivers 40 pounds of air per second at 300 psi absolute through air driers to three series connected cylindrical pressure vessels of about 50,000 cubic feet total capacity. These vessels are discharged intermittently about once every 20 minutes through the wind tunnel. The circuit from air storage back to atmosphere consists of a heat storage matrix, diffuser and settling chamber, flexible plate supersonic nozzle, perforated wall transonic working section, model support section, variable diffuser, fixed diffusers and outlet silencer.

To compensate for the fall of storage temperature during a tunnel run, the air passing into the tunnel goes first through a heat exchanger consisting of a 90 foot long bundle of steel tubes packed into the downstream end of the third air storage cylinder. The pressure and mass flow through the test section are held constant in spite of continuously falling storage pressure by a hydraulic servo-operated pressure control valve. The flow area of this valve is increased during a run in such a way as to compensate the falling upstream pressure, thus maintaining steady testing conditions. However the throttling action of the control valve introduces large disturbances into the air flow in the form of eddies, shock waves and noise, which can be detrimental to satisfactory testing. These flow disturbances are largely removed by a parallel acoustic baffle

(Continued on page 55)

*Most modern high speed wind tunnels are of the intermittent type, and are also either of two sub-types: vacuum or blowdown. In the vacuum type, a vacuum vessel is located on the "downwind" side of the tunnel working section; a valve is opened to allow air into the vacuum vessel and this air is sucked through the working section. In the blowdown type, by means of pressure bottles on the entry side of the working section, the air is forced through the section; hence, blowdown.

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.

News Roundup

A "SKI-130" HERCULES is shown making a jet-assisted take-off. The USAF's ski-equipped Lockheed C-130D's are now operating in Antarctica in support of the USN's "Operation Deep Freeze 60". The skis used are 20 feet long, and are coated with new Du Pont Teflon to minimize freeze-down possibility.

IRE Convention in 1961

The fifth Institute of Radio Engineers' Canadian convention and exposition is scheduled to be held in Toronto in October 1961. No convention will be held this year. Postponement for a year is expected to pave the way for an expanded technical program and increased industry participation in an exposition featuring more new electronic and nucleonic developments.

The decision to hold the fifth IRE convention in 1961 instead of 1960 followed a study of replies to questionnaires sent to previous exhibitors and a Toronto meeting of IRE and EIA officials. A contributing factor cited was a lack of unanimity among exhibitors on the wisdom of holding a 1960 convention.

Another factor in the decision was the conflict of dates with the National Electronics Convention in Chicago. This could not be avoided in 1960.

New NAE Wind Tunnel

Indications of progress of the NAE's new supersonic wind tunnel being built at Ottawa's Uplands Airport are to be found in the announcement of two new contracts recently let by Defence Construction (1951) Ltd.

The contracts are for the supply, installation and testing of group electrical controls for the tunnel by Bogue Electric of Canada Ltd., and the manufacture and installation of the tunnel's transonic section and model access platorm by Canadian Vickers Ltd. The Bogue contract is valued at $126,592 and the Canadian Vickers one at $221,215.

National Aviation Museum

During January, D. Napier & Son (Canada) Ltd. presented the National Aviation Museum of Canada with a Napier Sabre aircraft engine. This engine, used in the wartime Typhoon fighter, was one of the last of the high-powered internal combustion engines to be designed for aircraft.

The gift was received by General A. G. L. McNaughton, chairman of the National Aviation Museum committee. This committee also includes members of the RCAF, the industry, government departments, flying associations, and the aeronautical research and engineering professions.

The movement for such a museum began some 30 years ago among a small group at Ottawa. In 1935, the aeronautical research committee of the NRC aided in the setting up of the first museum which was located in the Council's engine laboratory on Sussex Drive, Ottawa. The main items then were a collection of aircraft engines. In 1937, better space was provided and the exhibit was opened to the public.

With the outbreak of war however, all available space was needed for research. In 1954 the NRC appointed an associate committee for a National Aviation Museum. A number of voluntary donations have been made to the Museum recently, and Canadian industries have contributed money, materials and work to assure the preservation of historic materials. A temporary home for the museum is to be provided in the new DoT terminal at Uplands.

Titles Change at DoT

New titles for senior DoT officials has been announced. This is in line with major organization changes which have taken place during the past year.

The Assistant Deputy Minister becomes Senior Assistant Deputy Minister. This position is at present held by C. S. Booth.

The other title changes include that of Air Vice Marshal A. de Niverville, Director General, Air Services, who becomes Assistant Deputy Minister, Air.

McCurdy Award

Nominations for the 1960 McCurdy Award are now being invited by the CAI and must be in the hands of the Institute by March 15.

The McCurdy Award is presented annually to a resident of Canada for achievement in design, manufacture or maintenance to aeronautics. The 1960 presentation will be made at the CAI's annual general meeting in Ottawa, May 24-25.

Full details of the requirements for nominations may be obtained from the secretary of the CAI in Ottawa.

CADIN Trainees

The vanguard of more than 200 Canadian electronics experts who within a year will man the CADIN radar aircraft warning stations across Canada, are presently undergoing training in Toronto on the electronic data processing systems that are a vital part of the equipment used to detect enemy aircraft. Eight men, who will become instructors for 200 others scheduled for duty at the CADIN stations, have started training at Burroughs Adding Machine of Canada Ltd., Toronto.

CADIN is the Canadian counterpart of the SAGE aircraft warning system used in the U.S. The same equipment is used in both systems to give full integration in a joint continental detection-warning network. The trainees will start going through the 22-week

FEB/60

Back to the Board: While the design deadline on a new airplane or engine may seem like a point of no return, it is not necessarily so. The aircraft designer for example, can always face up to the hard fact that it may be better to start his design again, even though it has passed the deadline, and thus delay the first flight of the first airplane. In essence, then, he establishes a new deadline.

This is a most difficult decision, but it has been successfully accomplished. The North American F-86 Sabre, now being built by Canadair, was one of those rare airplanes that suffered a major design change after the deadline, and still came out on top. Late in the last war North American Aviation Inc. were working on a U.S. Navy contract for a new straight winged jet fighter, the Fury. In the fall of 1944 the U.S. Air Force awarded a contract to the company for two prototypes of a slightly modified version, though essentially both airplanes were the same.

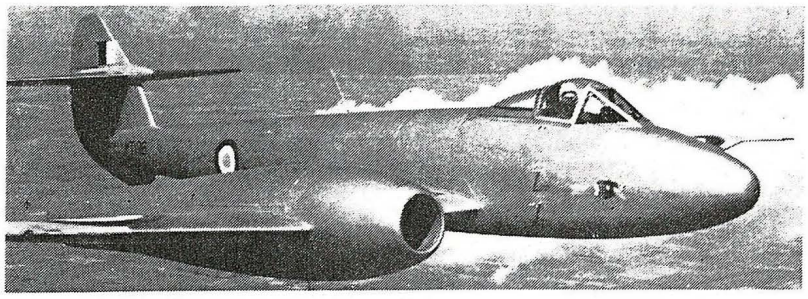
The design of the basic airplane was progressing at an even pace. The design deadline had long past. Then the war ended in Europe. It was not long before the first captured German aeronautical reports came filtering through to the company. Some of them described the advantages of swept wings for high speed airplanes. At almost the same time, the National Advisory Committee for Aeronautics, the U.S. research agency, had been delving into such wing shapes. Some of their early reports were then under study by the U.S. Air Force's technical personnel.

Sweeping Change: Armed with this data from both sources the North American designers put their heads together with the military engineers and a major decision was made. The F-86 would be redesigned for swept wings. Since the original design deadline had passed, this necessitated delaying the first flight of the first airplane for one year.

This was a bold decision. For at that time, and even for some years afterwards, there was really very little detailed design data on swept wings. It was therefore necessary to plunge into exhaustive wind tunnel tests on the new F-86 swept wing plan to ensure that the prophesied gains in performance had a fair chance of realization.

It was not until test pilot George Welch took off from Edwards Air Force

(Continued on page 68)



A Boost from the NAE

For the past four years, Canada's National Aeronautical Establishment has been engaged in the development of an improved system of reheat, or afterburning, and a short time ago a demonstration was held at Ottawa's Uplands Airport to show Canadian newsmen what progress had been made.

The Canadian-developed 230 lb. combustion device is currently fitted to the Rolls-Royce Derwents of a Gloster Meteor F.4 (see photos) which is on loan from the British Ministry of Supply. During the flying demonstration, the increased rate of climb was very noticeable and the pilot, Flyiing Officer Alan Arnold, reported that with the afterburners cut in, the Meteor could climb to 20,000 ft. in three minutes.

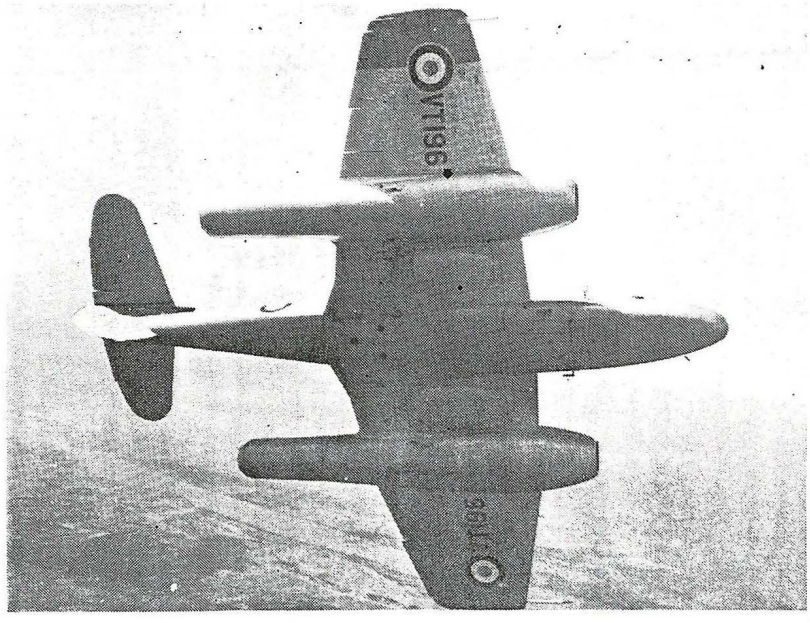
This NAE system of thrust augmentation has been the subject of lengthy investigations which initially included theoretical studies, small scale rig tests, and full scale static engine tests. These were carried out mainly by the Establishment's Engine Laboratory, while the flight tests, which have been under way since January 14, are being conducted by the Flight Research Section at Uplands.

The system under development differs from conventional reheat systems in that the reheat fuel, before being burned, is used to cool the turbine blades, the critical temperature of which normally limits the maximum temperature of the combustion chambers, and hence the rate at which they burn fuel.

Part of the reheat fuel is injected before the turbine, thus cooling the turbine blades as it passes through. This fuel is broken down—"atomized"—by the turbine, but is not ignited until it enters the extended tailpipe. The afterburner adds about four feet to the length of the engine and is somewhat greater in diameter than the normal tailpipe. This increased diameter is calculated to keep low the pressures inside the afterburner tailpipe.

As applied to the Derwents (3,600 lbs./th @ SL), the NAE reheat system boosts thrust by about 25%, while fuel consumption rate per engine goes up to 900 gph. The NAE believes that the system will eventually be developed to provide a 55% increase in thrust, though even the present 25% is sufficient to double the Meteor's normal rate of climb.

The NAE says that bench tests of an Orenda equipped with the system are now in process and such problems as ignition, flame stabilization, and screeching combustion have been studied.



NEWS ROUNDUP

Aviation & the Trade Fair

What appears likely to be the biggest aeronautical event ever to be held in Canada is shaping up as a result of the past year's activities of the Canadian International Air Show and the Canadian International Trade Fair.

The Trade Fair reports that its aviation section, inaugurated at the 1954 edition of the CITF, has expanded considerably, attracting all the leading Canadian aircraft firms as exhibitors, as well as companies from Czechoslovakia, the U.K. and the U.S. This year, the section will be housed in the Automotive Building, a move made necessary by the greatly increased amount of space booked.

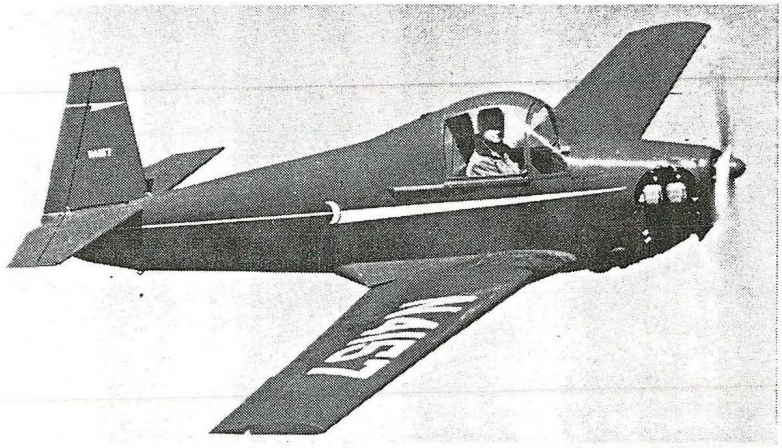
It appears evident, also, that the Canadian International Air Show ("International" for the first time this year), will have a more varied flying program and will move at a faster pace. Originally, it had been planned to hold the flying display on two days, Saturday and Sunday—June 4 and 5, but local regulations made it necessary to cancel plans to fly on Sunday.

The day on which the flying program is to be held falls in the middle of the two-week span of life of the 1955 CITF, which will run from May 30 to June 10. Last year, the Air Show was held on the day following the official closing of the Trade Fair, and though the Aviation Section was left open for this extra day, there was little opportunity for the spectators to do the static exhibits full justice, because of their pre-occupation with the flying events. This year, the timing is such that it will be possible to take in the aerial display and also have sufficient time to give the static exhibits the attention they deserve.

Canadian exhibitors will include Avro Aircraft, who will show a CF-100 and components; Canadair, with cutaway T-33 and F-86; de Havilland Canada, with an Otter; Orenda Engines, with an Orenda turbojet. In all, there will be more than 30 Canadian companies taking space in this section. Of considerable interest are the possibilities that Fleet may have its first Doman-Fleet LZ-5 helicopter ready in time for the Trade Fair, while Bristol of Canada expects to bring in one of its British parent company's Type 171 Sycamore helicopters.

Also from the U.K. will be an Eland turboprop, displayed by its makers, D. Napier & Son Ltd. One foreign exhibit which will likely be a centre of attraction is that of Czechoslovakia's Motokov, which will show an Aero 45, a four-place twin-engined executive aircraft. There is some chance that the Czechs may be bringing over two of these aircraft—one to take part in the flying display, and one for static exhibit.

Glenn L. Martin Co. is expected to display a Matador guided missile, complete with launching platform.



IT'S THE GREATEST: The newest version of the Mooney Mite is now in production. Featuring increased pilot comfort and more head room, the standard Mite (first known by this name, it was later renamed the "Wee Scotsman", but now has apparently reverted to the original name), carries a Canadian list price of $3,995, delivered. Full details may be obtained from the Canadian distributor, Frank Ogden, 17 Cliffside Dr., Ste. 2, Toronto.

Gov. Gen.'s Race

The 1955 Governor General's Trophy Air Race will take place during the Canadian International Air Show at Toronto, June 4, it has been announced.

The race, open to all aircraft under the empty weight of 4,000 lbs., will be flown over a circular course commencing from and ending at Toronto Island Airport. The total distance of the course will be approximately 40 miles and handicapping will be carried out by flying all aircraft over a measured course on a top speed basis. The handicapping committee will be composed of representatives from the DoT and leading aeronautical engineers.

The winner will receive the Governor General's Trophy and a cash prize of $500. Other prizes will be: 2nd, $200; 3rd, $100; 4th, $50. The entry fee is $15 per aircraft. Further details and entry forms may be obtained from the manager of the Toronto Flying Club.

NAE to Expand Facilities

Long-term plans for the research facilities comprising the National Aeronautical Establishment, at Ottawa, including the construction of a supersonic wind tunnel at Uplands Airport, were recently announced jointly by Minister of Trade & Commerce C. D. Howe and Defence Minister Ralph Campney.

Designs for the supersonic tunnel are now being completed and construction will begin this summer. Installation will take an estimated three years. To be housed near the NAE's flight research section, the tunnel will cost almost $3,500,000.

According to the announcement, installation of this versatile, modern research tool has become a necessity to support current and future Canadian development of military aircraft and supersonic air defence guided weapons. Existing tunnels in Canada lack the variety of facilities necessary for jet and missile-age developments. The Uplands installation will be an essential component of Canada's air defence program.

To be comparable in function and complementary to similar high speed tunnels in the U.K. and the U.S., it will have a working section of four to five feet square and a speed range of 200 to 3,000 mph. The installation's versatile characteristics will facilitate checking of theoretical estimates involving speeds, manoeuvrability, controllability and economy of construction of the developments under consideration.

The National Aeronautical Establishment was created in 1951 to provide research and development facilities adequate to meet the needs of the expanding RCAF. Additional requirements were flight and structural testing facilities for Canada's civil aircraft industry.

The Establishment now comprises several small research wind tunnels of varying speeds, and engine, structures, and thermodynamics laboratories, all at the National Research Council's Montreal Road site. The flight research section, formerly at Arnprior, Ont, moved in 1953 to Uplands Airport and occupied a large research hangar completed last year and financed by the Defence Research Board.

Because of its lengthy experience in the field of aviation and allied research, the NRC has operated the entire Establishment during its evolutionary phases. When the Uplands' facilities become more self-sufficient with installation of the new wind tunnel, they will be separated from the NRC's Montreal Road elements and operated as a Defence Research laboratory.

The Montreal Road facilities will remain with the NRC, where fundamental aeronautical research, both for military and civil purposes, will be stressed. The scientists at both sites will continue to work closely together, however, to fulfill military and civil requirements.

Until the two sections separate, the NAE will continue its operations under J. H. Parkin, who is also director of the NRC Mechanical Engineering Division.

Tariff Changes

Many alterations in the Canadian tariff structure affecting Canada's Aviation Industry were proposed in the Budget tabled in the House of Commons by Finance Minister W. E. Harris, April 5.

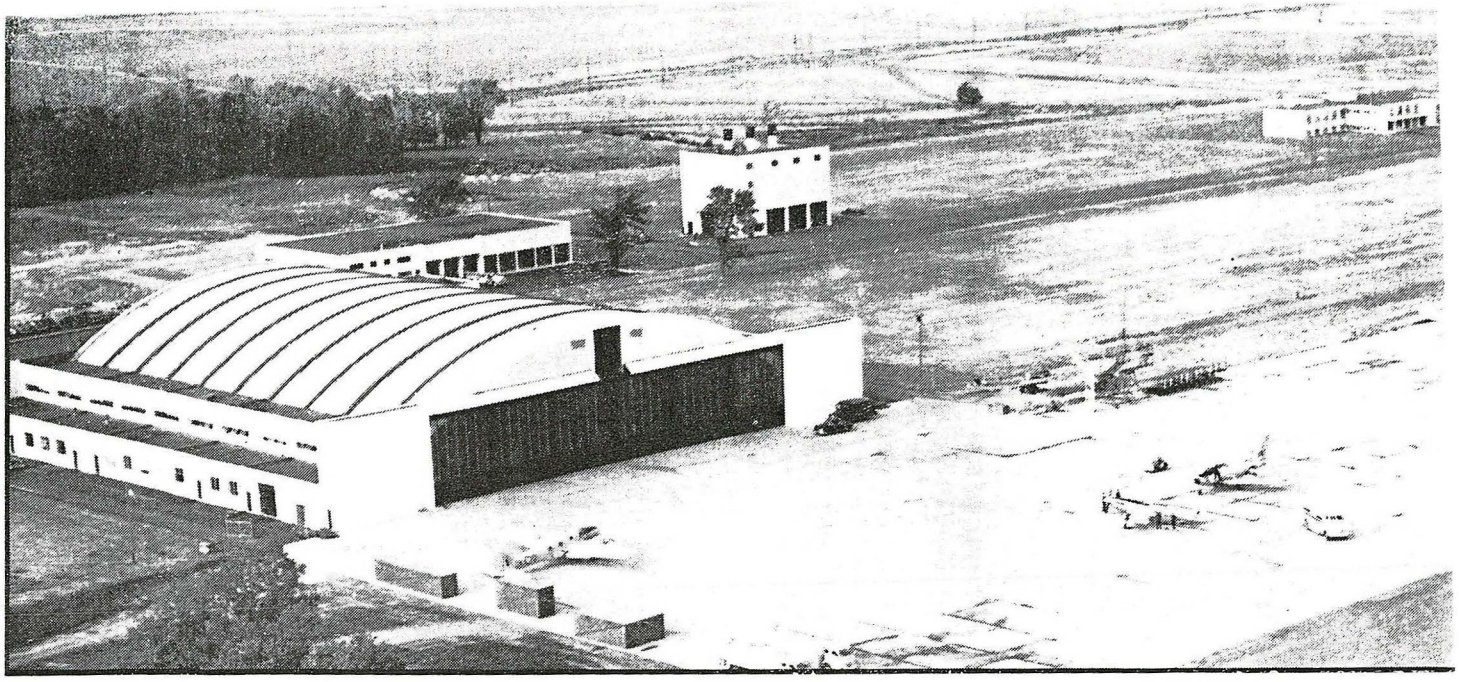
These alterations, which follow quite closely the recommendations made in the AITA's customs tariff brief, are to be found in detail in Hansard for Tuesday, April 5. Items of particular interest are to be found on pages 2749, 2756, 2757 and 2763.

All Quiet

The development of an improved ear defender which is expected to be particularly useful to personnel working around turbojet engines, has recently been developed by the acoustics laboratory of the Applied Physics Branch of the NRC.

According to NRC, cover-type ear defenders, or "muffs," have been until now, quite inferior to ear plugs in their ability to protect people's hearing from harmful effects of excessive noise. However, most people prefer the relatively inefficient but comfortable ear defenders to efficient but uncomfortable ear plugs.

NRC acoustic experts predicted that ear defenders could be made to rival ear plugs in efficiency, provided they



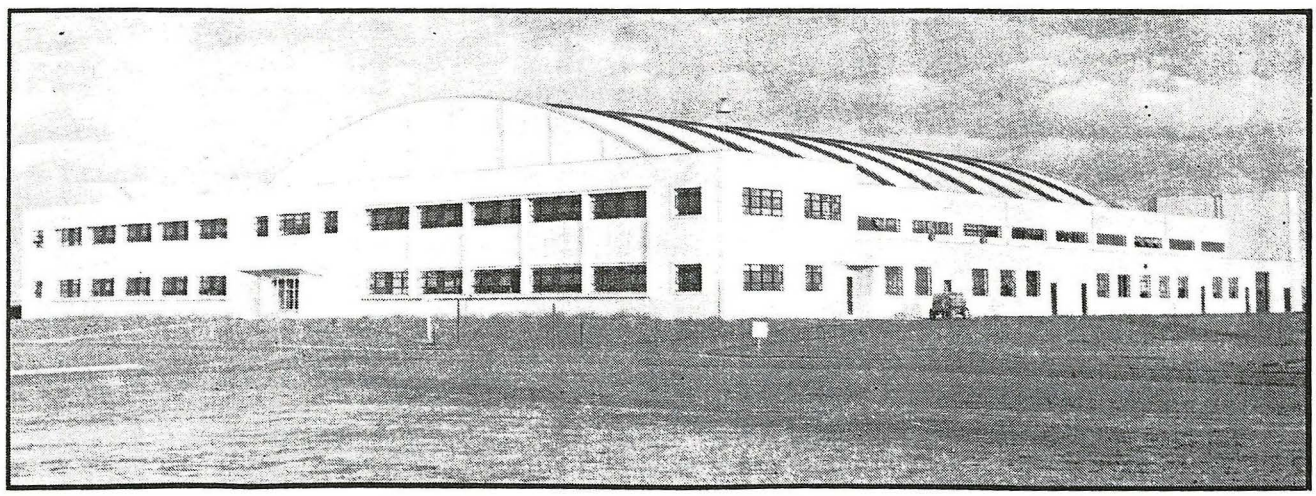
The NAE's New Home

WITHIN recent months, the National Aeronautical Establishment has occupied its new quarters at Ottawa's Uplands Airport. All the flight research facilities have now been moved from Arnprior, which has since been closed down.

So far the facilities at Uplands comprise four buildings: a hangar, a combined motor transport and storage building, a central heating plant, and a cafeteria building, each of which is easily identifiable in the general view at the top of this page.

The lower picture is a front view of the Flight Research Section's hangar (shown from the airport side in the general view), which is a standard RCAF "arch" type, of reinforced concrete construction throughout. This building features an unsupported span, which provides a clear hangar floor space, 160 feet wide and 220 feet deep. Offices for administrative and scientific staff, and laboratory space, are provided in the two-storey section at the front of the building, while workshops and stores, for both NAE and RCAF personnel (all the NAE's flight testing is carried out by RCAF pilots and most of the aircraft used belong to the Air Force) are located in lean-to's along both sides.

The NAE, which incorporates what used to be the Aeronautical Laboratories of the NRC's Division of Mechanical Engineering, as well as the flight research facilities shown here, is directed by the National Aeronautical Research Committee. This committee is made up of the president of NRC (Dr. E. W. R. Steacie); the chairman of the Defence Research Board (Dr. O. M. Solandt); Chief of the Air Staff, RCAF (Air Marshal C. R. Slemon), and the chairman of the ATB (John Baldwin). This committee is in turn guided by a Technical Advisory Panel of Deputies composed of the Director of NAE (J. H. Parkin); the Chief of Division "B" of the DRB, who is also Scientific Advisor to the CAS (Dr. J. J. Green); the Air Member for Technical Services, RCAF (Air Vice Marshal D. M. Smith); and the DoT's Chief Aeronautical Engineer (H. S. Rees).



NEWS ROUNDUP

NAE Wind Tunnel

Officials in Ottawa say the new $6,000,000 wind tunnel scheduled for completion at Uplands airport in 1960 will compare favorably in all essentials with any tunnel anywhere in the world. Research may be conducted for NATO and Commonwealth countries as well as for Canada.

Authorities say construction of the tunnel is predicated on the assumption that Canada will continue to have a flourishing aviation industry.

Authorities say the tunnel's construction should go at least part way toward allaying fears expressed recently by the Canadian Aeronautical Institute concerning the future of aeronautical research and development in Canada.

The Institute, representing some 2,300 aviation scientists, engineers and technicians, sent a memorandum in November to Prime Minister Diefenbaker asking for a clear Government statement on future research and development and steps being taken to conserve Canadian scientific and engineering resources.

The Institute said that to remain technically competitive the Canadian aircraft industry must be supported by research and development to foster design and manufacturing activities and to keep abreast of the state of the art.

Officials have said that lack of proper wind tunnel facilities slowed development of the Arrow. Tests had to be conducted in the U.S. where facilities were already crowded. Construction of the wind tunnel has no bearing on the future of the Arrow, however.

Crown Assets Sales

Sales of aircraft and component parts valued at $417,191 were made during the year ended March 31, 1958, by Crown Assets Disposal Corp., the federal agency charged with the disposing of surplus Government property.

The bulk of this total was accounted for by sales of Mustang, Vampire, Avenger and Lancaster aircraft and airframes. Biggest buying spree was that of James H. DeFuria & Fred J. Ritts, of Syracuse, N.Y., who bought some $119,670 worth of Mustangs, Merlin engines, airframes and parts.

Surplus Grumman Avenger aircraft went to such spray companies as Skyway Air Services Ltd., Langley, B.C., and Wheeler Airlines.

DRB Improves Doppler Navaid

The DRB's Electronics Laboratory in Ottawa has developed a new self-contained, transistorized Doppler navigation aid for use in aircraft. The improved Doppler navaid provides groundspeed and drift information thus eliminating the need for ground navigation installations. Developed in less than two years, the device is a miniaturized refinement of a heavier Doppler radar which employs vacuum tubes and which was developed previously by the Ottawa laboratory in conjunction with Canadian Marconi.

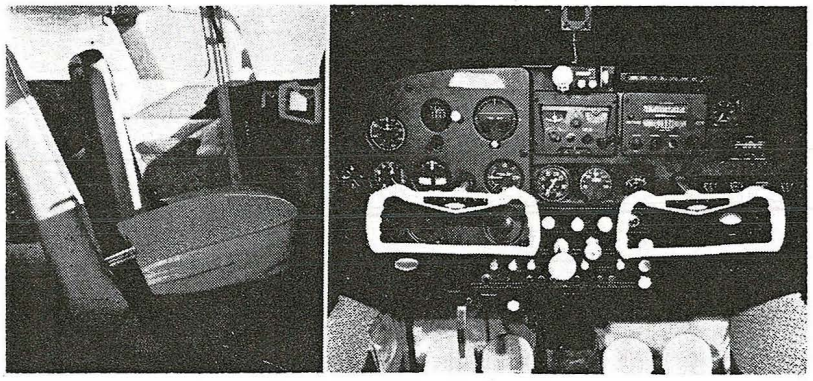
A number of features should make this new navigation aid particularly attractive both for military and commercial aircraft. The use of transistors rather than vacuum tubes increases its reliability and reduces the unit's size and weight. It requires only about a quarter of the power needed for its predecessor. Because the components can be installed in two small boxes, the complete radar is unusually compact. The use of transistors, printed wiring and miniaturized components results in a weight total of less than 50 pounds.

Experimental models were tested successfully almost a year ago and a more advanced model is now complete and available for further testing. The device promises to be of particular value in isolated areas with limited navigational aids for aircraft.

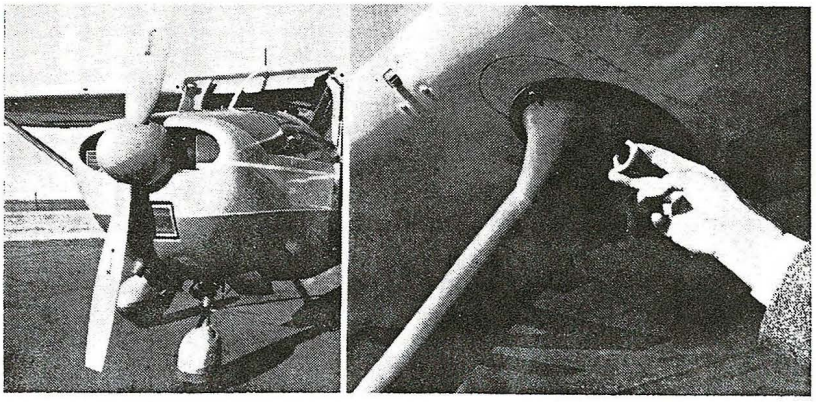
Paris Salon

This year's meeting of the Paris Salon in June, marks the fiftieth anniversary of the show and also, for the first time, the Canadian and American aviation industries will be represented. Static displays by Canadair, Avro Aircraft and Orenda Engines, will represent this country.

This year the Show will have days devoted to certain topics as is Farnborough practice. June 11 will open the Salon with a day devoted to the



1959 CESSNA MODELS: Recently unveiled was Cessna's "Mighty Middle" line for 1959. Upper left: Tilting front seats are available for first time as optional equipment in 180, 182 and Skylane. Upper right: radio equipment mounted high on centre line of panel for eyes-on-the-road flight in all three models. Lower left: adjustable cowl flaps for cooling during climb, on 182 and Skylane. Lower right: new wing strut fillets are standard equipment on Skylane.



Flight Research at Uplands

UPLANDS LOOKS TO A FUTURE AS CANADA'S CENTRE OF AERO RESEARCH

SOME DAY in the future, Ottawa's Uplands Airport may be one of the world's foremost centres of flight research. It will have a supersonic wind tunnel that will rate among the most advanced of aeronautical research tools anywhere. Aircraft being used for research and development work will fly off a runway 25,000 feet long. These and many other things are in the cards for Uplands if long range plans to turn it into the focal point of Canadian aeronautical research are eventually realized.

Actually the first phase of this long range plan has for some time been completed. This involved the moving of the National Aeronautical Establishment's Flight Research Section from its original base at Arnprior, Ont., where it had been originally set up in 1946 as a joint operation of the National Research Council and the RCAF. To accomplish this move, it was necessary to build new quarters for the Section at Uplands. These quarters took the form of a gleaming white concrete arch hangar, with integrated workshops and administrative quarters.

At the same time, the first stage of the Uplands runway extension program was carried out, with the main runway being stretched to 8,800 feet. There is to be a second extension which will take this runway to about 15,000 feet, and a third and final one which will bring it to 25,000 feet. These last two stages are, of course, some time in the future.

In addition to the main hangar building already mentioned, the Flight Research Section has a number of other buildings in the vicinity, these including a heating plant, a storage and motor transport building, and a cafeteria.

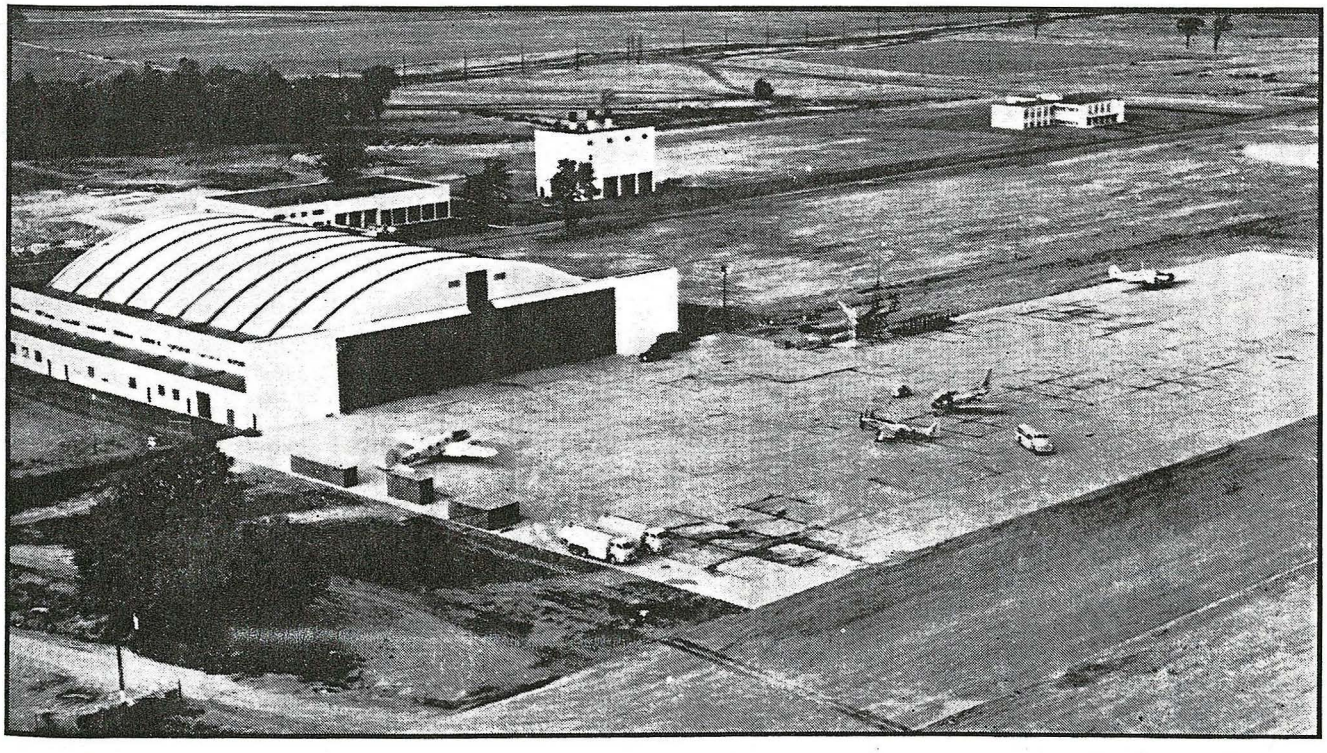
As it now stands, the Flight Research Section has reached the first plateau of the program to develop it into a Canadian centre of advanced aeronautical research. Steps are always underway to take the action necessary to reach the second plateau.

These involve the building of the long-mooted supersonic wind tunnel. This project has been delayed for some time because of difficulties in getting sufficient funds, there being something like $6,000,000 involved. However, it now appears that these difficulties are near resolution.

With the completion of the wind tunnel, an interesting change will take place in the administration of the Flight Research Section in that its operation will be taken over by the Defence Research Board. To date, it has been administered by the NRC. Even after the Section is taken over by the DRB, however, it will continue to be known as the "NAE" Flight Research Section.

The installation of the wind tunnel at Uplands will in time be followed

Picture below shows most of the existing facilities of the NAE's Flight Research Section at Uplands. Left foreground is the main hangar; just behind the hangar is the storage and garage building; centre rear, the powerhouse and steam plant; upper right, cafeteria. Not in this picture is the helicopter icing rig, which is located in area to right of hangar. New, advanced supersonic wind tunnel will be built to rear of and between powerhouse and cafeteria building.



NEWS ROUNDUP

New Quarters for Aerophysics

The University of Toronto's Institute of Aerophysics recently occupied its new laboratories in North Toronto, according to the Institute's recently released annual report. Addition of the new building in which the laboratories are housed to the existing facilities at Downsview Airport, means that the floor area available for graduate studies and research has been effectively doubled.

The new Aerophysics facility was built especially for the Institute on a site of about 18 acres near the corner of Dufferin St. and Steeles Ave., on the west bank of the Don River. Construction of the new building, by the University of Toronto, was made possible by a key contribution from the DRB. Assistance was also received from the A. V. Roe Canada Group and other members of Canada's Aircraft Industry.

Additional laboratories are being provided for aeronautical undergraduate students in the new University of Toronto Engineering building which is being erected on the University campus in downtown Toronto.

The Institute's annual report also notes that research work has continued in several fields of fluid mechanics, including: mechanics of rarefied gases; unsteady flows—shock tubes; aerodynamic noise; aerodynamics of propulsion; dynamics of flight.

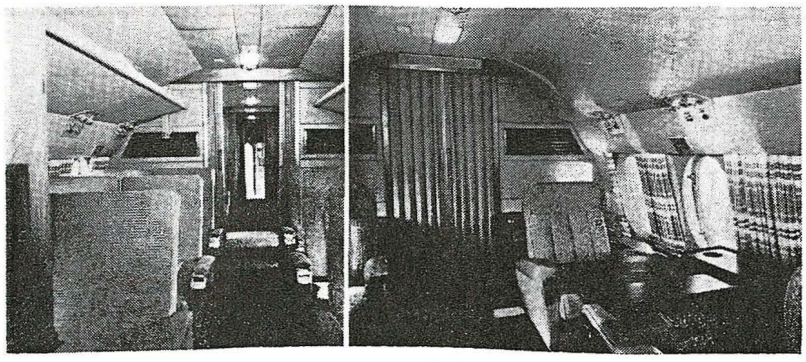
This work was carried out on behalf of the Defence Research Board, for which some 32 investigations are, or have been carried out; the USAF Office of Scientific Research (14 investigations); the USN Office of Naval Research (four investigations); Avro Aircraft Ltd. (two investigations); Orenda Engines Ltd. (one investigation), and the de Havilland Aircraft of Canada Ltd. (two investigations).

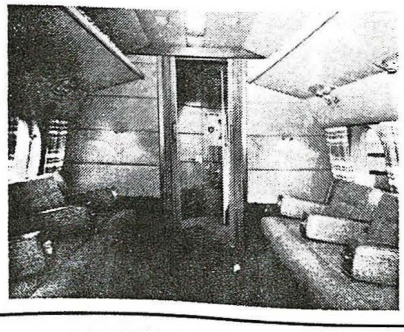
DoT/CAA Discuss Problems

A two-day joint meeting of the DoT and the U.S. Civil Aeronautics Administration, was held in Ottawa last month to discuss aviation problems of mutual interest to Canadian and American governments.

The two-man committee was comprised of James T. Pyle, administrator of CAA, and A/V/M A. de Niverville, director general of air services, DoT. Under each are three technical subcommittees dealing with air navigation facilities, air traffic control and airports.

Questions which concern the committee arise from the rapidly increasing volume of air traffic across the international border and from the advent of jet aircraft to the civil aviation scene. Jet travel has brought about new problems both in high altitude control of air space and in air terminal and airport facilities. The CAA-DoT meetings are held alternately in Ottawa and Washington from time to time to meet such problems on a basis of joint understanding and mutual benefit.





NEW DOT VISCOUNT: When the second Viscount ordered by the DoT was delivered recently, its interior revealed what can be done for an executive aircraft. Above left: forward cabin seats 12 in standard airline style. Above right: centre cabin shows extension walnut desk fitted to sidewall and full-swivel chairs. Right: aft cabin fitted with two divans which convert into beds. Behind folding doors is a comfortable washroom.

NAE Comes of Age

The National Research Council has announced the formation of a new division to be known as the National Aeronautical Establishment.

Authorized initially in 1951, the NAE consisted of the aeronautical research facilities of the Division of Mechanical Engineering in the National Research Council. Due to the heavy and increasing demands upon it, the NAE's scale of operations has reached a point at which it is more practicable administratively to separate it and embody it in a new division effective January 1, 1959.

The resources of Canada's National Aeronautical Establishment will consist of the hangar and laboratories now at Uplands Airport, the new 5-foot supersonic wind tunnel now being constructed at Uplands, and the Aerodynamics and Structures Laboratories in the Montreal Road Labs of the NRC.

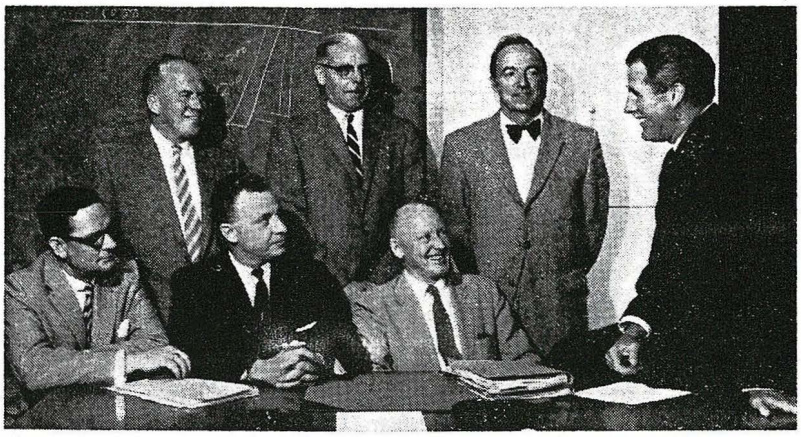
The new establishment will work with the Defence Research Board on defence problems in aeronautical science, and will also be responsible for meeting the aerodynamic and structural research needs of civil aviation and the aircraft industry. Appointed as acting director of the NAE is Frank R. Thurston, head of the Structures Laboratory.

Crash Position Indicator

Of special interest at Field Aviation these days, is the Crash Position Indicator which has been invented and developed by the National Aeronautical Establishment of Canada. Since the CPI is a natural follow-on to SARAH, Field has high hopes of marketing the novel device. A company which Field's agency and distribution division represents, is putting further development into the CPI with a view to production.

Hughes Distributor

R-O-R Associates Ltd. has been appointed exclusive distributor in Canada of commercial products for the Hughes Aircraft Co., of California. The Hughes



AIRWORTHINESS COUNCIL MEETS: Inaugural meeting of new Airworthiness Council, June 8, was welcomed by Transport Minister Hees (R). Council members are, L. to R. (seated): Ian Gray, CPA, scheduled airlines' rep.; T. A. Wheatley, Canadian Aviation Insurance Managers Ltd., insurance rep.; H. S. Rees, DoT, chairman; (standing) J. H. Lucas, Aircraft Industries of Canada Ltd., repair & overhaul rep.; J. A. Pool, SGA, non-sched. operators' rep.; Captain J. M. Grisdale, TCA, commercial airline pilots' rep.

RCAF and Avro in the operational service of CF-100's in the north.

The "Oscar" of industrial advertising in Canada was given to Avro in competition with 100 manufacturers from coast to coast. Approximately 300 individual advertisements were submitted for judging.

NRC Awards Contract

The Dynametrics Corp., Burlington, Mass., has been awarded a contract totalling approximately $150,000 by the National Research Council of Canada. The instrument to be provided under this contract is a Dynametrics six-component mechanical balance system, together with associated equipment.

The balance will be installed in the wind tunnel facility of the NAE, Montreal Road Laboratories, for the purpose of accurately measuring forces and moments on aerodynamic models under test in the tunnel.

Mutual Aid

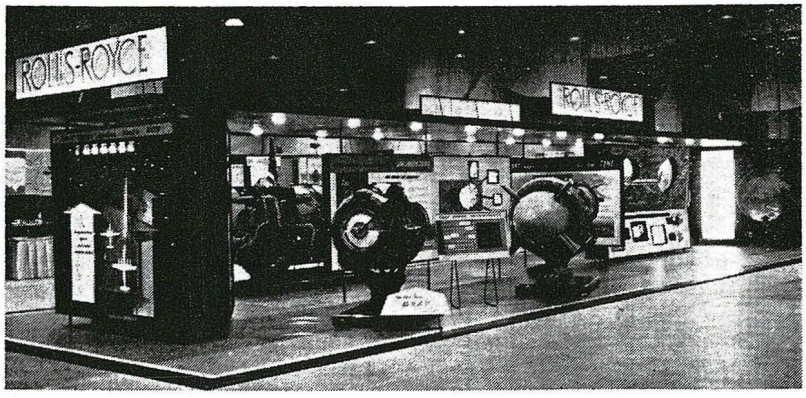
Canada has supplied 30% of the materiel strength of the Greek Air Force and 17% of the Turkish.

These figures were given recently to a U.S. Congressional committee by Gen. Lauris Norstad, Supreme Allied Commander in Europe.

The RCAF in Ottawa says Canada has given more than $73 million worth of air force equipment to Greece and more than $80 million worth to Turkey.

This country supplied Greece with 107 Sabres, 16 T-33's and spare engines and parts. It supplied Turkey with the same number of Sabres besides 24 T-33's, 24 Mentors, 40 Harvards and spare parts.

Since NATO was formed 10 years ago, Canada has given its European allies $1,600 million worth of arms. The program reached its peak in 1953-54 when Canada shipped $289,707,000 worth. The amount for the current fiscal year is $90 million, chiefly for aircraft and engines.



ROLLS-ROYCE DISPLAY: Shown here is the Rolls-Royce display at the recent World Congress of Flight, Las Vegas. At the left is a sectioned Dart; at the right, a Tyne; in the background a section of the Conway which attracted a great deal of attention. At the left is a totalizer showing Dart airline hours; sign was started at approximately 7,170,000 airline hours, and clicked over an extra hour every 9.6 seconds.

Radar Lab Opens

The official opening of the Prince Albert Radar Laboratory, the DRB's new atmospheric research facility in northern Saskatchewan, was held June 6 and was attended by prominent members of the Canadian and U.S. scientific communities and senior representatives of the armed forces of both countries.

Sponsored jointly by the DRB and the USAF, this new research facility will be employed for investigations of the various factors that influence radar detection of aircraft and missiles entering the auroral zone. Because the aurora borealis is associated with radio disturbances, it is necessary to develop means of reducing the effects of the northern lights on the detection of intruders.

The results of the research program to be undertaken are likely to provide a substantial contribution to the eventual development of a defensive system against the ICBM.

Aerial Photo Special

The July issue of "Camera", the well-known Swiss photographic review, appears as a special edition on the subject of photography and the world of aviation. This edition includes articles of aviation interest, many illustration and a serial of color-photographs in heliogravure. An aerial view of Manhattan covering a folder of eight pages is a unique achievement in the field of photography. The issue went on sale at the beginning of this month.

Canadian Space Committee

The National Research Council and the Defence Research Board have formed an associate committee on space research. The new committee will have coordination duties and will advise on international cooperation.

Scientific subjects to be studied will

NEWS ROUNDUP

Supersonic but Economic

The ability to improvise has enabled a small team of DRB aerodynamicists near Quebec City to carry out urgently required investigations and to provide the Canadian Armament Research & Development Establishment (CARDE), Valcartier, P.Q., an increasingly useful and inexpensive research facility.

When members of the Aerodynamics Section found recently that Canadian wind tunnel facilities would not be available for several months because of previous commitments, they cast about for an on-the-spot solution to a series of urgent aerodynamic problems. As a result, an inexpensive supersonic wind tunnel designed and constructed at CARDE by the Section members began operating six weeks after the design was completed.

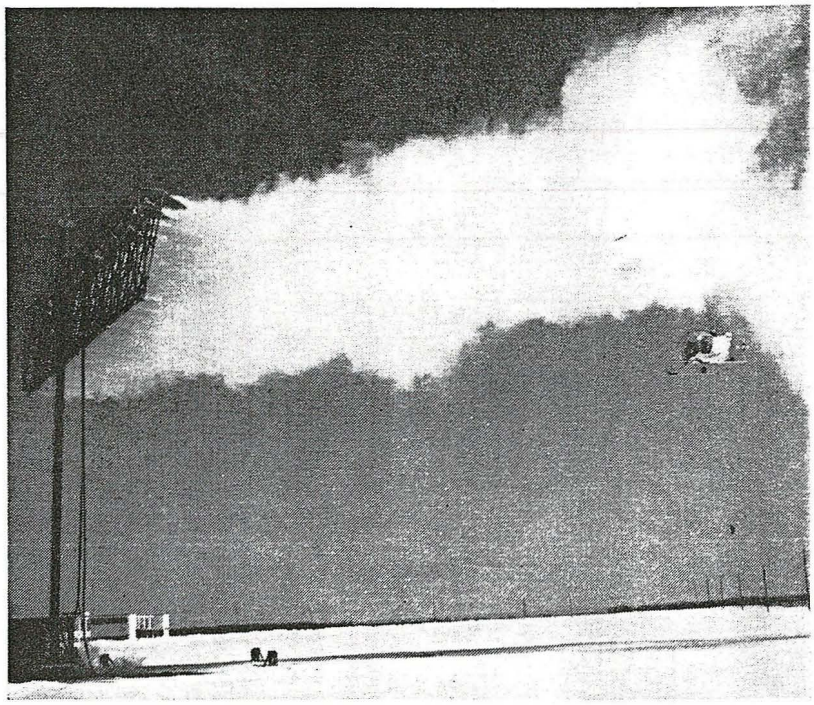
Working with Dr. G. V. Bull, Head of the CARDE Aerodynamics Section, were Richard Wickens of Montreal, a CARDE staff member on educational leave at Laval University while taking his Master's degree in aerodynamics, Jacques Laframboise of Montreal, also of CARDE, a part-time post-graduate student at Laval University, and Brian Cheers of Manchester, England, a CARDE physicist also taking a Master's degree at Laval on a spare-time basis.

All three scientists take lectures and carry out research projects under Dr. Bull who conducts a graduate school in aerodynamics at Laval University in his spare time.

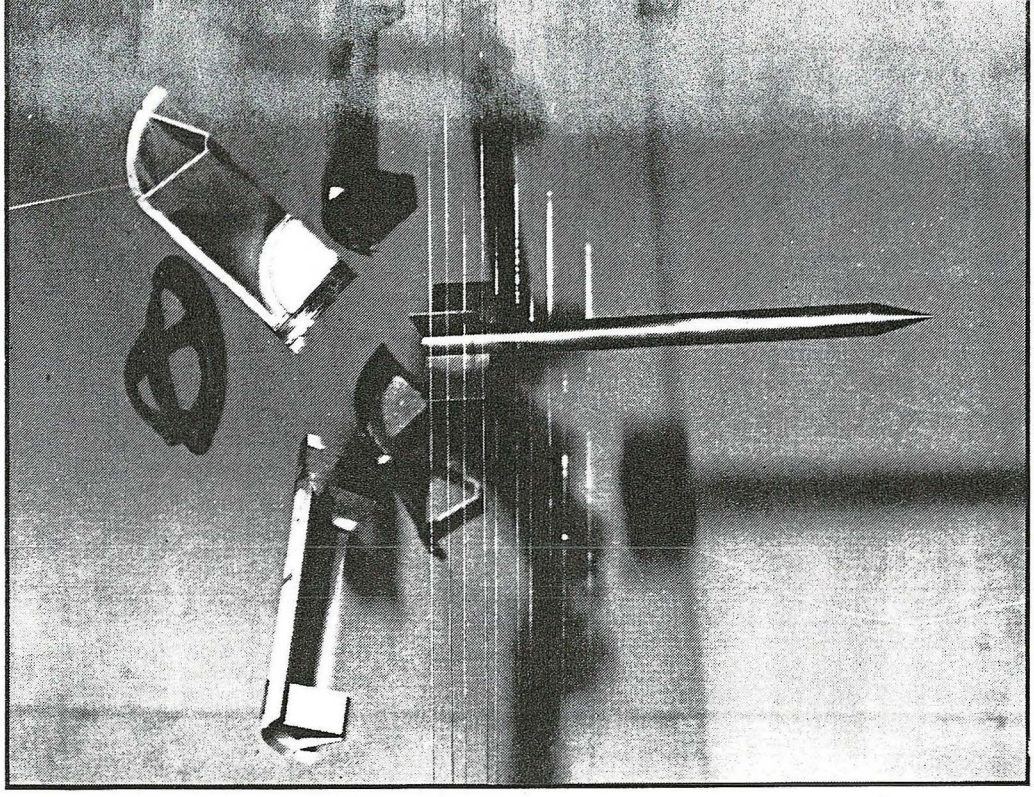
A complicated research tool that permits the prediction of the performance of a body in flight, the CARDE wind tunnel operates up to Mach 4.0 (3,000 mph.). Dr. Bull worked out the overall design and directed the project. His students carried out detailed design and all the necessary performance estimates.

When the tunnel is in operation, air drawn through a dryer increases in speeds from subsonic to high supersonic ranges. The air flow about missile, shell and mortar models, placed in a glass-enclosed working section, can be recorded both electronically and visually.

The development, which cost an



A PICTURE OF COOLNESS: Utilizing a specially-constructed spray rig and the services of an RCN Bell HTL-4 helicopter, investigations into helicopter icing were started last February by the National Aeronautical Establishment. Trials to date have been limited to the study of ice accretion characteristics and the performance of the helicopter under a variety of icing conditions. Next winter, electrical de-icing pads for the rotor blades will be tested. Last winter's tests included flight in simulated cloud as well as in natural supercooled fog and light freezing rain.

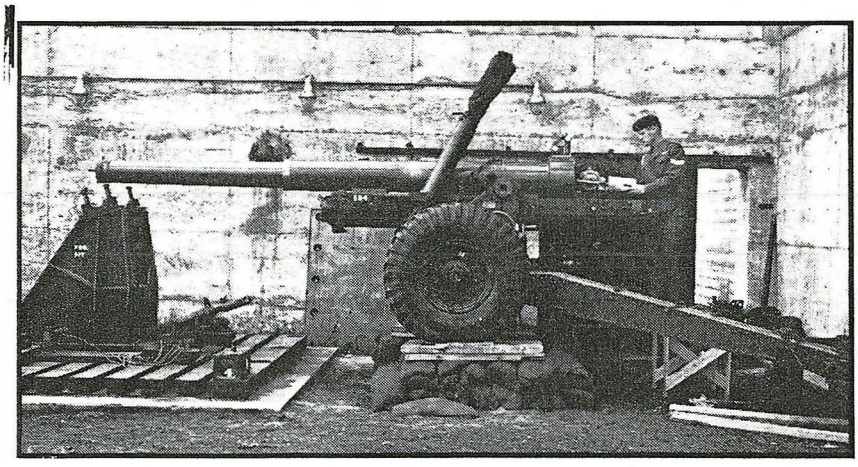


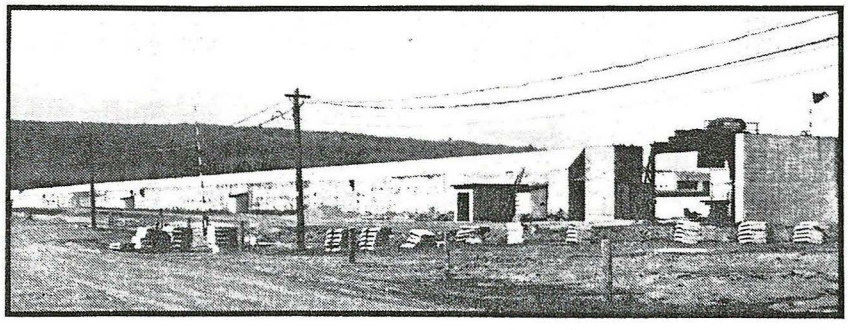
CARDE's Aeroballistic Range

AN INTERESTING new research technique used by the Canadian Armament Research and Development Establishment (CARDE), Valcartier, P.Q., in measuring the aerodynamic properties of various shapes in model form, was described at last spring's CAI annual meeting by Dr. G. V. Bull, head of the Establishment's Aerodynamics Section, in a paper entitled, "Aerodynamic Studies in the CARDE Aeroballistic Range".

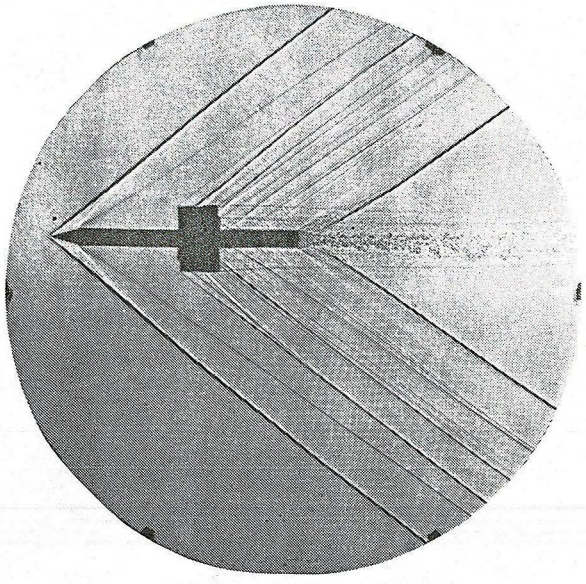
The aeroballistic range technique is relatively new as a method of measuring aerodynamic properties, the usual method of measuring the position of a projectile in space being by means of optical photography. This method is extremely complicated and time consuming, and has restricted the use of the ranges employing it.

The technique employed in Canada is considerably simpler and involves the use of cheap paper cards (similar to blotting paper) and a standard practice in ballistics. The model under study is literally shot from a cannon, perforating the cards which are arranged in sequence along the line of flight, leaving an imprint which can be measured with quite good accuracy,

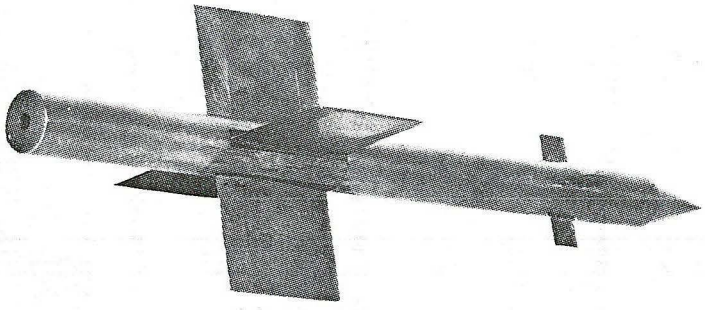




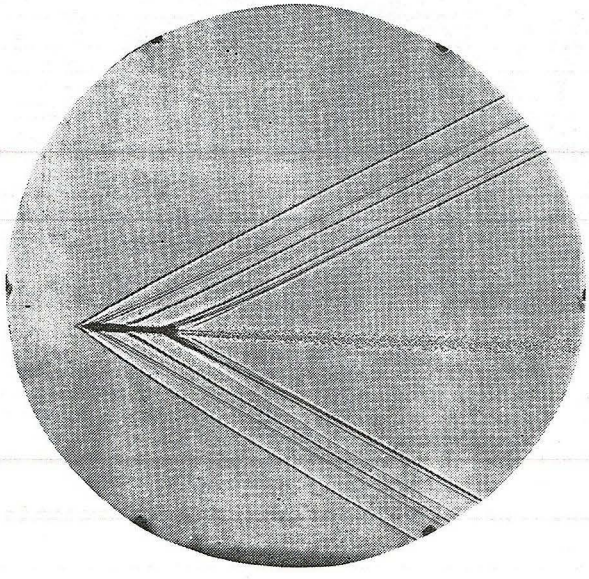
Above, the smooth-bored 5.5 gun (5.9 in. internal diam.) is shown being loaded. The model is protected during its travel in the barrel by a carrier (sabot), which is so built that the air loading causes it to break into four pieces (top of page) after leaving muzzle. The picture at top was taken when model speed was 1500 fps.: the wires are for flash-triggering purposes. Below is the 750-ft. long concrete building which houses the aeroballistic range. One of the guns used is visible at right. Flag indicates test in progress.



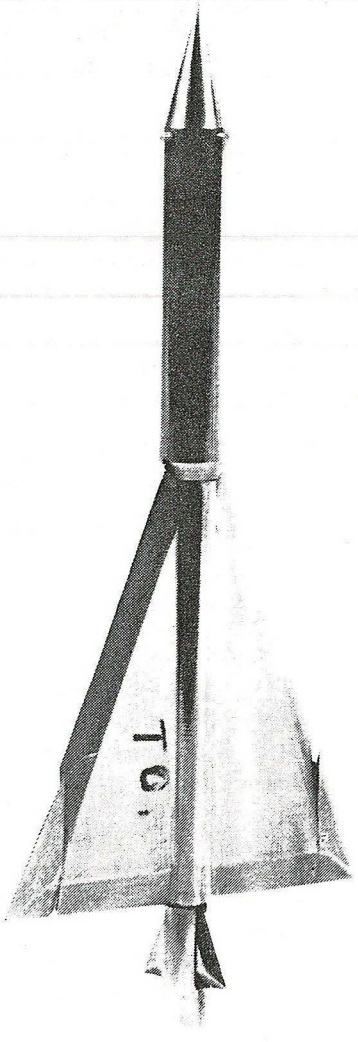
The cruciform wing/body combination below is shown in flight in the photo at left, taken by the shadowgraph-schlieren system which is located at the range's 50-ft. station. Photo was taken when the model was moving at 1790 fps. Four wing panels are clearly visible, and shock wave system, trailing vortex sheet and turbulent wake may be seen easily.

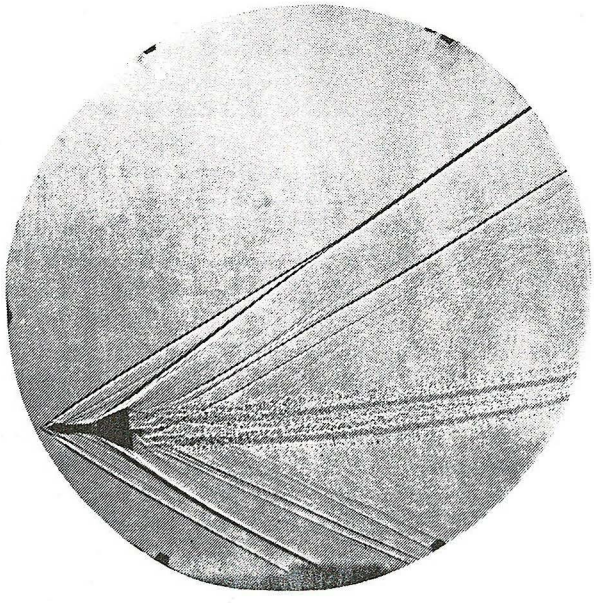


Below is a delta-monowing model which is similar in many respects to aircraft models. Note wing-tip ailerons. These models are made to extremely fine tolerances, as small errors in their manufacture can cause very large manoeuvers.



The Mach number of the delta mono-wing shown in flight at left, is over 2. The wings are in line with the body and not visible, though the shock waves from them are evident.





At the left, the delta mono-wing is shown in flight, rolling, pitching and yawing at a Mach number over 2. Curvature of wake indicates high manoeuvers: note dark lines on outer sides of wake made by the trailing vortices from the tip ailerons.

airliners to Eland power, with civil and military applications of helicopter gas turbines, with rocket engines and the Napier "Spraymat" system of aircraft de-icing.

Head office is located at 4104 St. Catherine St. W., Montreal; telephone WEllington 7-9383.

DRB's Rocket Firing

With the successful static firing last month of a 17-inch rocket engine containing almost a ton of solid propellant, the Defence Research Board's CARDE passed a notable milestone in its rocket development program. Primary object of the rocket propulsion investigations is to test the performance of improved solid propellants for powering research rockets.

During the past year, CARDE scientists have statically fired about 50 eight-inch rockets to measure pressures and to obtain other relative information. Last month's firing was the first of a rocket that size. The engine was 17 feet long and provided a thrust of about 20,000 lbs. for a period of 20 seconds.

The CARDE scientists are striving to develop materials which will withstand the unusually high temperatures experienced within rocket engines following firing.

Counter ICBM System

Canada will share with the U.S. control of a system designed to detect and destroy in-flight ICBM's, it is learned in Ottawa. A start has already been made on construction of this system. The beginning is erection of three huge radars—in Alaska, Greenland and Scotland—for the ballistic missile early warning system.

The display centre for all information by these powerful radars—their range will be some 3,000 miles—will be located at NORAD headquarters.

Gen. Charles Foulkes, chairman of the Canadian chiefs of staff committee, said in Ottawa on February 18 that NORAD will be "able to deal in the near future with attacks by ICBM's."

Devising a defence against the ICBM has top priority in the Defence Research Board, and Mines Minister Comtois revealed a few weeks ago that his department is trying to improve present alloys and develop new ones which could be used in construction of a counter-missile.

Canadian scientists plan to fire this year, all-Canadian rockets from Fort Churchill to test instruments and solid fuels. It is conceivable that the American Nike-Zeus, the projected counter-missile, will carry Canadian-developed and Canadian-made guidance instruments and solid fuel.

More Airport Funds

The DoT will pour another $64,000,000 into airport construction in the 1959-60 fiscal year. The figure is given in the estimates of Government Spending presented to Parliament February 5. The new appropriation is $9,000,000 more than the latest estimate of $54,000,000 for the fiscal year ending March 31, 1959.

A lot of the construction will be continuing work of jobs started in previous years. New work will start at several places, however, including North Bay, Sault Ste. Marie, Baie Comeau, Que., and Frobisher Bay.

Officials say spending at the present rate on airport construction will continue for about another decade. "We're only getting started," one authority said.

Municipal Airports Urged

The B.C. Aviation Council has sent letters to 125 towns and villages urging construction in 1959 of airports or landing strips.

Encouragement of new airport or airstrip construction is the council's project to commemorate Canada's golden anniversary of powered flight.

Provincial government and DoT representatives have agreed to advise and assist municipalities "wishing to join the air age," said council president Jim Meagher.

Caribou Changes

After six months of intensive flight testing with the first two aircraft, the de Havilland Aircraft of Canada has announced changes in the dimensions and weight of the DHC-4 Caribou.

The cabin has been lengthened by

THE AIRBORNE SERVICES

The New Auxiliary

The long-standing question of the status of the RAF's auxiliary squadrons has finally been answered. Defence Minister Ralph Campney told Commons during June that the ten auxiliary fighter and fighter-bomber squadrons, which were at one time to have been equipped with CF-100's, have now definitely been eliminated from a first-line role in the North American air defence system.

However, Mr. Campney said, other highly important duties will be assigned to these auxiliary squadrons, though two of them are to be disbanded as flying units. Six are to be re equipped with Sabre 5's, and their complements of T-33's will be increased. These six squadrons will continue to operate in pairs from Montreal (401 and 438), Toronto (400 and 411), and Vancouver (442 and 443), giving what Mr. Campney described as an effective and economical means of providing a reserve of fighter aircrew, ground crew and aircraft, at a minimum of overhead cost.

No. 403 Squadron at Calgary, formerly a fighter-bomber unit, is to become a light transport squadron, while 402 at Winnipeg (also previously a fighter-bomber unit) has been recast in the role of training squadron with the task of turning out navigators. No. 420 Squadron at London, Ont., is being disbanded as a flying unit and will become an aircraft control & warning squadron. No. 424 at Hamilton, Ont., will be similarly treated and its personnel absorbed into the control & warning squadron already in existence at Hamilton.

Weapons Unit

A weapons practice unit, designed to speed training of fighter pilots, has been formed at RCAF Station at Cold Lake, Alta. The unit will provide facilities for aerial target-towing, assessing air-to-air firing exercises and facilities for development of new methods in air firing training for CF-100 interceptor crews. It will also provide firing practice for all Air Defence Command CF-100 squadrons on a rotation basis.

Airborne Army

Canada is giving more attention to the development of new types of short take-off and landing aircraft with the long-term aim of training and equipping the Canadian Army as an air-portable force, Defence Minister Ralph Campney said recently in Commons. Experience gained in exercises in northern Canada indicated that parachuting is not a good way to land troops, Mr. Campney said.

The Minister pointed out that Canada has had a mobile striking force of three infantry battalions with supporting arms and services for some time. These are transportable in C-119 aircraft and are largely made up of trained parachutists.

Under the present system, the Minister pointed out, "it would required 148 [C-119's] at a cost of about $150,000,000, to provide a one-up lift for an Army brigade without its heavy equipment . . .

"Here in Canada we have not so far attempted to provide air transport on any one lift for more than a portion of the mobile striking force, and then only within our own country. This force has provided a good background of experience on which we can now go forward, applying lessons learned to air transport for the Army generally."

Mr. Campney concluded his remarks on air transport of the Army by saying: "Certainly the task of designing and developing equipment suitable for air-portability is a long-term program. It requires and is getting joint consideration by our Army and our Air Force planning groups."

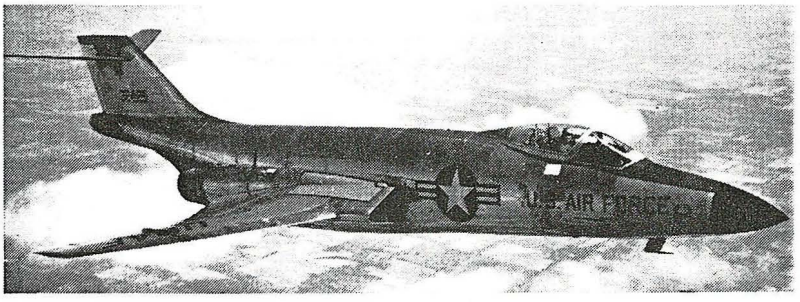
New Squadrons

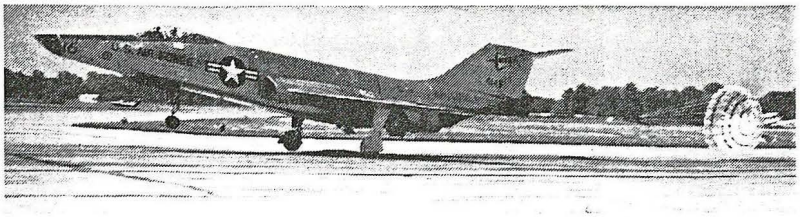
Three new all weather interceptor squadrons costing at an estimated $100,000,000 each, are to be added to Canada's first line air defence force, it has been announced by Hon. Ralph Campney, Minister of National Defence. The new squadrons, to be formed "over a period of time" will be equipped with CF-100's and will bring to 24 the number of regular force fighter squadrons in the RCAF, 12 of which will be based in Canada.

At the same time, Mr. Campney announced that Canada will be replacing one of the Sabre squadrons stationed in Europe with a CF-100 squadron late this year. An additional three Sabre squadrons will be replaced during 1957, fulfilling Canada's agreement with NATO to provide four all-weather interceptor squadrons. The total of 12 fighter squadrons based in Europe will remain unchanged.

Outdated?

A recent statement to the United States senate armed forces committee to the effect that Canada's CF-100 is "quite slow" and that American interceptors now in squadron service cannot fly high enough to attack jet bombers which the Russians have in





HEX ON INTRUDERS: The McDonnell F-101A Voodoo, supersonic fighter-interceptor, above, now in production for the USAF, is powered by two P&W J-57 turbojet engines developing a total of 20,000 lb. th. With a wing span of 39.7 ft.; length of 67.4 ft. and 18 foot height the F-101A is the largest fighter aircraft in production in the U.S. Wings and stabilizer are swept back 35 degrees. The RF-101A photo-reconnaissance version of the Voodoo is shown below using the parabrake during landing. Both aircraft are equipped for in-flight refuelling.

THE AIRBORNE SERVICES

Flying Pay Boost

The Department of National Defence is "approaching the point of action" in regard to flying-pay increases for aircrew of the RCAF, according to Defence Minister Ralph Campney. Mr. Campney pointed out recently that a study of comparable figures in the USAF and RAF had been underway for some time and that his department has practically completed a submission for the treasury board. The RCAF extra flying-pay has remained at $30 a month since the end of World War II.

75 Sabres to Bonn

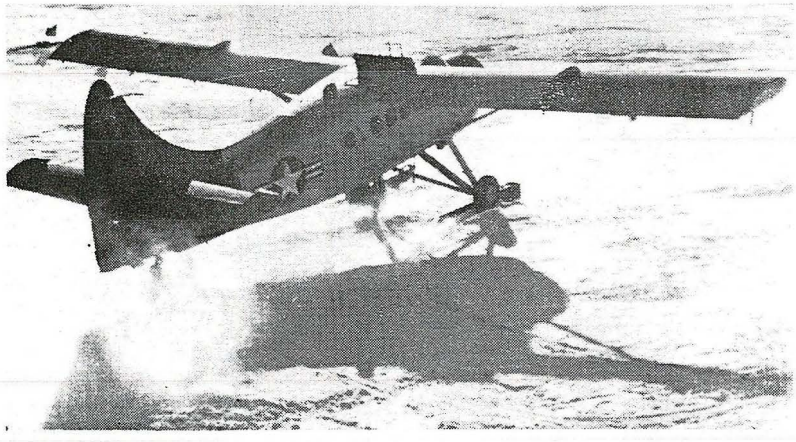
Canada has presented West Germany with 75 Sabre jet fighters worth $35,700,000 including spare parts, as part of Canada's contribution to Mutual Aid and to permit an early build-up of the West German forces. The arrangements for the transfer of the aircraft, "over a period of time" were made through the NATO standing group which is exactly the same procedure that has been used in the past for the release of other Mutual Aid contributions. In 1952-53, some 370 F-86's were transferred as Mutual Aid to the U.K. jointly by Canada and the U.S. Another 214 aircraft were allotted to Greece and Turkey in 1954, each getting half this total. The announcement brought considerable comment from the floor of the House due to the tie-up in dealings with Israel.

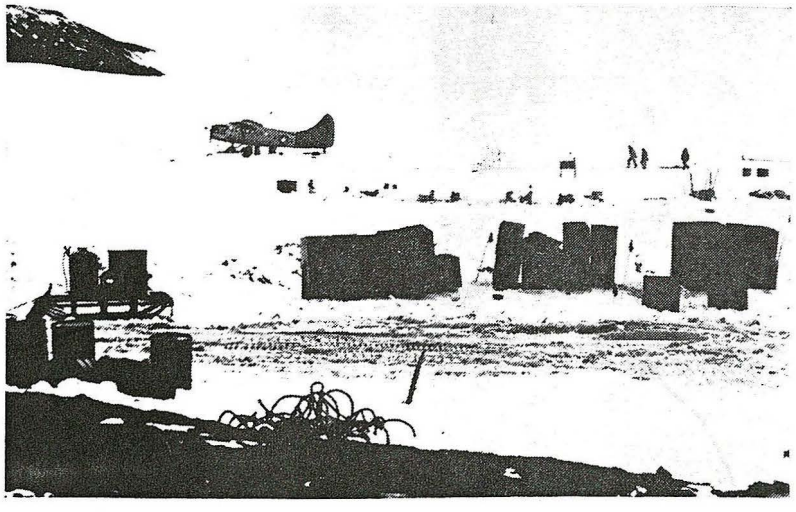
Reserve Sabres

RCAF auxiliary fighter squadrons at Montreal, Vancouver and Toronto are to be re-equipped with Sabre 5's early this fall, beginning in September. Squadron pilots have already started taking a conversion course at No. 1 Fighter OTU, Chatham, N.B., and it is expected that it will take till November to put all the RCAF's auxiliary fighter pilots through this course.

Ground crews will train at No. 2 Technical Training School, Camp Borden, Ont.

Group Captain E. A. Alexander, officer commanding No. 19 Wing (Auxiliary), Vancouver, said each of the units in Vancouver will be re-equipped with eight Mark 5 Sabre aircraft, four T-33 jet trainers and two Harvard trainers.





MEANWHILE, BACK AT LITTLE AMERICA: Scenes from the U.S. base "Little America" in the Antarctic show (above) a USN de Havilland Canada U-1 Otter taking off on a research & rescue mission. Below, an Otter meets a dog team at McMurdo Sound, where an air base is under construction to support flights to and landings at the South Pole. This preparatory work is the initial phase of "Operation Deep Freeze". In the foreground is a so-called fuel farm system.

CF-100 Crashes

The RCAF accident rate for the CF-100 is now about one-third better than last year, according to figures released by Defence Minister Ralph Campney. During 1954-55 there were 14,982 hours flown and 14 crashes, nine of which were total write-offs. In 1955-56 there had been a total of 43,142 hours flown in CF-100 aircraft by the end of June with 20 accidents.

Write-offs totalled nine in 1954-55 as compared to 13 in 1955-56. At the same time, Mr. Campney pointed out that the accident rate for T-33 jet aircraft has fallen about 25 per cent in the last year.

CL-28 Provisioning

Supply and technical specialists of the RCAF's Air Materiel Command and Maritime Air Command met with representatives of Canadair's Spare Parts Sales for a major week-long conference in June. The meeting was called to select a range of spare parts for the CL-28 aircraft now on order. Previous meetings, from one to two days in duration, have been held over the past eight months.

Courier Success

A Fleet Courier was successfully used by the 1st Canadian Infantry Div. to lay communication lines from the air in a recent experiment at Camp Gagetown, N.B. The experiment was carried out over rugged and heavily wooded country where, in slightly over three minutes, four miles of line was dropped accurately between two locations. Officers from the Royal Canadian Corps of Signals said that it

THE AIRBORNE SERVICES

Comets to Fly

AFHQ has announced that a decision has been made to have modifications carried out on its Comet 1A jet transports, to permit their return to full operational service. The aircraft are being flown to the de Havilland factory at Broughton, near Chester, in the United Kingdom, for the modification work, which will take about a year to complete.

Both Comets are being flown from Downsview, Toronto, to the United Kingdom by de Havilland crews, headed by John Cunningham, de Havilland test pilot. The first Comet, following test flights out of Downsview, left for the United Kingdom on May 25, and the second will follow in July. The modifications to the RCAF's Comets will be similar to those now being incorporated in the RAF's Comet 2's.

When returned to service with the RCAF they will provide facilities for transport, as well as a suitable means of exercising the Canadian defence system against high-speed aircraft simulating enemy bomber attacks, according to AFHQ.

Bid Rejected

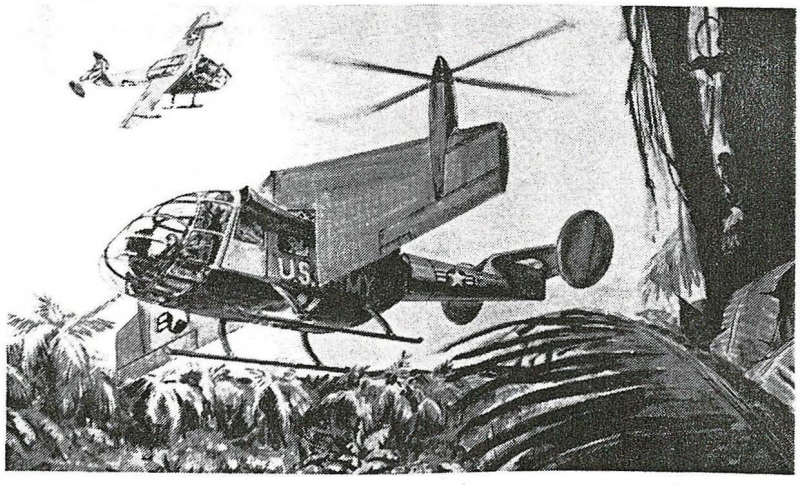
A recent Ottawa news report says that the Department of National Defence has rejected the RCN's proposal to operate two aircraft carriers. The Bonaventure, now nearing completion at Belfast, Northern Ireland, is scheduled for commissioning in the RCN in October. After the Bonaventure joins the fleet, the Magnificent, on loan from the Royal Navy since 1948, will be returned.

The Navy's argument for the retention of the Magnificent, according to the report, was that more recruits could be trained at one time in the carrier than either of the two training cruisers, the Quebec and the Ontario. However, the Defence Department feels the cost of operating the Magnificent as well as the Bonaventure would outweigh the advantages, especially at a time when NATO countries are trying to cut defence costs by concentrating on top priority items. It is understood that the RN has no present use for the Magnificent and it would be just as happy if Canada kept her in service.

Heliport Frigates

An experiment to test the feasibility of operating helicopters from escort vessels of the frigate class will be carried out by the RCN this summer.

Approval has been given, according to naval authorities, for the installation of a helicopter platform on the frigate, HMCS Buckingham, based at Halifax. Work on the installation is expected to be completed in July and trials with helicopter landings and take-offs will begin immediately thereafter. The tests will be tried in various sea and weather conditions.



TILT WING: Artist's drawing depicts turbine-powered VTOL reesarch aircraft which Vertol Aircraft Corp. is designing and developing under contract to the U.S. Army and the USN. A single turboprop engine will be geared to two rotorprops mounted on the wing tips. The wing will tilt into the positions shown; the lower for vertical take-off and landing, the upper for normal flight.

Officials say the frigate is the smallest type ship to be considered for helicopter operations in naval history. So far, helicopter operations have been limited to ships no smaller than the ice-breaker HMCS Labrador with a gross tonnage of 5,400 tons. Frigates come at weights of around 1,500 tons. If the experiments prove the idea feasible, authorities claim that the helicopter could become the most efficient submarine hunter of all time as it will no longer be limited to operation from land or off large ships.

SAC in Canada

The USAF Strategic Air Command has a bomber base in Canada, at Goose Bay, Labrador, according to a press report from Ottawa. At the present, the base is being used by the USAF refueling tankers which take off to meet the B-47 globe-circling bombers of SAC. It is also used as a stop-over point for the bombers on specific operations.

The report points out that the ability of the B-47 bombers to use Goose Bay is a help to the RCAF's Air Defence Command. RCAF CF-100 fighters constantly make practice interceptions on the B-47 aircraft.

F-104 Interest

An RCAF official has confirmed the possibility that the RCAF is looking into the F-104 Starfighter, the USAF's 1,500 mph fighter, as a possible replacement for the F-86 Sabres now in service. However, it is a common procedure, he said, to investigate the operational characteristics of most new aircraft. If the RCAF should decide that the F-104 is the aircraft to complement the CF-100, the report suggests that Canadair will be the prime contractor for the Canadian version.

One Out of Four

According to the daily press Canada is falling behind in RCAF commitments to the NATO. News stories say that the Canadian Government promised NATO last year that by the end of 1956 it would have four CF-100 jet fighter squadrons in Europe and it is now known that only one CF-100 squadron will reach the RCAF No. 1 Air Division by the end of the year.

The press quoted senior officials as saying that the chief reason is that,

THE AIRBORNE SERVICES

More RCAF Helicopters

U.S. manufacturers are rapidly filling RCAF orders for 12 new freighter helicopters — six Sikorsky H-34's and six Piasecki H-21B's. They are to reinforce 108 Communications Flight at Bagotville, P.Q., for duties in connection with construction of the Canadian-financed Mid-Canada radar belt.

The H-34 (purchased through Canadian Pratt & Whitney at Montreal) is a single engine, single rotor machine capable of carrying 12 persons, eight litters, or a net payload of 4,000 pounds, plus crew of two, over 100-mile range; with restricted load and auxiliary fuel tankage it has a 970-mile range. Power is from a Wright R-1820 engine of 1,525 hp.

It is a big brother (with nearly three times the load capacity) of the Sikorsky S-55, 10 of which were obtained previously by the RCAF. Total RCAF helicopter orders placed through P&W amount to 23(including a small number of S-51's used in search and rescue).

The H-21B, tagged the Flying Banana because of its unusual configuration, differs only slightly from the H-21A, six of which were obtained last year for search and rescue duties and allocated to units at Trenton, Winnipeg, Edmonton, Vancouver and Greenwood, N.S.

Out of Turn?

Another high-ranking RCAF officer got his propriety caught in the proverbial wringer last month. He was Air Commodore F. S. Carpenter, Chief of Air Operations, who, on returning from a tour of 1 Air Division in Europe, was quoted as telling newsmen at Halifax:

"Our position is to make the Russians know we can knock hell out of them."

He was quoted as venturing the further opinion:

"We've got to be good and make sure any enemy knows we're good. I may add I'm sure we are."

Tass, the Soviet news agency, picked up the purported remarks and flashed them to Moscow, where External Affairs Minister Pearson had gone on a goodwill mission.

During a reception at the Canadian Embassy tendered for Soviet officials, one of the guests, Soviet Deputy Premier Lazar Kaganovich, confronted Mr. Pearson with the Tass report and indignantly demanded how good relations could be achieved with high officers on the home front rattling their sabres. Press reports from Canadian newsmen in Moscow said the External Affairs Minister was acutely embarrassed and that he promised to take the matter up with Canada's Defense Department.

At home, the Defence Department issued an ambiguous statement denying that the Air Commodore had said Canadian squadrons were poised for an attack on the Soviet.

Air Comodore Carpenter, standing pat, said he could not recall having been interviewed by a Tass representative.

RCN Jet Squadron

VF-870, slated to become the Royal Canadian Navy's first jet squadron, will receive its first U.S.-surplus McDonnell F2H-3 Banshee all-weather fighters in late November at HMCS Shearwater, the naval air station at Dartmouth, N.S. They are destined to replace British-built Hawker Sea Fury piston-engine fighters.

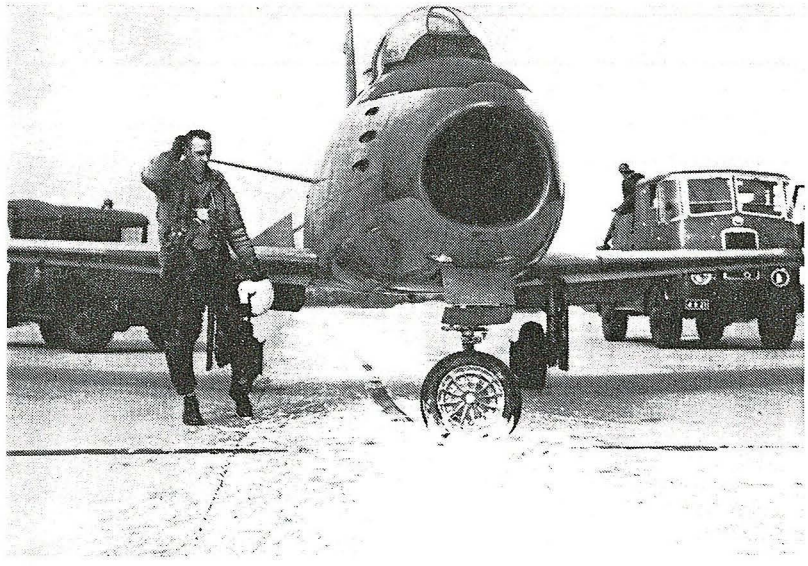
The RCN has obtained about 60 Banshees for service aboard the new carrier HMCS Bonaventure, being fitted at Belfast. Before being released for squadron use, it is learned, the aircraft will go through the shops of Fairey Aviation at Eastern Passage for airframe checks and modification to RCN standards. Engine overhauls will be done by Rolls-Royce of Canada at Montreal. All the Banshees have had varying degrees of service in the U. S. Navy.

In preparation for the conversion, the RCN has been operating four T-33 Silver Star jet trainers at Shearwater. In addition, about 45 sub-lieutenants are taking flying training at Pensacola and Corpus Christi. A course of 27 technicians was trained at Cecil Field, Jacksonville, Fla.

A-A Re-Equipment

Canadian Army heavy anti-aircraft units are being re-equipped with U.S.-built 90-mm cannon, replacing British-built 3.7-inch units. Electronic fire control equipment associated with the new guns is capable of detecting and tracking aircraft and providing automatic aim.

Regular and militia heavy anti-aircraft formations will be redesignated as medium, and reorganized for mobile roles with field forces. The 1st Light Anti-Aircraft Regiment of the 1st Canadian Infantry Division will continue as the divisional A-A regiment



SLIDE FOR HOME: F/O Bob Caskie looks over his Sabre after safely landing at 2 (F) Wing's base at Grostenquin, France, with a cocked nosewheel. The landing was effected safely when F/L Lloyd Skaalan ordered the station firetruck to spread a strip of fire-extinguisher foam down the centre of the runway, two feet wide and two-thirds of the runway in length. Then F/O Caskie brought his aircraft in with main gear straddling the foam and proceeded to lower the nosewheel so that it slid safely along in the foam until the Sabre came to a halt.

OPERATORS' NOTES

Buffalo Bell

The uses to which helicopters have been put are legion, but none is more unique than the job currently being carried out with the aid of an Associated Helicopters Bell 47—painting buffalo from the air.

It's not as silly as it sounds. In fact, government keepers have found that it is the only way they can keep track of the movement of buffalo herds in Wood Buffalo Park in the Northwest Territories.

Here's what happens: From a helicopter flown by Don Landells of Associated Helicopters Ltd., Edmonton, the chief mammologist of the Department of Northern Affairs & National Resources, W. Fuller of Fort Smith, N.W.T., is methodically marking the buffalo herds for a future check as to their migratory habits within the vast Park, which extends from Claire Lake, south of Fort Chipewyan in Alberta, to Buffalo Lake, only 40 odd miles from Great Slave Lake.

The helicopter spots the buffalo, then swoops down to follow the thundering herd, with the mammologist poised for a shot with his dye-filled portable pump, a piece of equipment normally used by fire fighters. By this technique, and thanks to the slow-flying and hovering characteristics of the helicopter, the Department has been able to institute an important scientific program which has evaded them for years because of the lack of suitable methods [illegible] out the job.

Wood Buffalo Park is the home of one of the last great buffalo herds in North America.

Who Goes There?

That the Canadian air defence system has swung into high gear is indicated by a recent information circular (0/15/54) issued by the DoT, warning that, if intercepted by a military aircraft, a steady course should be maintained, as any other action could result in some regrettable misunderstanding.

Says the DoT: "Interceptions are made only where the possibility is considered to exist that an unidentified aircraft may be truly hostile in intent. Interceptions are made in a serious manner presuming the unidentified aircraft to be hostile until definitely proven to the contrary. Therefore, for example, night interceptions are made with all lights out and the interceptor approaches into close proximity and identifies the unknown aircraft by reading the identification markings by means of a light. The fact that the interceptors do not have lights on is not considered dangerous as they are controlled by radar from the ground and are also equipped with airborne radar.

"Intercepted aircraft should maintain a steady course and under no circumstances take retalitory action such as shining a light on the interceptor or attempt evasive action. Retaliatory action on the part of the intercepted aircraft could be construed as hostile intent and might result in drastic consequences.

"Practice interceptions are not carried out on civil aircraft. . ."

Champions for Sale

The popular Aeronca Model 7 Champion will soon be available again as the result of the sale of the manufacturing rights by Aeronca Manufacturing Corporation to Flyers Service Incorporated, Holman Field, St. Paul, Minnesota. Flyers Service is planning to start production of the two-place tandem trainer immediately and anticipates being able to make deliveries within six months or less.

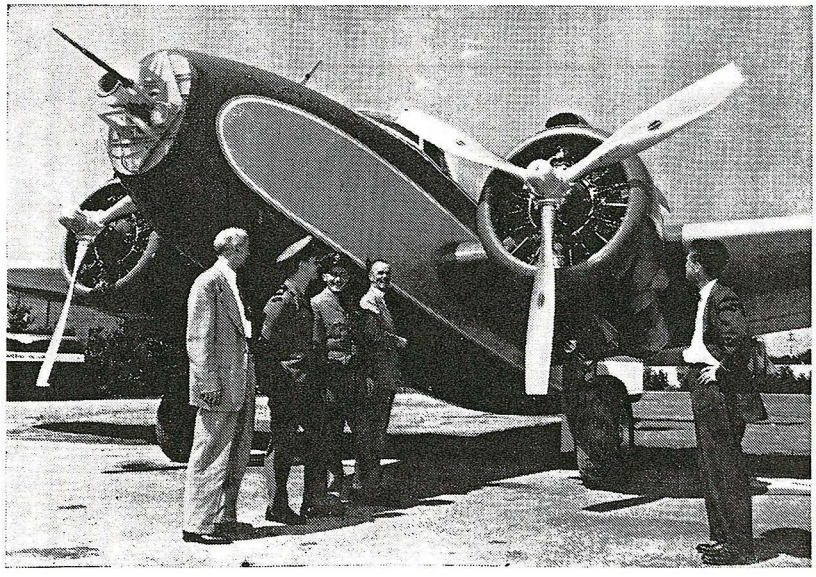
The Champion was introduced in 1946, and by 1951, when it was taken out of production by Aeronca, over 10,000 had been produced. Aeronca no longer produces any of its own designs, being at present completely engaged in heavy aircraft component production under subcontract.

Flyers Service says that a new corporation known as Champion Aircraft Corporation is being formed for production and sales of the aircraft, and to provides sales of service parts for existing Champions. Parts inventories and engineering data have been transferred from Aeronca to avert delays in servicing on open parts orders.

Leavens Bros. Limited of Toronto have for many years represented Aeronca Aircraft Corporation in Canada. During a visit to Toronto recently, George B. Millard, sales manager for Champion Aircraft Corporation, indicated his company would continue the arrangement whereby Leavens Bros. will act as Aeronca distributors. Leavens already maintain a large stock of parts in Toronto for the Aeronca Champion, Chief, and Sedan.

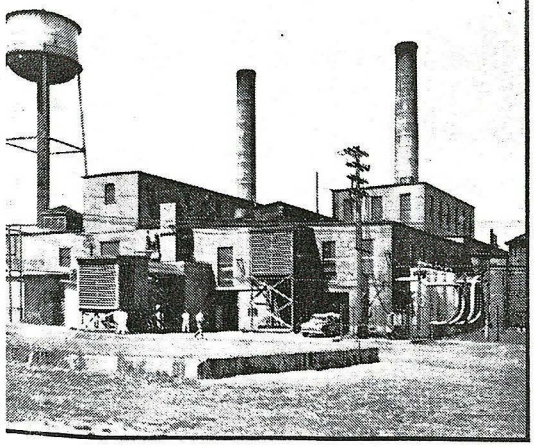
Survey in Guiana

Photo-mapping of a 38,000 sq. mile area in Central British Guiana was started during August by Spartan Air Services Limited, Ottawa, which was awarded the assignment by the Colonial Surveys Office, London, England.

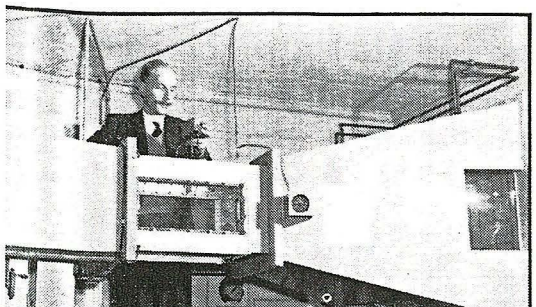


LEARSTAR VISITOR: A recent visitor to Ottawa was the new Learstar, which was demonstrating Lear instruments to military and government officials. Shown in front of the aircraft are, L to R: W/C McLulich, RCAF; Lt. Cdr. R. C. D. O'Donnell, RCN; F/L M. Freidl, RCAF; S. S. Payne, DDP. At right is T. W. Dowbiggin, who is in charge of sales of Lear products for Canadian Aviation Electronics. CAE recently concluded a manufacturing agreement with Lear to produce Lear autopilots in Canada.

RESEARCH AND DEVELOPMENT in Canada's Aircraft Industry

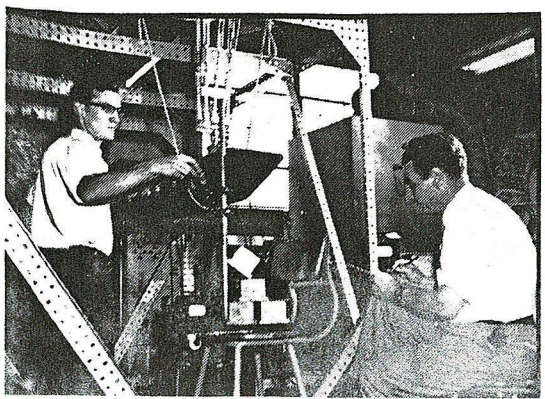


In photo above is gas turbine test & development establishment operated at Nobel by Orenda Engines. Below, Applied Research icing wind tunnel.



Below, USAF artist's impression of VTO disc-shaped aircraft configuration on which Avro Aircraft Ltd. is carrying out research for the USAF.

Below, the torsion rig in Canadian Westinghouse's environmental lab. This rig is used to simulate the stresses encountered during flight.



HOW ACTIVE in the research and development field is Canada's Aircraft Industry, and those members of the Electronics Industry which have an allied interest in the aviation field?

Defence Research Board officials sum up the situation this way: the Canadian Aircraft Industry is weak in research capacity, but strong in development; the Electronics Industry is reasonably strong in both phases.

In the electronics field, all the large companies have in the past few years set up research laboratories. Some of these labs have already paid for themselves by designing and developing products that have resulted in financial returns many times greater than the initial cost of setting up the lab.

Defence Stimulation: Of the research and development work that is going on at electronic and aircraft companies, a large proportion has been stimulated by the defence program. The DRB is of the opinion that it's equally important for industrial firms to inaugurate their own programs. While it is not considered too good to have industry depending entirely on defence programs for sustenance, Government scientific officials are anxious to continue fostering research because it is desirable to have a civilian scientific capability in universities and industry that can be converted to defence industry if necessary.

Though the aircraft industrial research and development capability in Canada has not yet reached very large proportions, the situation is improving, with individual companies slowly building up their facilities. The major deterrent is expense. Although most of the companies are well aware of the importance of research programs, the staggering costs involved are enough to discourage all but the wealthiest of industrial concerns. Still, considering that research and development facilities in the Canadian Aircraft Industry were practically non-existent prior to 1951, there is some evidence that progress is being made to alleviate this situation.

On the other hand, it is significant that the amount spent on research and development in Canada in the past few years is equal to only about 1% of the amount that has been expended on aircraft production. It is generally conceded that to support an aircraft production program properly requires a minimum expenditure equal to about 10% of the amount allotted for production.

Because so much of the research and development work being carried out in industry falls into the class of defence work, little can be said about it without breaching security. However, brief outlines are presented here of the facilities which some Canadian companies are operating, with mention being made of some of the activities going on therein.

Canadair Ltd.: Canadair's Engineering Test & Development Laboratory was officially inaugurated in December, 1955. It was formed to obtain the research data necessary for advancement, and the answers on performance, capabilities and structural limitations of equipment already in use.

Ben Kaganov, chief structures engineer, is responsible for the Structural and Dynamics Test Sections which include an array of complex machines. Says Kaganov: "Most of this equipment is specially designed to fill a specific need. It is built elesewhere and then brought in. Sometimes though, the situation gets so bad that we have to build our own."

Such a situation arose during the development work on the CL-28 wing. It was discovered that the natural frequency of the wing was down to

News Roundup

BMEWS ANTENNA for installation in Arctic Canada is being built by Goodyear for USAF's Ballistic Missile Early Warning System. Rigid spherical radome will have 140 ft. diameter, while antenna itself will be about 100 ft. across.

Canadians with NASA

The U.S. National Aeronautics & Space Administration has announced that 25 Canadian scientists have been assigned to that organization's Mercury man-in-space project at Langley Field, Va. The Canadian engineers and scientists, all formerly employed at Avro Aircraft on the Arrow program, are headed by James A. Chamberlin, formerly Avro's chief of design.

The NASA reported that the services of the 25 men were offered by the Avro company, and that they have not completely severed their connections with the Canadian firm. Commenting on the status of the group an Avro spokesman said: "They are on an extended leave of absence . . . if we needed them and the U.S. was willing to let them go, they could come back."

Included in the group are some of the design experts who were largely responsible for the ill-fated Avro Arrow. Mr. Chamberlin, whose experience in this country dates back to Avro's early days, worked on the Jetliner and the CF-100.

New Edmonton Airport Progress

Tenders will be called for runway extensions at Edmonton's new International Airport around the end of this month. However, according to DoT officials at Ottawa, the airport will not be ready for air traffic before late 1960. A DoT spokesman explained that two more full construction seasons are needed to complete the runways, install lighting, pave all taxi strips, and complete a temporary terminal building.

At the present time, only two runways have been completed, and all terminal buildings have yet to be erected. It is thought likely that hangar construction may continue for the next ten years.

Official opening of the airport may not come before 1961, and may depend in part, on the provincial government completing construction of a four-lane highway with a cloverleaf turn-off to serve the airport.

Aeronautical Museum

The new National Aeronautical Museum of Canada is to be opened to the public this year, in the late summer or early fall. The museum is to be located on the second floor of the east wing of the new Ottawa Airport Terminal at Uplands.

The National Aeronautical Museum was conceived and implemented by the NRC, the RCAF, the RCFCA, the DoT, the CAI, the AITA and the Department of Northern Affairs. M. S. Kuhring of the National Research Council has been appointed acting curator pending the appointment of a permanent curator.

Mr. Kuhring has expressed interest in obtaining suggestions on how to enhance the historical value of the museum. He would appreciate documents or displays of an aeronautical historical nature that may be in possession of the aircraft industry. He may be contacted at the National Research Council, Montreal Rd., Ottawa 2.

SGA Asks for Sched Run

Saskatchewan Government Airways is making a bid to enter the ranks of Canada's handful of airlines operating Class 1 scheduled air services. The crown-owned company has applied to the ATB for a license to operate a Class 1 service between Prince Albert, Saskatoon and Regina, all in Saskatchewan.

Change of Address

Rotaire Ltd., which has been located at Niagara-on-the-Lake, has taken up new quarters at Hamilton Municipal Airport, Mount Hope, Ont. New mailing address will now be: Rotaire Ltd., P.O. Box 299, Mount Hope, Ont. Telephone OSborne 9-4723.

According to Managing Director Art Limmert, the Niagara location was too far removed from the main stream of Canada's aviation industry. For this reason Rotaire decided to move to Hamilton.

Ultra to Produce CPI

The Crash Position Indicator device developed by H. T. Stevinson and D. Makow of the National Research Council (AIRCRAFT, March, 1959, p. 51 et seq.) is being developed and sold commercially by the Special Products Div. of Ultra Electric Ltd., London, England. Ultra is represented in Canada by Field Aviation Co. Ltd.

It will be recalled that Ultra Electric is the company responsible for the now widely used SARAH homing radio equipment for use by survivors of downed aircraft.

Raven Expands

Raven Air Service Ltd., of Yellowknife, N.W.T., has recently started charter service operations with Group C aircraft. This is the company's first venture into the charter field, having started in 1957 as a flying school operation.

DRB to Go Into Orbit

The Defence Research Board announced on April 20 that its scientists will do all the instrumentation for a

U.S. satellite scheduled for launching from Vandenberg Air Force Base, Calif., in 1961.

The satellite will weigh some 50 pounds and the instrumentation will be done by DRB's Telecommunications Establishment at Shirley Bay, near Ottawa. A sum of $300,000 has been allotted for the project so far.

The objective of the satellite is to obtain data on the upper layers of the ionosphere, an electrically-charged belt 60 to 300 miles above the earth's surface, a field in which the DRB is considered a world authority. The ionosphere affects radar and communications and therefore the satellite will have military implications.

Though the DRB announcement didn't say so, it is understood that the satellite will form part of the joint Canada-U.S. research into development of a system to destroy in flight intercontinental ballistic missiles.

The satellite will be put into north-south orbit so that receiving posts at Fort Churchill, Man., and elsewhere in Canada can gather information provided by the vehicle.

The DRB scientists will also provide the instrumentation for two American high-altitude rockets to be launched this year, possibly from Fort Churchill although the launching site is not definite yet.

The Canadian Armament Research & Development Establishment at Valcartier, Que., has already instrumented U.S. Nike-Cajun rockets fired last fall from Fort Churchill. These rockets, however, probed only the lower levels of the ionosphere.

Canadian instruments in the satellite will direct radio pulses downward as the satellite pursues its polar orbit. They will be reflected back to the satellite from the upper layers of the ionosphere and the information received will then be relayed to the ground. The rockets will be used to study the electron density of the ionosphere.

The team planning the Canadian phase of the satellite project is led by R. Keith Brown.

Airport Movements

Air traffic for March, in terms of the numbers of landings and take-offs at the 28 DoT controlled airfields across Canada, showed a very slight decrease of .67% over the same period last year. The March figure was 256,114 landings and take-offs compared with 257,853 for March, 1958.

Busiest airport was Montreal with 25,869 arrivals and departures, followed by Ottawa with 24,757 and Vancouver, 24,327. Scheduled airline take-offs and landings show Toronto leading with 5,132, followed by Montreal, Vancouver and Edmonton.

McCurdy Honored

The awarding of an honorary degree of Doctor of Law to the Hon. J. A. D. McCurdy has been announced by the University of Toronto. Mr. McCurdy, who attended the University as a student during the 1902-07 period, will receive the degree on May 29 in Toronto.

COPA Hears Boling

Captain M. L. Pat Boling of United Air Lines was guest speaker at the COPA Ottawa District dinner held late last month in the capital city. Captain Boling's visit was sponsored jointly by the COPA, Beech Aircraft

were built in four sizes; the L-type trainer, the G-type which is also a trainer but considerably larger; the K-type patrol ship and the M-type longer range patrol ships. Their main use was of course the escorting of convoys and they achieved the remarkable record of escorting 89,000 ships without the loss of a single vessel, a striking tribute to their suitability for this particular role. Despite their seeming vulnerability very few blimps were lost during the war either by storms or by enemy action.

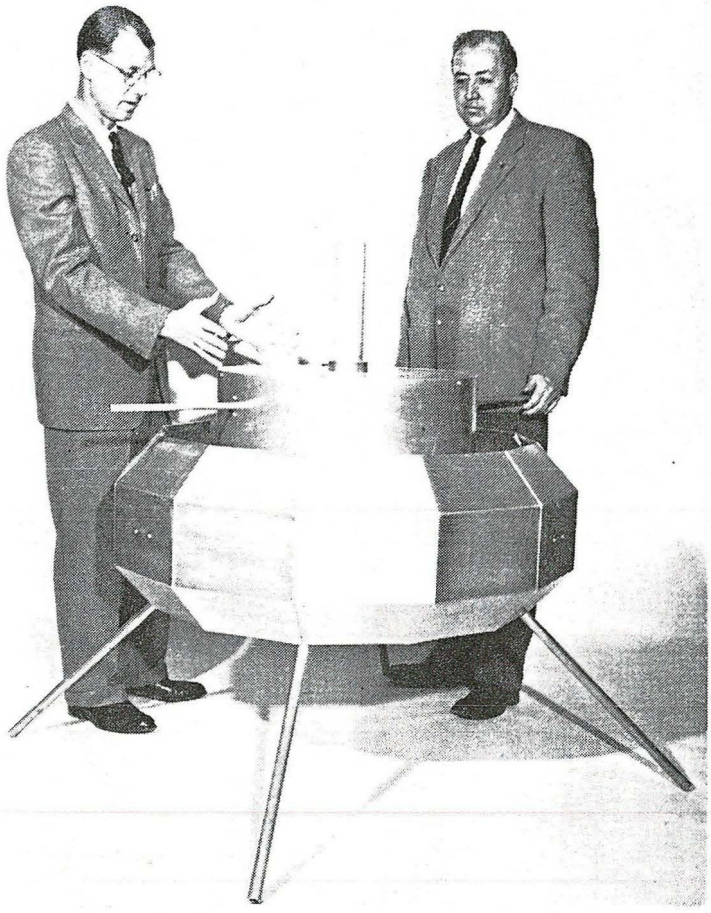
In 1955, the ZPG-2W ships went into service with the U.S. Navy. They were originally designed for anti-submarine work but incorporate electronic features intended specifically for early warning missions. Their unique construction enables them to carry the largest airborne radar reflectors ever built. The reflectors are connected to scopes in the control car so that the blimp can become, in effect, an extension of the DEW line over the ocean. One of these ships established a world's endurance record in 1954, flying for 200 hours without refuelling. On a later flight, even this endurance was exceeded by a considerable margin when a blimp flew from the U.S. to Europe, thence to the Mediterranean and back to the U.S. remaining aloft for over 10 *days!*

The craft has a speed of about 70 knots, which can make upwind travelling a rather tedious business, but this is more than offset by the ship's phenomenal endurance capabilities.

The very latest types, the ZPG-3W blimps are a new class entirely. The prototype flew for the first time in 1958. They are the largest non-rigid ships ever built, over 400 feet long, each having a capacity of 1.5 million cubic feet, which is about 50% greater than any others in service. The normal crew is 25 persons.

The -3W ships have the same general appearance as their predecessors but they are powered by 1500 hp Curtiss-Wright engines appproximately twice as powerful as those used by the -2W.

It seems that blimps still have before them a long and useful service life. It is a great pity that the economics of flying do not permit their use on conventional airlines. Where speed is not a vital factor, they could provide the public with a mode of flying which has to be sampled to be appreciated.



Canada's Satellite

In April 1959, Dr. A. Hartley Zimmerman, chairman of the DRB, and Dr. Keith Glennan, administrator of the U.S. NASA, announced acceptance by NASA of a proposal by the DRB's Defence Research Telecommunications Establishment (DRTE) for a joint satellite experiment.

Initially, DRTE proposed that instrumentation designed to investigate the top layers of the ionosphere be included in a NASA satellite conducting other experiments. Further consideration suggested the employing of all the space in a complete satellite for the Canadian experiment.

NASA agreed to this proposal and for economic and logistic reasons, it was decided that DRTE should construct the satellite shell as well as its instrumentation.

To be launched late in 1961 at Vandenberg AFB by means of a three-stage Thor-Delta rocket provided by NASA, the experiment will be designed to achieve two objectives.

First, the satellite will examine and record fundamental scientific information about the structure of the upper levels of the ionosphere by using a radio sounder above the ionized layers. Secondly, it will provide information about galactic noise or the radio signals which emanate from outer space.

This information is needed by both Canada and the U.S. as a phase of their research programs aimed at improving long distance telecommunications.

The DRB satellite, which will be launched in a near-polar orbit, will be constructed of aluminum and fibreglass, nearly round in shape and girdled by banks of solar cells (see picture). The diameter of the girdle will be about 42 in. and the weight of the complete satellite approximately 200 lbs.

The long wave-lengths used for sounding the ionosphere require long satelliate antennas. The two 30-foot antennas projecting from the sides of the vehicle will be the longest used in satellites to date. Coiled within the vehicle during launch, they will extend like a carpenter's rule when the satellite achieves its orbit.

To protect the satellite during its acceleration through the dense atmosphere, it will be enclosed in a metal nosecap or shroud. On reaching the orbit altitude of 700 miles, both the nosecap and the third stage rocket will be separated from the satellite.

In photo above: R. K. Brown, who is in charge of the DRTE satellite construction group discusses an antenna problem with Dr. R. C. Langille, superintendent of the DRTE electronics laboratory.

Orenda Afterburner

The development and adaption of the Bristol simplified re-heat system (afterburner) for use on Avro Canada Orendas, as installed in the CF-100, are said to be the subject of recent negotiations between the RCAF and The Bristol Aeroplane Company in England. News of these negotiations appeared in the most recent issue of Bristol's house magazine, "Bristol Review".

This news is of more than usual interest because it brings to three the number of commercial organizations which have been publicly associated with projects to develop an afterburner for the Orenda.

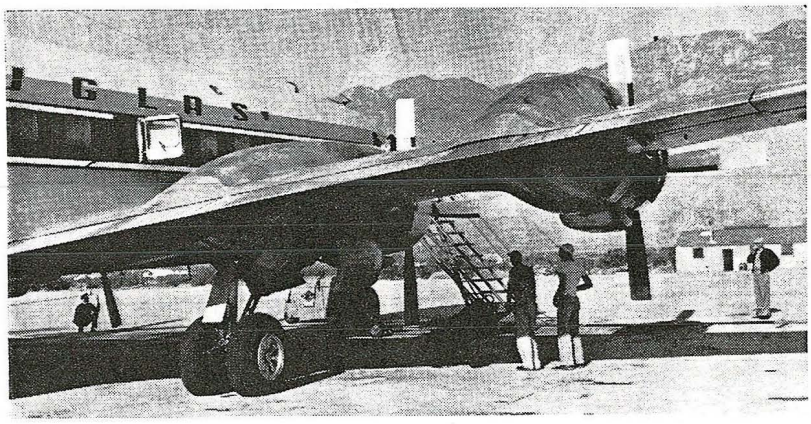
Late in 1951, Avro Canada announced the awarding of a substantial contract to Solar Aircraft Company, of California and Iowa, for the development of an afterburner for the Orenda. The announcement at that time said . . . "it is expected that it will be considerable time before it will be ready for use." That was the first and last official mention of the Solar afterburner, and occasional enquiries as to the progress of the development of the device have elicited no further specific information.

The Marquardt Aircraft Company, Van Nuys, California, has recently hinted that it is also working on an afterburner for the Orenda. In a news release dated April 26, Marquardt stated that it was . . . "developing and manufacturing variable area turbojet nozzles of advanced design for nearly all of the major engine companies in the U.S. *and Canada.*" Though Marquardt does not specify the name of the Canadian company involved, only Avro Canada and Rolls-Royce of Canada produce jet engines in this country, and it seems improbable that the RCAF would have a requirement for a Nene afterburner.

F-100 for the RCAF

A final decision on the choice of a day fighter as a replacement for the F-86 Sabre, is soon to be made by the RCAF, and it is expected that the nod of approval will be in the direction of the North American F-100 Super Sabre. The F-100, powered by Pratt & Whitney's big 10,000-lb. thrust J-57, has recently gone into large-scale production at North American's Los Angeles plant.

However, the aircraft will in all probability be built in Canada by Canadair Limited, under an arrangement similar to that evolved for the F-86 (North American would license the Canadian Government to produce the airplane in Canada, and the Government would then designate Canadair as its manufacturing agent). It is expected also that the J-57 would eventually be replaced by an Avro Canada-built turbojet, either a developed Orenda, or an entirely new engine now being built.



BULGING AT THE SEAMS: The intercontinental version of the Douglas DC-7, the "B" is recognizable by the bulges over its engine nacelles (above), which contain extra fuel tanks. Fuel capacity of the DC-7B has been boosted from 5,512 to 6,400 gallons by the addition of "saddle" tanks. Other improvements include a new flap linkage system for better take-off performance. Gross weight of new model has been raised to 125,000 pounds.

The decision on a replacement for the F-86 cannot come too soon for Canadair, which is nearing the end of its production contracts for Sabres and T-33's, and does not expect to get into full swing on the Brittania M.R aircraft for at least 18 months. Recently the company confirmed reports that it would be laying off between one and two thousand production employees over the coming six-month period. Employment is now about 10,000, down some 3,000 from the peak reached early in 1953, just prior to the cancellation by the USAF of the T-36 contract.

Amphenol Canada

The formation of Amphenol Canada Limited, with manufacturing plant and offices at Toronto, has been announced by American Phenolic Corporation of Chicago, a leading manufacturer in the field of electrical/electronic components for aircraft use.

According to the announcement, the new undertaking is to be a Canadian operation, with its manpower, management, and engineering to be reinforced and aided by the U.S. company to whatever extent may be necessary at the outset and then only as long as conditions demand.

Amphenol Canada is headed by J. R. Longstaffe of Toronto as president. The directorate consists of: Mr. Longstaffe, W. J. Bushnell, J. T. Band, A. J. Schmitt, and A. Trevor Jones. The latter two represent U.S. interests. J. R. Longstaffe has been the Canadian representative for American Phenolic since 1936. He is also a director of International Resistance Co. Limited, Renfrew Electric & Refrigerator Co. Limited, and Copper Wire Products Limited.

To house Amphenol Canada, 30,000 sq. ft. of modern manufacturing and office facilities have been acquired at 300 Campbell Avenue, Toronto. Sales offices will be located in principal Canadian cities.

Defence Spending

Government spending for RCAF aircraft will eventually hit a peak of $460,000,000, and then level off at about $450,000,000 a year, Defence Minister Brooke Claxton told Commons, May 20, during the course of the debate on the defence estimates. The implication was that spending would continue at this rate indefinitely.

Said Mr. Claxton: "In . . . the

financial year just concluded, we spent on aircraft for the RCAF alone a total of about $410,000,000. For the year 1954-55 . . . the amount we will spend to meet our requirements on aircraft . . . ordered . . . will be over $425,000,000.

"The figure will increase, not decrease, year by year, until it reaches a total of between $455,000,000 and $460,000,000, then level off at about $450,000,000.

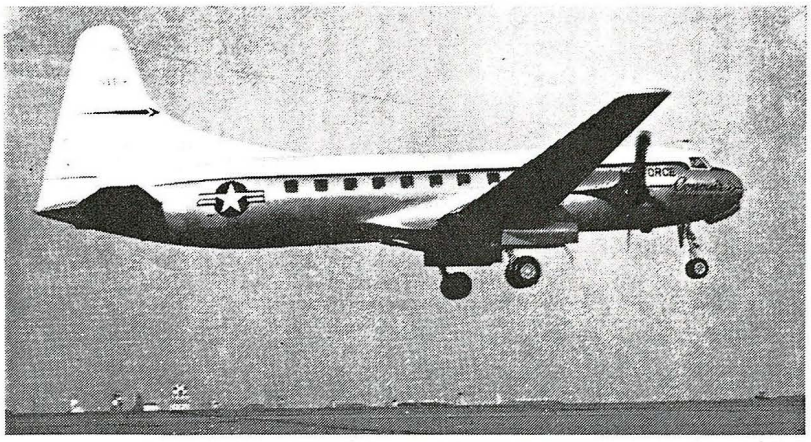
"Those figures are not to provide us with a complete new suit of aircraft; they are not to provide us with any additional aircraft of new types and for purposes not at present envisaged in our commitments; but expenditures . . . of about that magnitude are necessary if we are to keep our Air Force at about its present strength in terms of quantity and quality, as judged by what is required from year to year . . .

"It involves, of course, replacement at the appropriate time of the F-86 Sabre fighter with a supersonic fighter, and . . . replacing the CF-100 at a suitable time with a supersonic long-range all-weather fighter, an aircraft that does not exist today."

And later on, Mr. Claxton gave a hint of the trend of RCAF thinking when he said that . . . "We may also be coming close to the time when the pilot of a fighter aircraft will not have much more to do than get the aircraft off and back onto the ground, so that by the time we have our supersonic fighters to replace the F-86E and the CF-100, it is at least possible that these will be the last aircraft to depend extensively on human beings, and we will then be in or very close to the age of the pushbutton. It has been a long time coming and it is still some distance off."

White Paper: A government white paper titled "Canada's Defence Program 1954-55", was tabled in Commons on May 17 by Defence Minister Claxton. Some choice items:

- The CF-100 may be fitted with a new type heavier calibre gun for use in conjunction with air-to-air rockets, if certain tests now being conducted are successful.
- A successor to the Sabre V, the Sabre VI, is on the way and will be powered by a more powerful Orenda.
- Sabres and Otters from new production are among the list of military equipment and supplies which Canada will send to eleven NATO nations this year.



TWO TURBINE TYPES: Above is the Convair YC-131C, taking off on its first flight recently. The YC-131C is the first U.S. military twin-engine turboprop transport and is powered by Allison YT-56 engines, each developing 3,750 hp. Below, the prototype Super Constellation is being used as a flying test bed to test turboprop engine installation to be used on forthcoming Lockheed C-130 military transport. C-130 will also be powered by the T-56, of which it will have four.

Inaerco to Move

Inaerco Limited is to move from Toronto to Perth, near Ottawa, it has been announced. A new 17,000 sq. ft. plant is being constructed at Perth and when it is completed the move from Toronto will be made in stages.

For the aircraft industry, Inaerco is best known for its high pressure hose assemblies and fittings, as well as a wide variety of other precision aircraft parts.

President of Inaerco is Ian Filshie of Toronto, who will move to Perth. Vice president & general manager is Colonel S. C. Cook, formerly president of Triangle Valve Canada Limited.

New Cannon Plant

Work is underway on the construction of new offices and factory building for Cannon Electric Canada Limited, well-known manufacturers of all types of electrical connectors.

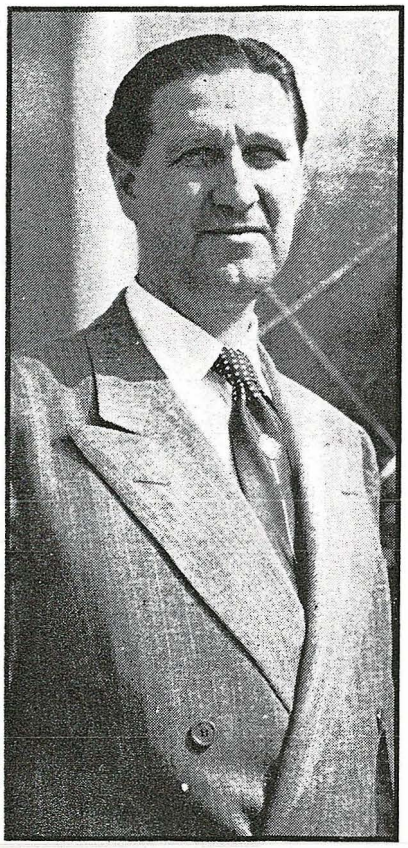
The new plant is located at 160 Bartley Dr., Toronto, and is a one-storey building enclosing some 20,000 sq. ft. of work space.

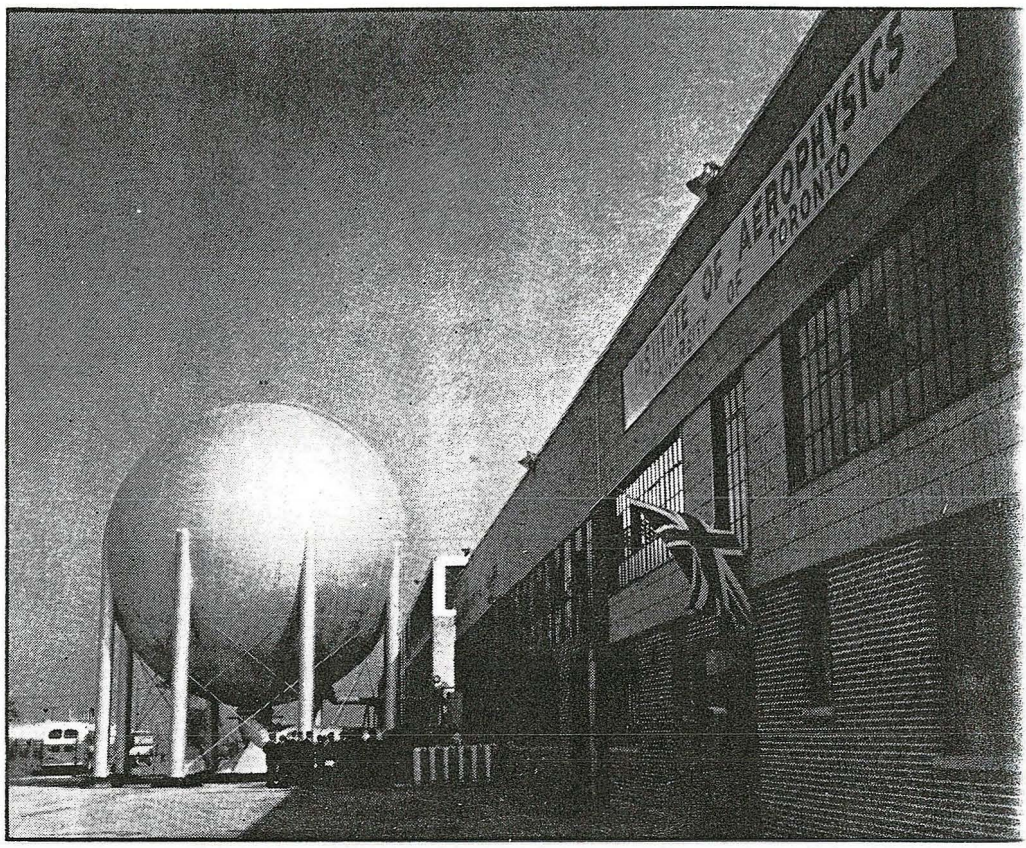
New AEL Plant

Aviation Electric Limited recently announced construction of a new plant at Vancouver's International Airport.

Aviation Electric has maintained a sales & service office at Vancouver for the past year, but the new 8,000 sq. ft. plant is for the repair & overhaul, as well as service, of aircraft instruments and accessories. It is now unnecessary for AEL customers to have their equipment sent back to the company's Montreal plant for overhaul, as has been done in the past.

The new plant is under the direction of Harold Ollis, who has been in charge of the AEL Vancouver office since it was opened last year. It is expected that the initial staff of 20 employees will eventually increase to 60 and the premises are designed for a staff of that size.





OFFICIAL OPENING OF . . .

The Institute of Aerophysics

Less than two years after the Defence Research Board announced two grants totalling $350,000 to the University of Toronto for the establishment and operation of an organization known as the Institute of Aerophysics, the official opening of the Institute was held at Downsview Airport, near Toronto. Although the official opening took place on September 26, one of the Institute's two laboratories has been in full operation since January of this year.

Guiding Hand: Director of the Institute and designer of its laboratories is Dr. Gordon N. Patterson, Professor of Aerodynamics at the University of Toronto and considered one of North America's leading authorities in supersonic research. Dr. Patterson is the Canadian who set up the Australian government's aerodynamics laboratory during the war. In addition to his work in Toronto, he is also a member of the aerodynamics panel at the USN Ordnance Laboratory, White Oak, Maryland, where he spends one week in four.

According to Dr. Patterson, the two primary purposes of the Institute are (a) to train scientific personnel for research and development work in the basic physics of gases, applied aerodynamics, and ballistics with special emphasis on rocket propulsion and supersonic flight; (b) to engage in research in aerophysics and to develop practical applications which arise from this work.

Close Touch: An advisory committee for Aerophysics Research has been set up to keep the work of the Institute in close touch with design problems encountered by industry and the armed services. However, a large proportion of the research program is devoted to basic investigations.

AT TOP LEFT is Dr. Gordon N. Patterson, director of the Institute of Aerophysics and designer of the laboratories. At right is a general view of the exterior of the Institute, with the big Hortonsphere predominating. The vacuum sphere is 40 feet in diameter and is made almost entirely of 0.78 steel plates. It is not braced internally and rests on eight columns, spaced equally about the equator. A 51-inch elbow with an expansion joint is bolted to the south pole of the sphere. The wind tunnel is attached to this elbow.

The Institute includes two laboratories, one for basic studies in non-stationary wave motion (fluid dynamics laboratory) and the other for investigations in steady flow over a very wide range of air speeds. The former includes a shock tube and a wave interaction tube in which the non-liner properties of waves of finite amplitude are now under intensive study. The main item of equipment for the latter is a large supersonic wind tunnel suitable in size and speed not only for fundamental studies, but also for the determination of reliable design information.

Those Present: The official opening was attended by a multitude of distinguished aeronautical and other personalities, including Dr. Sidney Smith, president of the University of Toronto, Air Marshal W. A. Curtis, Chief of the Air Staff, who carried out the official opening on behalf of Defense

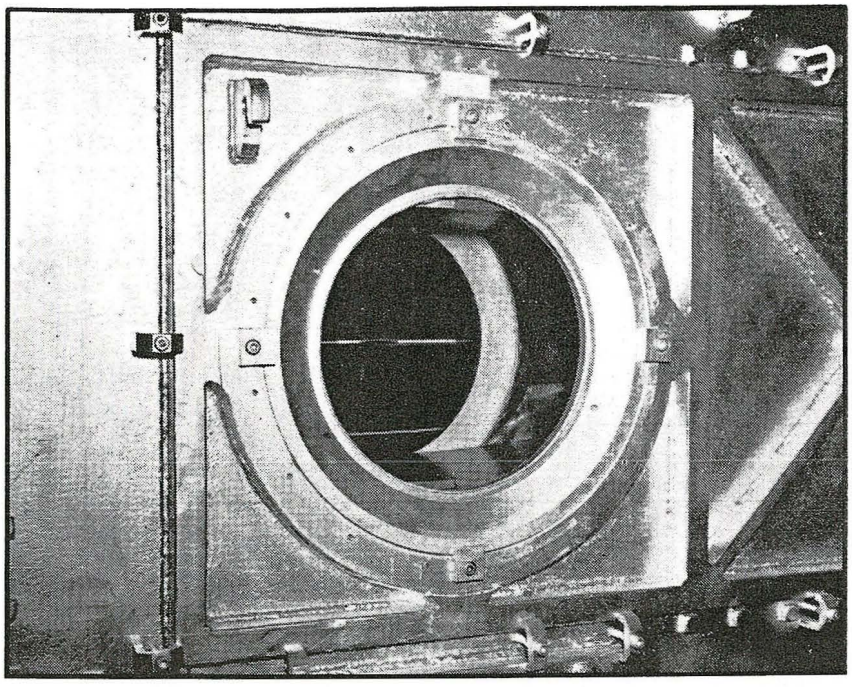
Minister Brooke Claxton, and Dr. O. Solandt, chairman of the Defence Research Board, who spoke briefly on the organization and activities of the Institute.

Said Dr. Solandt, in part: "When the Defence Research Board was formed in 1947, it was clearly recognized that research in the Universities was the foundation on which rested all the applied research in the country, whether in federal government agencies such as the NRC and the Defence Research Board, or in industry. If the Board was to accept responsibility for all aspects of defence research, it must therefore give effective assistance in developing the strength of the Universities.

Different Interests: "It soon became apparent that the interests of the Defence Research Board were different from and did not conflict with the interests of the NRC. The Council was traditionally concerned with fostering research in the universities in a general, rather than in a specific way. The Defence Research Board soon found that its interest in the universities was of two distinct kinds. The first was to ensure that the universities produced an adequate flow of well-trained research workers in fields of special interest to defence, and the second was to make use of unique research facilities or abilities in the universities in the solution of defence problems.

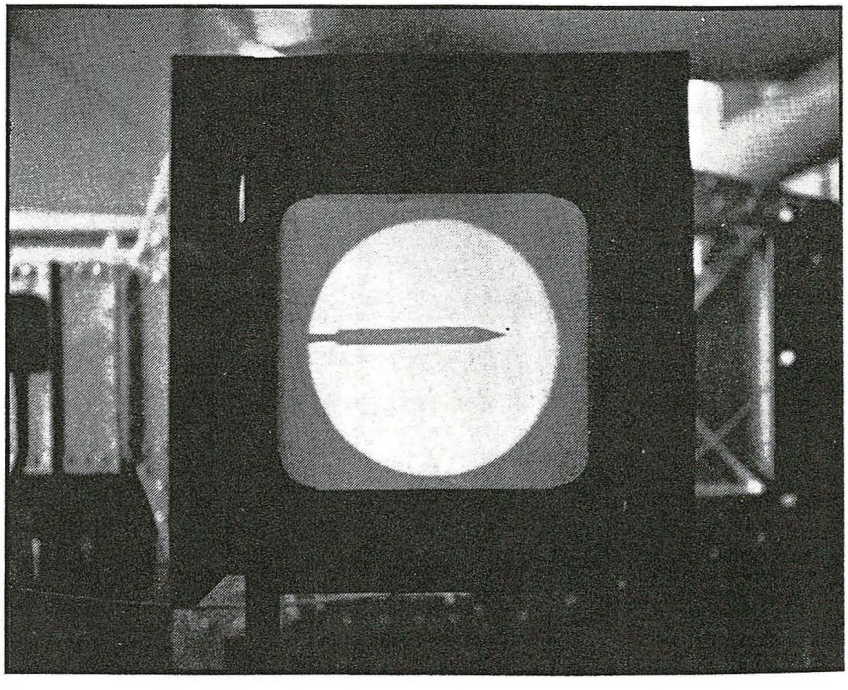
"In reviewing the first of these interests, it was apparent that research and post graduate training in aeronautics in Canadian universities was lagging because of the lack of suitable modern equipment. The Board therefore decided that it would be in the interests of the armed forces, and especially of the RCAF, to give some university in Canada a modern supersonic wind tunnel and related equipment in order to foster research and post-graduate teaching in aerophysics.

RCAF Support: "The proposal that the Defence Research Board make a grant to the University of Toronto for the establishment of these facilities received the support of the NRC and . . . of the RCAF. When is was finally decided to go ahead with the project, RCAF showed its interest . . . by donating the land and the building now occupied by the Institute. The Board made a grant of $250,000 for the conversion of the building and $100,000 toward the operation of the Institute during its first three years . . . the wind tunnel . . . has been planned to be complementary to another supersonic tunnel in Ottawa, which will be completed by the NRC before the end of the year. When these two tunnels are in operation, we will have in Canada first class facilities for many aspects of supersonic research."



MODEL IN WORKING SECTION

A description of the Supersonic wind tunnel by G. V. Bull and I. I. Glass states that the new tunnel will be used to investigate fundamental problems in gas dynamics and for the study of the aerodynamic characteristics and performance of aircraft and missile models at speeds up to Mach 7.0. The tunnel, which has a 16 inch by 15.75 inch test section, accommodates relatively large models and will therefore provide a very useful range of Reynolds numbers. This is the same size of test section that was used to develop the German V-2. The tunnel is of the intermittent flow type where the air is drawn through the test section by a vacuum. The duration of each run is

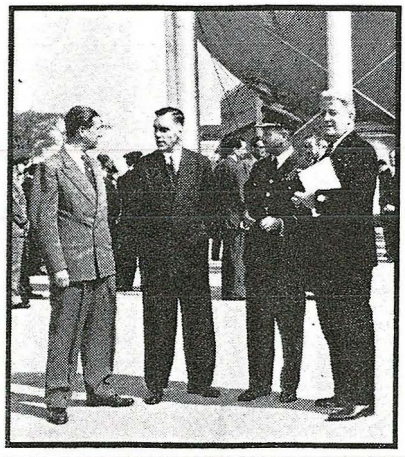


FLOW VISUALIZATION APPARATUS

about 20 seconds.

Major Components: The entire tunnel consists of several major components: the Hortonsphere, which is the large sphere evident in two of the accompanying illustrations; the vacuum pump system; the dry air storage chamber.

The 40 foot diameter Hortonsphere is the potential energy storehouse for the entire tunnel. The pumping system which evacuates this sphere consists of a Fuller duplex rotary vacuum pump driven by a 212 bhp Twin 4 General Motors Diesel engine through a multi-vee drive. The pumps will evacuate the 33,500 cu. ft. sphere to 4.5 mm Hg. abs. in one hour; and as low as 0.8 mm Hg. abs. in 100 minutes. The excellent vacuum tightness of the sphere and piping system was demonstrated by the fact that in 14 hours the entire system lost only 0.25 mm hg. abs.



THE MEN RESPONSIBLE . . .

Dry Air: While the sphere is evacuated, dry air is pumped into the dry air storage chamber by a Lectrodryer Dehumidifier. This unit is capable of handling 6,000 cfm and will completely fill the 36,000 cu. ft. storage chamber with air having a moisture content of less than 0.2 grains per cu. ft. in about 45 mins. The dry air prevents fogging and condensation shocks which would greatly interfere with the study of supersonic flow.

The dry air storage chamber is rectangular in cross-section. Fastened to the floor of this chamber, diagonally across the ends, is a prismatic diaphragm of balloon fabric made of nylon impregnated with neoprene and treated with a flexible aluminum lacquer to give a very low water vapor permeability. As the dehumidifier fills the chamber with dry air, the diaphragm rises and hugs the walls of half the chamber. Meanwhile the air on the other side of the diaphragm is pushed outside the building through screened openings. When dry air rushes into the vacuum chamber during a test run, the diaphragm collapses uniformly to the floor and keeps the inlet pressure constant. Simultaneously, fresh air comes into the room through the screened openings on the other side of the diaphragm to take the place of the dry air drawn into the sphere.

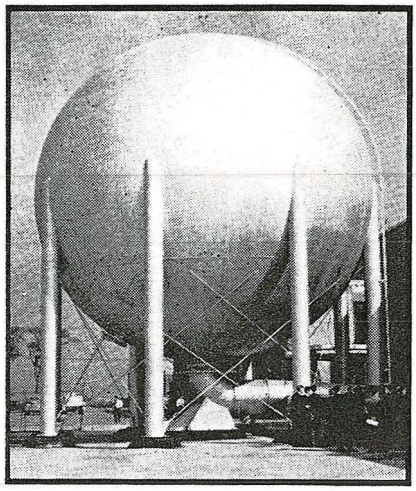
Done with Mirrors: Flow visualization is accomplished by means of seventeen inch diameter mirrors of 170 inch focal length and a General Electric air cooled mercury vapor lamp. What one sees when looking at one of these mirrors is shown in the lower photograph on page 8. Shadow is of the model which is evident in upper phototraph on same page. No flow waves are visible because tunnel was not in operation at the time the picture was taken.

The tunnel ducting consists of a straight inlet section connected to the dry air storage room, turbulence screens, subsonic contraction section, a manually operated gate valve, the working section, a type of variable diffuser, a model catcher screen, an expansion coupling, a quick acting valve and a fixed diffuser bolted to the elbow of the vacuum sphere.

Working Section: The inlet ducting is constructed of welded ½ in. steel plate. The subsonic contraction section is similar in construction and provides a 10:1 contraction ratio. The working section houses the nozzle blocks, mounting quadrant, and internal balance. The mounting quadrant may be freely rotated to provide any required angle of attack from plus 15° to minus 15°. The model under test is so mounted that it has its centre of rotation at the centre of the quadrant circle.

When the required angle of attack is obtained, the quadrant is securely held by means of clamping screws. By means of a vernier scale, the angle of attack can be set to within one minute of the desired value. Mounted inside the model is a six component strain-gauge balance, enabling measurement of lift, drag, and side forces, and rolling, pitching, and yawing moments.

All in Twenty Seconds: A quick acting valve is pneumatically operated to completely open in less than ¾ of a second, thus providing for rapid starting of the tunnel. When this valve is opened, a flow of air is induced in the direction of the vacuum sphere. The dry air initially at rest in the atmospheric storage chamber accelerates into the 5 ft. by 5 ft. inlet section. The turbulence screens in this section eliminate any large scale turbulence. The velocity is increased as the gas flows through the subsonic contraction section.



. . . FOR THE HORTONSPHERE.

Supersonic flow is obtained by means of what is known as a Laval nozzle. The subsonic portion of the Laval nozzle accelerates the flow until the local velocity equals the speed of sound at the throat. The gas is then expanded beyond the throat to supersonic speed. The Laval nozzle provides a region of supersonic flow at constant Mach number during the entire blast duration. It is in this region that the model is mounted and tests are conducted. Blast times may vary from an infinitesimal value up to 20 seconds, depending on the Mach number and the initial pressure ratio.

PICTURE AT top of page 8 shows a model in the actual working section. Angle of attack of model may be varied. Lower picture on same page shows same model as it appears on the flow visualization screen. Flow appears as shadows. Picture at left of this page shows, l to r, Dr. Patterson, Dr. O. Solandt, chairman of the Defence Research Board, Air Marshal W. A. Curtis, Chief of the Air Staff, and Dr. Sidney Smith, president of the University of Toronto. Picture at right is close-up of the Hortonsphere.

Rocket Research in Canada

The Defence Research Board is giving preliminary study to a proposal for an expanded rocket research program in Canada.

The new proposed project would concern research into upper atmosphere phenomena such as aurora borealis, the electrically-charged ionospheric belt, cosmic rays, meteors, solar radiation, chemical composition of the atmosphere and electron density distribution, which is important in radio wave propagation.

Such a project would involve initially the firing of two rockets 60 to 100 miles into space with maximum instrument payloads of 150 pounds. It would be in addition to the DRB rocket program already in progress.

United States Nike-Cajun rockets were used in November in two successful firings of Canadian-instrumented nose cones about 90 miles into space from Fort Churchill, Man. The Board's Armament Research & Development Establishment (Carde) at Valcartier, Que., which built the cones and their instruments, plans to fire Canadian-made high-altitude rockets this year, possibly in the summer or fall.

Nearly 50 CARDE-designed rocket motors were fired in the establishment's static test bed last year. Seventeen-inch-diameter rocket engines are about to be tested statically.

This program is connected with the Board's research into development of solid-fuel propellants to power countermissiles capable of destroying ICBM's in flight.

The proposal to the Board for the new project came out of a recent study conference at the Defence Research Telecommunications Establishment at Shirley Bay, near Ottawa. The proposal then was placed before a symposium on rocket research of the upper atmosphere organized by the National Research Council. The idea was to interest scientists from non-government as well as government agencies in a rocket research program apart from the purely defence program at Valcartier. Officials say this object was fully achieved. Scientists from several Canadian universities delivered papers at the symposium on what new and vital information could be gleaned from a rocket research program.

There is no indication when a decision may be taken on whether to undertake such a program.

Price of Falcons

Ottawa estimates cost of the Falcon air-to-air missile, which may be used in the Avro Arrow, at approximately $30,000,000. This amount would purchase 1000 Falcons at a price of $30,000 each.

Bomarc Sites to be Set

No decision has yet been made by the Federal Government on location of Bomarc launching sites. According to Defence Minister Pearkes, "several sites are now being looked at, and some preliminary surveys have been made."

Mr. Pearkes mentioned that a spot near Lac Macaza, a wilderness emergency air strip some 120 miles north of Montreal, is among the possible sites under consideration. There are to be two Bomarc bases, one in Ontario and one in Quebec.

The sites will be roughly situated on a line drawn from Sault Ste. Marie to Quebec City; it is felt that from here the anti-aircraft missiles would be able to defend the industrial area lying to the south. The sites will be smaller than 100 acres each and the Bomarcs will likely be launched from below ground level. The Bomarc B's destined for use with the RCAF will have an effective range of plus 400 miles.

ATLAS ICBM PRODUCTION: First photo of the USAF's Atlas missile production line shows the assembly and check-out section of the line. The stainless steel missiles are 10 ft. in diameter, 75 ft. long. At upper left, booster sections are pulled back to permit installation of boosters and sustainer engine of the Atlas.

Firefighting Missile

The Sidewinder, which built a reputation during the days of the Quemoy crisis, appears to be in for an important new role in the fighting of major fires. The U.S. Forest Service has been experimenting with the use of the Sidewinder with helicopters. Suspended on a platform under the helicopter, the missile is fired while the mother ship hovers. In flight, the missiles are controlled by infrared sensing devices which lead them to targets producing the greatest heat. In this way, the fire-extinguishing version can seek out and destroy the heart of the fires.

Shortly, it is hoped that the method can be brought into play to squelch fires in industrial plants, oil refineries and chemical factories. The last remaining link to make this plan fully workable is already under development. Experts hope for a solid, foam-type material designed particularly for extinguishing high-intensity fires.

Wizard Anti-ICBM

The U.S. Defense Department's Advanced Research Projects Agency has authorized two contracts totaling more than $25 million with the Convair Division of General Dynamics Corp. One contract is for theoretical and limited experimental studies of ballistic missile defence systems; the other for basic research into phenomena involved in ballistic missile operations. The work at Convair will be under the direction of J. M. Pasternak, director of the Wizard anti-ICBM studies for the past four years.

U.K. Rocket Fuel Plant

A peroxide fuel plant, claimed to be the largest in the world, was opened at Warrington, Lancs., England, at the end of November by Laporte Chemicals Ltd. The plant will provide high test peroxide fuel for rocket motors and guided weapons.

The company's output of high strength hydrogen peroxide will now be doubled, and a new method of manufacture will cut production costs. Apart from supplying the aircraft in-

course in March; each class will have 20 men, with a new class starting every month.

Canada/U.S. Rocket

In a joint experiment carried out by Canadian and American scientists, a 48-lb. payload of equipment was launched by means of a four-stage rocket to a height of 560 miles above Wallops Island, Virginia. Objectives of the test were to measure the intensity of galactic noise, and to test the performance of the rocket at high altitude. Take-off weight of the vehicle was 7000 lbs. and the payload is believed to have gone into the Atlantic some 600 miles east.

BP to Supply Sabena at UL

Jet fuel requirements of Sabena Belgian World Airlines in Montreal will be filled by BP Canada Ltd.

Awarding of the contract, by which Sabena jetliners reaching Montreal will be fuelled from BP's new terminal at Dorval Airport, was announced by the two companies last month. The new fuelling service, scheduled to commence April 1, is a further extension of Air BP's international aviation facilities which already supply Sabena in other parts of the world. It will coincide with the inauguration of Sabena's regular jet services via Montreal.

New Crash Tender

The Vancouver airport board has recommended to city council the purchase of a $76,000 LaFrance crash truck capable of blanketing a large transport with 10,000 gallons of foam in two minutes. An early decision is expected.

Airport manager Bill Inglis said the equipment is the best available and is being purchased by a number of airports in North America.

LETTER TO THE P.M.

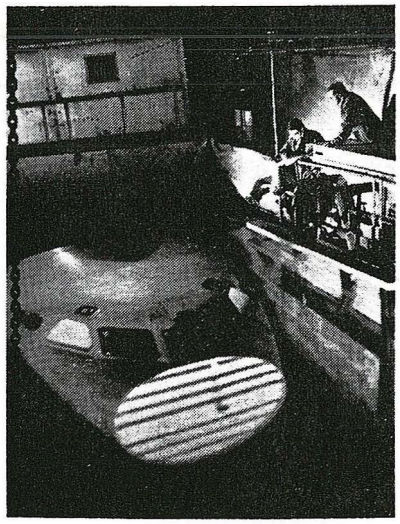
(Continued from page 41)

Air charter transportation is in a unique position vis-a-vis ground transportation in that its capital outlay is heavy, both with respect to air equipment and ground facilities.

In spite of the above factors of the present and indicated air policy the operators of public air transportation are faced with unrestricted licensing — a situation which does not apply even to taxi or bus operators.

Having regard for the foregoing, this Association has therefore reached the following conclusions:

1. The Association is fully satisfied that unrestricted licensing as a substitute for regulated competition will cause a much less efficient service to the public, a serious setback to the industry with a consequent delay in the development of the country.
2. It is our further opinion that the unrestricted issue of licenses cannot be construed as being in the best interests of the public, either from a convenience or a necessity point of view. Nor can it be construed as being the best interests of the immediate, or long term, development of Canada as a whole.
3. We do not believe that there should be a restriction of free enterprise as it effects air transportation, but rather that competition should be regulated as provided for under the Aeronautics Act.
4. We believe that free enterprise must be fitted into the economy of



DH-121 STATIC TESTING: Shown is the fuselage nose section of the Airco DH-121 undergoing static and fatigue pressure testing in one of de Havilland's Hatfield water tanks. Present tests are part of a series covering other major components which will precede the proving of complete airframe in a specially-constructed water tank.

Government Aviation Spending

(As compiled from the Estimates for the Fiscal Year ending March 31, 1951)

FISHERIES

	1950-51	1949-50
Charter of Aircraft	$ 72,443	$ 61,100

MINES AND TECHNICAL SURVEYS

Purchase of Air Photographs	15,000	5,500

NATIONAL DEFENCE

Navy

Stores and Equipment: including spare parts, acquisition, construction, and repair and upkeep of ships and Naval aircraft, Naval and aircraft stores	$ 38,135,386	$ 27,270,595
Fuel costs for ships, aircraft, and mechanical equipment	2,200,000	2,900,693

Air Force

RCAF (Regular)

Civil salaries and wages, pay and allowances, transportation, etc.	49,907,285	44,814,943

RCAF (Reserve)

Civil salaries and wages, pay and allowances, transportation, acquisition and construction of properties	3,374,895	3,648,675

Royal Canadian Air Cadets

Civil salaries and wages, pay and allowances, transportation, etc.	481,775	363,045

General

Acquisition, construction and maintenance of properties	23,508,516	27,368,513
Personnel supplies and service	11,963,898	10,108,091
Stores and equipment, including signal and wireless stores, ammunition and bombs, armament stores, aircraft, engines and spares, including overhauls, photographic equipment, and miscellaneous	80,037,035	66,725,340
Fuel costs for aircraft and mechanical equipment	7,087,246	4,317,947
Sundries	3,567,526	4,244,564

Aerial Photographic Survey

Pay and allowances	533,380	709,033
Transportation, etc.	49,329	120,612
Personnel supplies and services	85,321	118,538
Stores and equipment, signal and wireless stores, aircraft, engines and spares, including overhauls, photographic equipment, etc.	1,169,965	881,800
Fuel costs for aircraft	128,922	130,000
Sundries	11,825	7,622
Less: Recoverable from the Department of Mines and Resources	940,000	940,000

Northwest Staging Route

Civil salaries and wages	1,220,768	1,030,387
Pay and allowances	2,991,519	2,425,461
Acquisition, construction and maintenance of properties	3,639,070	3,074,477
Personnel supplies and services	919,191	931,582
Stores and equipment: signal and wireless stores, aircraft, engines and spares, including overhauls and miscellaneous stores	696,380	1,011,685
Fuel costs for aircraft and mechanical equipment	171,080	291,000
Sundries	169,264	115,885

Search and Rescue

Pay and allowances	960,844	695,132
Transportation, etc	76,370	60,633
Personnel supplies and services	94,702	99,080
Stores and equipment: signal and wireless stores, aircraft, engines and spares including overhauls and miscellaneous stores	1,409,810	1,003,260
Fuel costs for aircraft and mechanical equipment	137,385	131,384
TOTAL, RCAF	$194,350,000	$174,125,577

General Services

Royal Canadian Air Force Association	15,000	15,000
Air Cadet League of Canada	40,000	40,000

NATIONAL HEALTH AND WELFARE

Civil Aviation Medicine	54,880	49,015

POST OFFICE

Mail Service by Air	8,335,747	8,228,821

PUBLIC WORKS

Seaplane landing at Alert Bay, B.C.	45,000	----
Seaplane landing at Massett, B.C.	35,000	----

RESOURCES AND DEVELOPMENT

Sundries, including hire of aircraft	106,915	117,445

ROYAL CANADIAN MOUNTED POLICE

Aviation Services	184,961	189,677

DEPARTMENT OF TRANSPORT

Air Service

Air Service Administration	203,890	129,775
Control of Civil Aviation	676,656	645,124
Airways and Airports		
Construction and improvements, including radio facilities	9,430,340	13,546,801
Operation and maintenance		
Civil aviation services	7,708,041	8,695,347
Radio aviation services	4,489,730	4,512,050
Airway and Airport traffic control	1,050,659	997,074
Grants to Organizations for the Development of Civil Aviation		
RCFCA	10,000	10,000
NRC	50,000	50,000
Flying Clubs, Flying schools and student pilots	250,000	250,000
Contributions to assist municipalities to improve existing airports, etc.		
Pentecote, P.Q.	25,000	25,000
Rouyn-Noranda, P.Q.	50,000	25,000
Val d'Or, P.Q.	62,000	189,000
Northwest Communication System	497,287	500,000
Meteorological Service	5,559,075	5,625,595
Radio Directional Finding Stations	1,952,250	1,897,783
Air Transport Board	229,335	188,745

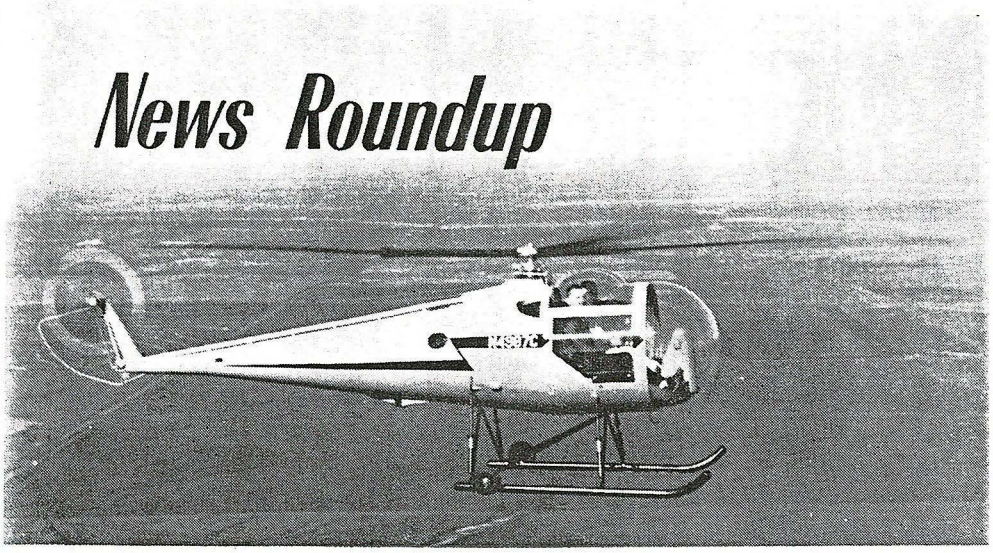
Marine Service

Aerial Ice Survey	13,000	13,000
TOTAL, DEPARTMENT OF TRANSPORT	$ 32,257,263	$ 37,323,294

Approximate Total All Government Aviation Spending	**236,312,209***	**220,155,429***

*This figure does not include the amount to be spent on Naval Aviation, as there is no breakdown available of the RCN figures which are given in these tables.

News Roundup



BRANTLY B-2 HELICOPTER is being distributed in Canada by Associated Equipment Co. FAF price for basic machine, Canadian duty and sales tax paid, is $21,995. Powered by 180 hp Lycoming, the 1600 lb. B-2 carries two, cruises at 100 mph. Total operating cost is estimated at $18.63 per hour.

OW Terminal Opens

The ultra-modern $6 million air terminal building at Ottawa has gone into public service. Initial reaction from Canada's travelling public seems to be all favorable. The big, handsome building went into use in mid-June, and was officially opened by Prime Minister Diefenbaker June 30.

Ottawa visitors describe the new terminal as a refreshing experience for any who have been through the small, dirty and crowded "chicken-coop" that used to serve as terminus in Canada's capital city. Whereas 50 people comprised a mob in the old building, the new one handles 500 with no difficulty.

The new Uplands building is expected to handle up to 400,000 passengers within the first year of its service. Within ten years, authorities are predicting that it will see up to a million people per year.

In addition to the usual airport facilities found in terminal buildings, the new edifice houses a DoT controller school and Canada's new National Aviation Museum (for more news about the Museum, see "Names in the News," this issue.)

Controllers Organize

The founding convention of Canada's newest aviation organization — the Canadian Air Traffic Control Association — was held early in May when delegates representing Canada's some 800 ATC controllers met in Winnipeg.

Don Morton of Winnipeg was elected first president of the embryo association, while Hugh Challis of Vancouver was named vice president. Other officers chosen were Herb Duggan, treasurer, and Les Bryant, secretary, both of Winnipeg.

The eight-man board of directors comprises one representative from each flight information region in Canada and includes: Jim Jordan, Vancouver; George Wilkins, Edmonton; Roy Cushway, Saskatoon; Don McLaughlin, Toronto; Ken Gray, Montreal; Jack Taylor, Moncton; Buck Buchanan, Goose Bay. A director still remains to be appointed by Gander FIR, which was unable to send a representative to the meeting.

Aims of the new association embrace research aimed at the solving of the many problems faced by ATC.

Membership will include corporate and associate members so that any company or private individual interested in the work of the association may join.

New Pat Bay Terminal

Tenders for the first stage of construction of the long-awaited new terminal building at Patricia Bay airport, serving Victoria, B.C., will be called before the end of the present fiscal year, March 31, 1961.

A DoT spokesman said the new terminal is expected to be completed in 1962 or 1963.

Local authorities have waged a four-year duel with Ottawa to get a deal on a better airport. The tenders will be for the first stage of an over-all airport improvement program.

Plans announced by Transport Minister Hees in 1957 included a new terminal and lengthening of runways. Last year the runways were strengthened — but so far have not been made longer.

The Government has announced it plans to build a $200,000 air terminal building at Port Hardy on the northern end of Vancouver Island. No details were given but it is expected tenders will be called before the end of the current fiscal year, March 31, 1961.

Crown Assets Sales

The Crown Assets Disposal Corp. annual statement for the year ended March 31, 1960, reveals that during the year under review, over $200,000 worth of surplus aircraft and aircraft components were sold to various companies and individuals. Largest single purchase was that of a Lockheed aircraft complete with two engines, equipment and spares for $32,500 by W. C. Hanaway, of Winnipeg.

Trans-Florida Aviation Inc. bought eight Mustang aircraft complete with Merlin engines for $24,000, while James DeFuria, of DeWitt, N.Y. picked up 38 Merlins for the bargain price of $5210. Avro Aircraft Ltd., of Toronto, is listed as having purchased aluminum sheets worth $11,655. Canavia Corp. Ltd. acquired ten Sea Furies with engines for $5000.

15,000 Pilots

There are now over 15,000 licensed civil pilots of all kinds in in Canada, the most recent DoT summary of licensed personnel shows. The total actually went over the 15,000 mark some time during 1959 and as of March 31 of this year, had reached 15,689, up from 15,496 at the end of 1959 and 13,632 at the end of 1958.

Most of the increase continues to be in the private pilot category, which has shown near explosive growth in recent years. There are now 11,237 private licenses in force, an increase in the 15 months from the end of 1958 of nearly 1800.

A breakdown of the March 31, 1960, total (with comparable figures for Dec. 31, 1959 appearing in parentheses) shows the following: Glider 385 (376); Private 11,237 (10,596); Commercial 2449 (2338); Senior Commercial 434 (407); Airline Transport 1184 (1179).

Figures covering the same period for

RCAF FLYING TIME

Training	70,699	hours
Transportation	34,496	"
Photographic	5,205	"
Testing	4,976	"
Ferrying	3,080	"
Test and development	1,935	"
Other flying	8,044	"
TOTAL	128,435	hours

RCAF AIR TRANSPORT OPERATIONS

	1948-49
Air miles	2,246,416
Number of passengers	33,552
Passenger miles	29,281,541
Cargo weight (lbs.)	5,665,350
Ton miles	2,295,930
Mail weight (lbs.)	224,722
Mail ton miles	95,592

EXTRACTS FROM . . .

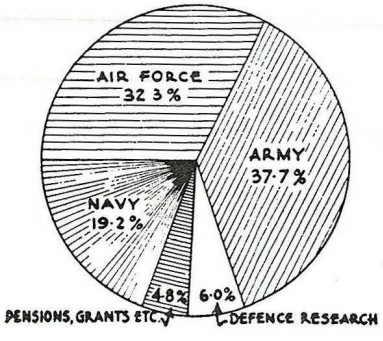
The 1949 Report on the Department of

National Defence

Distribution of the Defence Dollar

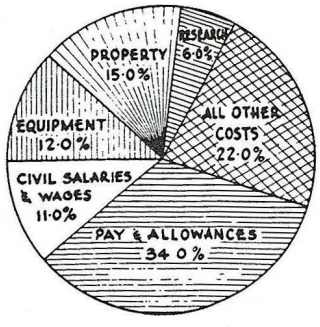
BY SERVICES

1948-49



BY REQUIREMENTS

1948-49



The annual report of the Department of National Defence, covering the fiscal year 1948-49 (ending March 31) was tabled in the House of Commons on October 19 by Defence Minister Brooke Claxton. *Aircraft and Airport* has taken certain material from the report which the editors think will be of interest to aviation people in Canada. The number of the paragraph from which each extract has been taken, is also given.

12. The Air Force, in addition to its training program, in which the first postwar wings parades were held, flew almost two and a quarter million miles in transport operations, and broke previous records in air photography by covering close to a million square miles in surveys. Over a hundred rescue missions were flown, involving 2,600 flying hours. The modernization of equipment was pursued with the acquisition of over 70 new Vampire planes and a number of aircraft of other types.

20. In the RCAF (Auxiliary) University Flights there were 344 students divided among seven universities, and under the University Air Training Plan 366 students were given summer employment in various branches of the organization.

37. The Canadian Joint Air Training Centre at Rivers, Manitoba, is a tri-service training station. Its functions are to provide training in matters relating to the joint employment of air and ground forces, to evolve Army-Air doctrines, to conduct service trials, and to make recommendations for the improvement of techniques and equipment; but the training of soldiers in air-transported and parachute operations has been the major object. In addition, the centre at Rivers is concerned with the training of the RCN Carrier Air Group in ground attack techniques, instruction of Army light aircraft pilots and glider pilots, training of RCAF personnel in the tactics and techniques of airborne operations, and the training of all three services in photographic interpretation.

38. In August of 1948, 18 Carrier Air Group of the RCN moved by air from Dartmouth, N.S., to the Canadian Joint Training Centre at Rivers. The RCAF provided excellent co-

operation, transporting by air not only all the personnel of this Naval group who did not fly in their own planes, but also flew out stores totalling 60,000 pounds. With an Army air-carrying team supervising the loading, this was a good working example of tri-service cooperation.

39. . . . Of primary importance was the conversion of one infantry battalion into a parachute-air transported battalion.

Operations

42. (With reference to the B.C. floods during May and June of 1948) . . . The Air Force flew 900 sorties to carry over two million sandbags, fifty-five tons of freight (from water pumps to blood plasma) and several hundred soldiers. . . . 100 aircrew were on continuous duty in addition to 450 other personnel engaged in emergency activity.

44. The RCAF is coordinating authority for search and rescue operations and maintains for this purpose an organization which has been approved by IACO. Search and Rescue coordination centres are located at Halifax, Trenton, Winnipeg, Edmonton, and Vancouver, each of which has available Dakota, Norseman, Canso, and helicopter aircraft especially equipped for search and rescue work over land or water. Also available for this work are high speed rescue launches of the two marine squadrons stationed at Dartmouth and Patricia Bay. One hundred and sixteen missions were undertaken during the year, of which forty-two were searches for missing aircraft, thirty-five for missing vessels, twenty eight for the evacuation of sick or injured persons and eleven for the provision of medical assistance. Almost 2,600 hours were flown on these missions among the most noteworthy of which was "Operation Attache", a thirteen day search for USN aircraft lost in September on a flight from Churchill to The Pas. The five occupants of the plane were successfully located and rescued.

Recruiting

48. RCAF recruiting stations, which had previously in most cases been located on Air Force stations, began during the year to be moved into major cities chosen across the Dominion on a population-density basis. After careful study the educational qualifications for both aircrew and groundcrew have been lowered, junior, matriculation instead of senior now being the requisite for aircrew.

49. Total intake . . . for the Air Force (was) 709 officers and 2,909 airmen.

181. Two Carrier Air Groups have been maintained by the RCN and have been embarked alternately in the one carrier. The Carrier Air Group when not afloat is based at Dartmouth Naval Air Station, which was taken over during the year from the RCAF. Early in the year a Naval Air Stores Depot was established at Dartmouth. In May, 1948, the RCN established . . . a School of Naval Aircraft Maintenance to provide instruction to air mechanics and ordnance and electrical personnel.

182. The two Carrier Air Groups of the RCN, the 18th and 19th, are divided into two squadrons each. The 18th Carrier Air Group is composed of 825 and 826 Squadrons, each equipped with 10 Fireflies, which are anti-submarine aircraft. The 19th Carrier Air Group is composed of 803 and 883 Squadrons, each equipped with 8 Sea Furies.

205. HMCS Magnificent, a light fleet carrier, was obtained on loan from the RN to replace HMCS Warrior, and was commissioned on April 7, 1948.

Meteorology

206. HMCS St. Stephen, formerly a frigate, but now converted for weather reporting, shared operating duties with the USCG at the weather station between Labrador and Greenland, in accordance with the ICAO agreement. During the year she completed six patrols on this station.

358. At the end of the fiscal year the strength of the regular component of the RCAF was 2,701 officers and 11,851 airmen and of the auxiliary, 429 officers and 998 airmen. The reserve, a pool of partially trained personnel, is now in course of organization. On March 31, 1949, there were 46,423 officers and airmen enrolled in the six classes of the reserve.

385. The Flying Training School at Centralia graduated 84 pilots, including two RCN, and had 118 pupils end of the year. The planned intake of trainees was increased from 20 to 36, including three RCN, every eight weeks. The wings parade held at this school on June 21, 1948, marked the graduation of the first of the new pilots, 14 in number, trained since the termination of the war.

386. The Instrument Flying School, also at Centralia, graduated 91 RCAF and 3 RCN pupils. Planned intake per course is 20 trainees.

Training

387. The Central Flying School at Trenton gave training to 198 pupils. Two RCN officers were graduated as Link Trainer Instructors. Three basic flying instructor courses were conducted with 44 graduates, and 66 former instructors were recategorized as flying instructors after refresher training. Thirty-nine pilots were converted to Vampire aircraft. Twenty-nine Flight Cadets of the University Air Training Plan, of whom 24 qualified for continued training, received the first year course of ab initio flying instruction, and 18 completed the second year.

388. The Flying Boat Conversion School at Sea Island graduated 18 pilots. It is intended to operate this school only during the period September to April, with an intake of eight pupils every ten weeks.

389. The Air Navigation School at Summerside conducted a Staff Navigation Instructors Course, which was completed by 16 RCAF navigation officers and one RCN observer, and a Staff Pilot-Navigation Instructors Course, which was completed by five pilots with eight more in training at the close of the year. A Specialist Navigation Course began on October 22, attended by eight RCAF and one USAF officer . . . Basic navigation courses at this school commenced on March 28, 1949; intakes of 18 pupils every eight weeks are planned.

Electronics

391. The Radar and Communication School at Clinton continued radio officer training with courses of 15 students every eight weeks. The standard of air training phases of these courses was considerably improved by the receipt in October of the first Dakota radio trainer. By the end of the year, four of these "flying classrooms" had been delivered.

392. The first postwar wings parade was held at this school on May 6, 1948, when 13 officer graduates received the

new double-wing badges for radio officers and radio navigators.

393. The Air Armament School at Trenton graduated 63 pilots and 58 radio officers, and also gave familiarization bombing and gunnery flights to all technical courses.

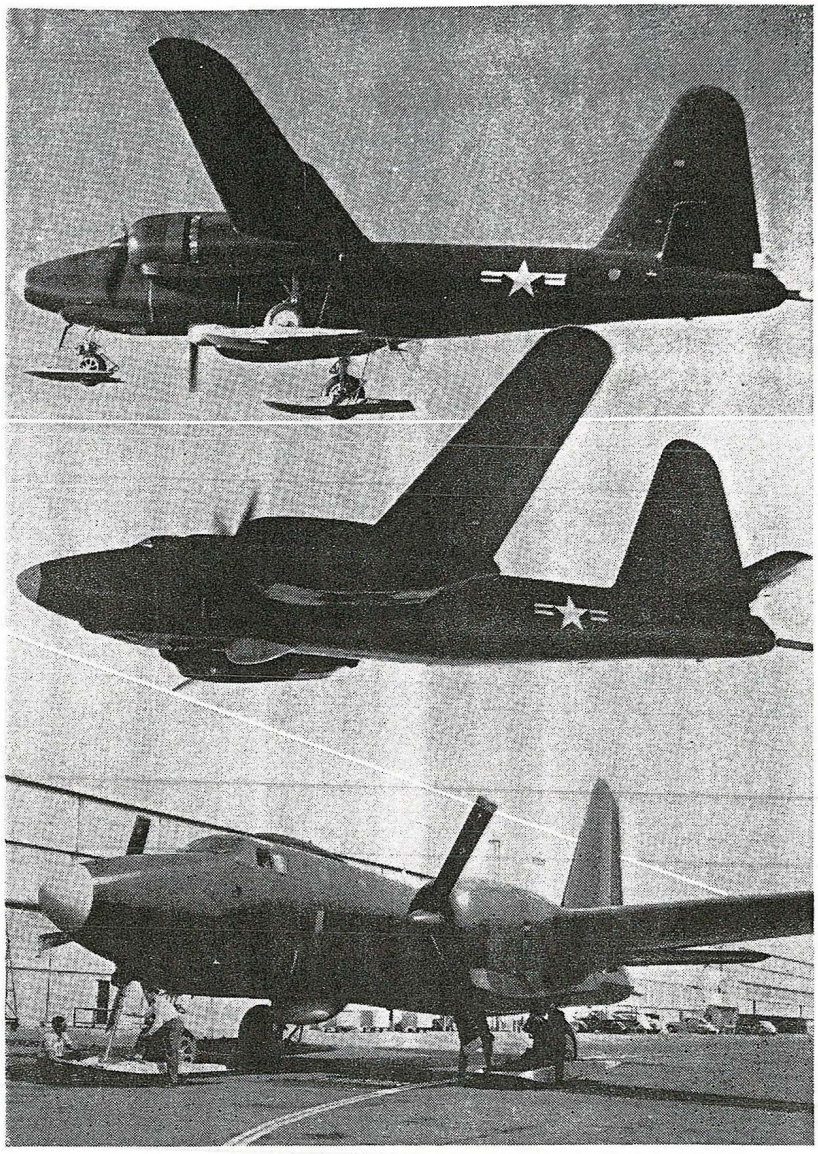
395. Ten of the proposed eleven auxiliary squadrons have now been activated. The eight fighter squadrons carried out flying training and operational exercises, including ground-controlled interception problems with the use of radar. The two tactical bomber squadrons were engaged on flying training and conversion to operational aircraft; one carried out several operational training exercises.

419. One hundred and nine aircraft (73 Vampire and 36 Auster VI) were received from the U.K. and erected. Two hundred and forty-four aircraft (172 Harvar, 37 Dakota, 15 Expeditor, 10 Canso, 6 Mitchell, and 4 Lancaster) were reconditioned and modified or converted for various uses.

428. During the year the Chinook, Canada's first experimental jet propulsion engine, completed 400 hours on test runs which proved the mechanical design of the engine and achieved the planned performance. In February the Orenda, a larger development of the Chinook, made its first run and completed over 100 hours on test by the end of the year. It gives every indication of satisfactory operation.

429. A series of tests at McGill University was sponsored by the RCAF to determine the performance of a Canadian experimental jet engine fuel.

447. It has been decided that the RCAF will use GCA as the standard landing aid rather than the ILS used by commercial air lines in accordance with ICAO. GCA systems were established at St. Hubert and Edmonton and a training school for GCA operators and technicans was set up at Dorval. As highly trained GCA crews graduate from the school, additional installations will be made during 1949 at Greenwood, Mont Joli, Bagotville, and Centralia. Six GCA units are now owned by the RCAF. Procurement action was commenced to obtain additional units of a new design which will, amongst other improvements, be air transportable in North Star aircraft. Installation of an instrument landing system was partially completed at the flying training school at Centralia to provide a training facility for RCAF pilots.



Neptune on Skis

No chance of the USN's Lockheed P2V Neptunes becoming snowbound. With 16 foot aluminum skis fitted over the wheels of its regular tricycle landing gear, the Neptune is claimed to be the largest combat aircraft ever equipped for Arctic operations. The aircraft has already been test flown.

Retractable in flight, the skis are tucked inside a fairing underneath the engine nacelles and at the nose of the airplane to reduce in-flight drag. For landings on standard runways, the three wheels protrude through openings in the skis. For snow operation the skis are lowered farther, offering an area of 64 square feet for each of the two main skis and 32 square feet for the nose ski.

The top photograph shows the undercarriage in a down position. The centre shot reveals the neat fairing job which Lockheed has effected when the undercarriage is fully retracted. The bottom picture gives some idea of how the Neptune looks on the ground.

Fully equipped for cold-weather operation, the P2V has been specially fitted with super-sized heaters, a sun-compass, special radio and radar for use near the magnetic poles, and additional fuel tanks for extra-long range operations.

There are also special camera installations, and winter rescue gear is contained in the aircraft's fuselage. The camera's are intended for mapping work.

The Department of Defence Production and the Aircraft Industry

By D. D. P.

THE OVERALL function of the Department of Defence Production — procurement on behalf of the Armed Services — appears in its most complex form when applied to the Aircraft Industry. This portion of the Department's function is performed primarily by the Aircraft Division in co-operation with other divisions of the Department. It has assumed various phases since the beginning of the Department, with a progressive change in emphasis as difficulties approach solution.

When the Department was established in March, 1951, there was, in Canada, a general insufficiency of facilities for production of defence items and components. Because of the threat of immediate hostilities, it was necessary, in many instances, to begin defence procurement through direct purchases from the U.S. At the same time, industry and government co-operated to establish necessary facilities in Canada in accordance with governmental policy of producing our own military end items, wherever practical.

In the process of establishing these facilities, the Government recognized that there were cases requiring specialized facilities for which industry could not, under the circumstances, be expected to take the risks involved. These cases were particularly obvious in the aircraft field where the Government has been the principal customer. To alleviate this difficulty, the Government implemented two measures—additional capital cost allowance and capital assistance.

Fast Write-Off: The first of these provides a system of fast write-off for tax purposes which permits current tax reduction during a period of anticipated high income and has permitted industry to expend private capital for defence work with a lesser risk of commercial loss should defence requirements decrease substantially after a four-year period. If no decrease occurs after this period, the reduced portion will be returned to the Government by normal taxation process since assets can be depreciated only once.

Capital assistance is intended primarily to provide established firms, which already have basic facilities and know-how, with additional machine tools to produce specialized military items but has, on occasion, been utilized to finance entire plants where it was desirable to bring into the country special skills and knowledge.

The Aircraft Industry was, in the early stages of the present program, faced with the world-wide shortage of strategic materials, as well as a shortage of such items as machine tools. The Department found it necessary to impose informal control on materials from Canadian sources, and more formal controls on some items obtained from the U.S. Through co-operation of Government and Industry and an overall increase in production, this difficulty has been reduced to the point where even informal controls are unnecessary.

Spreading the Load: When facilities were being established and now when facilities are being utilized through the awarding of defence contracts, a most important consideration from the Government point of view, was and is location.

Wherever possible the Division has attempted to spread the work load of defence requirements so as to include all parts of the country. The production side of the Aircraft Industry does not lend itself too readily to this procedure, but in those cases where costs and production rate will not suffer prime contractors have been encouraged to employ sub-contractors on this basis and assistance has been extended to the sub-contractors through capital assistance and accelerated depreciation.

In the repair and overhaul field, on the other hand, it is not only economically feasible but sound to employ contractors across the country since aircraft are located and require servicing in various areas.

At the present time, strategic materials present no acute problems. Capital assistance projects for establishment and rounding out of facilities are, for the most part, nearing completion and a major portion of defence procurement can now be accomplished in Canada.

establishd pattern

IMPLEMENTATION of the requirements of the Department of National Defence through direct procurement action, which is the prime function of the Department of Defence Production, can now be accomplished in accordance with a set pattern. When a contract demand or an enquiry is received in the Department, it is directed to the appropriate production officer within the Division for discussion with industry, examination of facilities, and recommendation as to sources and method of purchase. In those cases where specialized equipment is requested under capital assistance procedures, the request is examined by the production officers before being actioned.

Applications for accelerated depreciation are also examined by production officers. In fact, all problems relating to establishment, rounding out or evaluation of facilities are handled in the first instance by officers in the Production Section of the Aircraft Division.

Contract Procedure: All contractual matters, on the other hand, from the issuance of enquiries and tenders to the final follow-up on delivery schedules are primarily the responsibility of the Contracts Section of the Division which acts on the recommendations and findings of the Production Section. Because of lack of cost experience in the Aircraft Industry, many of the

(Continued on page 94)

supplies); **Laurentian Air Services,** Ottawa (rebuilding Wasp Jr. engines for installation in new DH Beaver aircraft); **General Steel Wares** Ltd., London, Ont. (CF-100 components); **Victory Tool & Machine** Co. Ltd., Montreal (aircraft parts and tools); **Aircraft Services (Western)** Ltd., Winnipeg (military aircraft overhaul under subcontract from MacDonald Bros.); **Decca Radar** Canada Ltd., Toronto (radar and navigation equipment); **High Duty Alloys,** (Canada) Ltd., Toronto (special light alloy metals in forged, cast, and extruded forms); **Stratoflex of Canada** Inc., Toronto (flexible hoselines with detachable and re-usable fittings, and associated products); **J. W. Lawrence (Canada)** Ltd., Montreal (repair & overhaul of heat exchange equipment); **B. F. Goodrich Rubber** Co. of Canada, Ltd. (airplane tires, de-icing equipment, etc.); **Dunlop Tire & Rubber** Goods Co. Ltd., Toronto (tires, rubber seals, components, etc.); **McQuay-Norris** Mfg. Co., Toronto (manufacturer of parts for piston and jet engines); **Alloy Metal Sales** Ltd., Toronto (nickel aloys, stainless steels, aluminum alloys, in all commercial forms and shapes); **T. C. Chown** Ltd., Montreal (seats, pressure switches float valves, etc.); **Dominion Fasteners** Ltd., Hamilton (locknuts, lightweight fasteners of all kinds); **Rousseau Controls** Ltd., Montreal (pumps and valves for fluid and air systems, de-icing and anti-icing controls, etc.); **Simmonds Aerocessories** of Canada Ltd., Montreal (aviation supplies and accessories); **Spartan Air Services** Ltd., Ottawa (helicopter overhaul under DDP contract); **Walter Kidde** & Co. of Canada Ltd., Montreal (extinguishing systems, pneumatic systems); **X-Ray & Radium Industries** Ltd., Montreal and Toronto (instrument dial illuminizing); **Aero Sales Engineering** Ltd., Ottawa (aircraft ancillary equipment, aviation supplies); **Aircraft Parts & Supplies,** Montreal (aviation supplies and equipment).

DEFENCE PRODUCTION

(Continued from page 39)

earlier contracts had, of necessity, to be let on a cost-plus arrangement. Additional experience in the field, acquired during the past few years, now permits negotiations to be made on a firm price or a target basis for a good many of the major contractors.

In brief, the Armed Services develop their operational requirements and determine the type of equipment they require. It is the duty of the Department of Defence Production to effect procurement. In carrying out this role the Aircraft Division has two main objectives: to secure for the Armed Services quality equipment at economic prices, and to develop and sustain the defence potential of the Aircraft and allied industries.

BRITANNIA

(Continued from page 19)

major points of difference between the MR and the airliner versions.

The MR aircraft, which will be the biggest airplane ever built in Canada, will be both longer and heavier than the transport Britannia. The latter tips the scales at 155,000 lbs. max. gross and has a length of 124 ft. 3 in. in the Mk. 200, Mk. 250, and Mk. 300 versions, which are the most recent.

The transport aircraft is, of course, powered by four Bristol Proteus turboprops rated in the most recent 750 version at 4,150 ehp. In the MR airplane these will be replaced by Wright R-3350 Turbo Compound piston engines, which are now rated at 3,700 hp. for take-off (wet). The RCAF regards the Wright engine as more suitable for the great duration and long range requirements of maritime reconnaissance duties, speed being a secondary consideration. The MR airplane will be heavily loaded with electronic gear, including submarine detecting devices and various types of airborne radar.

No performance estimates on the MR Britannia have been made public.

Data for the latest models of the Britannia are as follows: Wing area, 2,055 sq. ft.; wing loading, 75.5 lbs./sq. ft.; landing weight, 125,000 lbs.; weight less fuel and payload, 80,420 lbs.; capacity payload, 30,000 lbs.; fuel capacity, 6,800 Imp. gal.; payload with full tanks, 20,000 lbs.; range with capacity payload, 3,940 st. miles; range with full tanks plus payload, 5,100 st. miles; max. cruising speed, 389 mph; stalling speed, sea level, 96 mph; take-off field length, 5,750 ft.

The Airborne Services

Joint Exercise

Elements of the Royal Canadian Air Force Reserve joined units of the United States Air Force, Air National Guard, and Naval Reserve in an air training exercise held in Northwestern United States, November 4th through 14th.

The Canadian units were allocated by the RCAF's 12 Group, Vancouver. As in the case of the other non-regular units, Naval Reserve and Air National Guard, major participation by the RCAF Reserve was during the two weekends of the 11-day exercise when the reservists could take time off from their civilian occupations.

One RCAF radar unit located at Vancouver, was incorporated into the aircraft control and warning system used in the manoeuvre area.

Act of Defence

The National Defence Act, now before the Senate, will effect the Canadianization of laws governing the Dominion's three armed services, it has been announced by Defence Minister Brooke Claxton. The 251 clauses of the proposed act would replace 598 sections in existing legislation.

Another step towards unification and coordination of Canada's Navy, Army and Air Force, the streamlined act would replace what is contained in eight separate acts of parliament, either Canadian or legislation of the United Kingdom.

The minister said the act represents action on the part of the Dominion to regulate independently the administration, organization and discipline of its own forces. In drafting the act Canada had profited from its relations with the United Kingdom and through this source gleaned much of what is contained in the act.

The proposed act, which would make Canada's soldiers, sailors and airmen subject to the same law, would replace legislation dating back to 1868 when the first Militia Act of Canada was passed.

The bill now before the Senate represents more than two years of study by officers of the Defence Department and three Services, as well as by the Departments of Justice and Finance.

Mr. Claxton termed the drafting on the "new and comprehensive bill" as an "intricate and formidable matter." He gave credit for the undertaking to a team of service legal officers under the direct supervision of Brig. R. J. Orde, CBE, Judge Advocate-General The bill has been drafted eleven times but the minister said "the government is open to any suggestions which might make for improvement."

The bill is designed "to promote the economy and efficiency of the administration in matters relating to all the armed forces of our country and the fair and just treatment of officers and men in the service of their country."

Reward

Sixty serving and retired members of the RCAF and next-of-kin of deceased decorated personnel, received decorations and awards from His Excellency the Governor-General at an investiture held at Government House in Ottawa November 7. In all, more than 80 awards were presented at the investiture.

Majority of the awards were Distinguished Flying Crosses to present and former members of the RCAF.

Operational

The formation of an Air Defence Group by the RCAF and of a second fighter squadron for the Regular RCAF, has been announced.

The Air Defence Group, which has been in the development stage for some time, now has taken over its operational function, with headquarters at St. Hubert. It includes two interceptor fighter squadrons of the Regular Force, an Operational Training Unit, a number of Regular Force units in Eastern Canada, and Reserve Fighter and Radar and Communications units in Quebec.

Regular Force squadrons included are 410, formed last December and presently based at St. Hubert, P.Q., and 421 Squadron, formation of which is taking place now at Chatham, N.B.,

The Operational Training Unit, for training of pilots for jet aircraft, had been in operation at St. Hubert since last year. It now has been moved to Chatham, and the complete move of personnel and equipment was carried out by airlift arranged by Air Transport Command.

Regular Force locations which will come under control of the new Group include St. Hubert, Mont Joli and Bagotville, in Quebec, and Chatham.

Group Commander is Group Captain W. R. McBrien, OBE, of Ottawa, a wartime commander of a Canadian Fighter Wing in Britain and on the Continent.

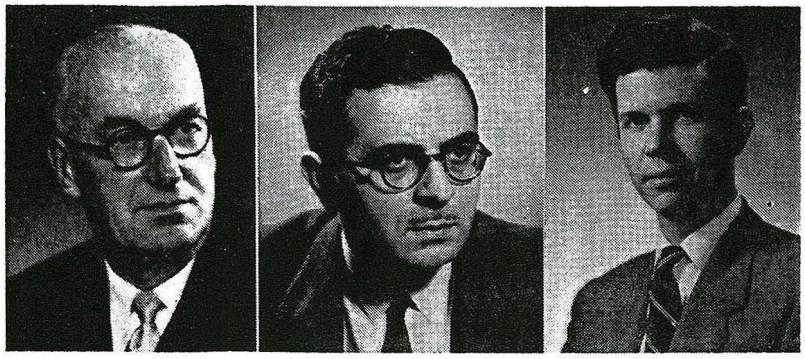
Getting Ahead

Promotions and new appointments for two RCAF senior officers have been announced. Group Captain W. E. Kennedy, AFC, is to be promoted to the rank of Air Commodore, and will become a deputy head of the Division of Technical Services at Air Force Headquarters, Ottawa. Group Captain M. M. Hendrick, OBE, is also promoted to Air Commodore, and has been named Air Member on the Canadian Joint Staff and Air Attache at Washington, D.C.

Both promotions become effective December 1st, and G/C Kennedy will take over his new Headquarters post on that date. G/C Hendrick will assume his Washington duties shortly after the New Year.

G/C Kennedy has been taking postgraduate studies in business administration at Leland Stanford, Jr. University, Palo Alta, Calif., for the last year. He joined the RCAF in 1935 after being graduated from the University of British Columbia. C/G Kennedy served at flying training schools in Canada throughout most of the war, and from 1941 until late 1944 was commanding officer of the Service Flying Training School at Claresholm, Alta., receiving the Air Force Cross for valuable services to the British Commonwealth Air Training Plan.

Group Captain Hendrick has been senior air staff officer at North West Air Command Headquarters, Edmonton, for some time and previously was commanding officer of RCAF Station, Edmonton. A native of Portland, Ore., he came to Canada early in life and gained his secondary education at Montreal High School, later being graduated from the University of Toronto. He joined the RCAF in 1934 and on outbreak of war was



NAPIER OF CANADA APPOINTMENTS: Officials of the recently formed D. Napier & Son (Canada) Ltd. include, L to R: H. Sammons, pres.; L. A. Sanson, executive vice pres.; G. T. R. Cochrane, aero representative. Mr. Sammons is also managing director of the parent D. Napier & Son Ltd., London, England, while Mr. Sanson was formerly Napier's senior representative in Canada. The new Canadian subsidiary has its head office in Montreal.

1939. The eastbound Atlantic Mercury covers the 2120 air miles in just under 7 hours. By further comparison, the airline's new DC-8 jets, will fly from Vancouver to Toronto in 4 hours 10 minutes.

New Soviet Bomber

USAF General Nathan F. Twining, chairman of the U.S. Joint Chiefs of Staff, recently told the House Defence Appropriations Subcommittee that the U.S.S.R. is building a new long range bomber, "which we have seen", that is away beyond the capability of the turbojet Bison or the turboprop Bear, both currently in service with the Red air force.

Churchill Radio Station

A new DoT Aeradio-Marine Radio station was opened late last month at Churchill, Manitoba. The new station replaces a marine radio station built in 1930 and an aeradio station built in 1942. It comprises four major units: a transmitter station four miles from the control point; a remote receiver station shared with the RCAF; the control centre; and 20 apartments to house the staff located at Fort Churchill.

The new station provides a radio beacon for sea navigation, weather broadcasts and ice reports by both message and radio facsimile charts for shipping. It serves northern aviation, including international flights using the trans-Polar route, by providing a radio range for navigation, weather information and a fast message service from aircraft to their despatch centres.

The Churchill station also serves as a main link for message service to the Canadian North, beyond the areas covered by telephone and telegraph lines. It is connected with meteorological stations, Hudson Bay posts, mining camps and missions.

New Rating for Dart 10

The Rolls-Royce Dart R.Da.10 turboprop engine has successfully completed a 150 hour type test to the Combined US/UK Civil Type Test Schedule at a dry take-off rating of 2660 tehp (This 2400 shp plus 670 lb. thrust). The test, which was completed last December, has been officially acknowledged by the Air Registration Board of Great Britain.

The Dart engine is being still further developed, and has completed a 25 hour flight approval test at a military rating of 3200 shp boosted with water-methanol.

Research Facility Opened

A new communications wing for the Defence Research Telecommunications Establishment (DRTE) at Shirley Bay, near Ottawa, was opened November 25. The new wing is intended to facilitate increased research in radio propagation relative to urgent defence radar communications problems.

Because of Canada's unique geographical position relative to the auroral zone and to the earth's magnetic field, the country is faced with unusual communications problems. Part of the auroral zone passes over Canada and directly over Fort Churchill, Manitoba. This effectively divides the country into separate north and south areas. Communications near the auroral belt are frequently disturbed by ionospheric storms and auroral disturbances.

The presence of aurora borealis emphasizes the peculiar role that Canada can play in radar research. Ionization in the zone causes clutter in long-range radars that can mask small targets. This is a new problem that has arisen only recently with the advent of new, very high power radars for ballistic missile defence.

The Prince Albert Radar Laboratory, with one of the largest radars in existence, is a DRTE sub-unit. The radar is being installed with USAF assist-

ance. This facility will permit Canada to make a significant contribution to western defence in the research field of radio propagation.

Canberra Replacement

Vickers-Armstrongs (Aircraft) Ltd. and English Electric Aviation have been named prime contractor for the RAF's TSR2 Canberra replacement Royal Air Force. Development of a new British bomber has been indicated by the British Ministry of Supply.

Work on the aircraft is being shared on a 50-50 basis between the two companies, and a project team is being established at Weybridge for the execution of the project. The new engine to be used in the TSR2 is being developed by Bristol-Siddeley Engines.

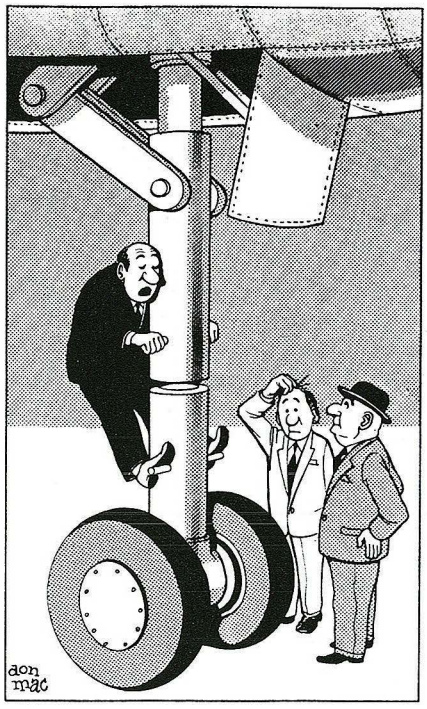
The aircraft is described as being a tactical support reconnaissance aircraft, also capable of limited operations and close army support by virtue of its ability to operate from shorter runways of lighter construction than now necessary. The TSR2 will be capable of performing all the roles of the English Electric Canberra, but by reason of its greater flexibility and higher general performance will be more versatile.

Automatic Landings

Automatic approach and landing systems which will permit the airlines to operate on schedule in all weather conditions are now considered inevitable, according to a recent report from the IATA. This was the consensus of opinion among technical experts of the world's airlines after discussions with manufacturers, governments and research organizations during the 1958 IATA technical conference.

Just when this long-standing objective of the airlines will be achieved depends upon how much research time and effort is put into the solution of the remaining problems. The report added that the objective will likely be reached by evolution of present systems and devices, rather than by any revolutionary new departures.

However, the gathering of experts from many countries were agreed that push-buttons will not replace the pilot. They insisted that any system will be unacceptable if it does not allow the pilot to take over in an emergency and to conduct a missed approach on instruments in all-weather conditions without undue strain.



. . . however, the bugs on our steerable nosewheel are only temporary.

CANADIAN VICKERS

(Continued from page 24)

. . . an air-cooled radial of 200 hp . . . was eventually adopted. This handsome little flying boat was made in small numbers and saw continuous forestry service for many years. It can claim to have pioneered forest protection services and being a flying boat of easy alighting and take-off characteristics, was able to operate from the multitude of small lakes that are found in the forest areas of Canada.

A twin-engined version known as the Varuna was later evolved by the small aircraft design office set up in Montreal. The Varuna also used the Lynx. Thereafter followed a series of similar machines, all designed for forest patrol work. Their names were Vancouver, Velos, Vigil, Vista and Venessa. Records of the numbers of each built are obscure.

In the years that followed, Canadian Vickers built, under license, the designs of Fairchild, Fokker and Northrop. Early in World War II it produced a number of Hampden fuselages for the British government, as well as 40 Supermarine Stranraers for the RCAF. Two of the latter saw postwar service with first, Queen Charlotte Airlines, and then Pacific Western Airlines, which took over QCA a few years back. They were retired shortly after their acquisition by PWA.

During World War II, Canadian Vickers also produced over 300 Catalina flying boats and Canso amphibians, plus some 600 PBY hulls.

In December 1941, the company took over the St. Hubert plant of Canadian Associated Aircraft for Catalina assembly, and in 1942 all aircraft activities were transferred to a new Government plant at Cartierville. In 1944, a contract was nearing completion when a new Government agreement was concluded whereby all aircraft activities of Canadian Vickers were transferred to an independent company known as Canadair Ltd.* and the original investment of Canadian Vickers Associated Aircraft was duly returned. Thus Canadian Vickers passed out of the aircraft business after 20 years of pioneering effort.

*Canadair was formed as a crown company and remained one until 1947 when it was taken over by the Electric Boat Company of New York. Canadair remains to this day a subsidiary of the U.S. firm, which has since changed its name to General Dynamics Corp.

NEW GUINEA

(Continued from page 30)

depart. VH-EAW took off first and set course up the coast for the refuelling stop at Daru, an island just off the New Guinea coast, and then on to Port Moresby. Estimated flying time was 7½ hours and as the weather was clearing, a pleasant trip was expected.

North from Cairns, the aircraft followed the Australian coastline and passed Cookstown, then swung slightly inland across mountainous and largely uninhabited terrain. Occasionally, a lighthouse or mission station was seen far away on the coast. Below there was little evidence of any human activity, although several large properties are in the area. Heavily timbered country, bisected here and there by a river or creek, stretched as far as the eye could see. Eventually, the coast was reached again on Prince Charlotte Bay. Farther north the airfield at Iron Range could be seen. To the west, over on the shores of the Gulf of Carpentaria, the Weipa Mission is situated. It is in this area that huge bauxite deposits have been discovered. Preliminary work has already been commenced for the establishment of an

Scientific Partner in Defence

CANADA'S DEFENCE RESEARCH BOARD LAYS FOUNDATION FOR THE FUTURE

BRILLIANT minds, precision focussed by scientific training, tenacity of purpose and penetrating natural curiosity, are the instruments used by the scientists of Canada's Defence Research Board to look five, ten, and fifteen years into the future.

World War II experience brought recognition from Canadian defence planners of the special ability of the scientific mind to use knowledge and imagination to range at will in the unexplored Never-Never Land of things to come. With recognition came proposal that study should be given to the feasibility of establishing a fourth service to give scientific guidance and assistance to the three Armed Services.

Unfettered: Among other factors that influenced the broad-minded scientific and military planners who laid the foundations for the Board during the dwindling days of World War II, was the realization that scientists work best in relatively independent groups. They dislike and are hampered by the centralization of authority necessary in military operations where direct channels of command and discipline are more important than detailed facts or the freedom of the individual to be independently creative.

Thus was born on April 1, 1947, the Defence Research Board, a fourth member of the defence family which is now nearing the end of its tenth year.

DRB shares equal responsibility for defence with the three Armed Services. It wields an influence on Canadian military thinking out of proportion to its size but not disproportionate to the importance of science today to military strategy and to the design or selection of defence equipment. DRB is, in effect, the scientific partner in Canadian defence.

All Canada's militarists are not in agreement with this as an ideal situation; some believe the Services should have more direct control over research relating to their own operations. They feel the work could then more readily be channelled in the areas in which they think it should be directed.

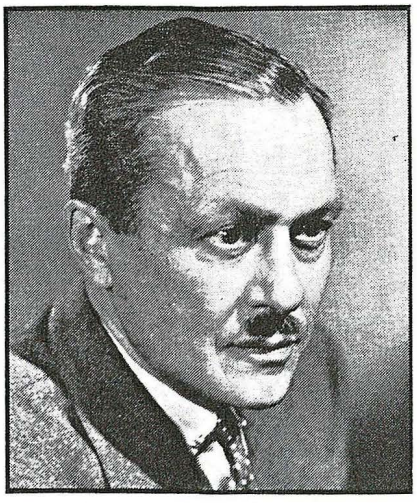
Equal Partners: On this point, Canada's defence scientists point out that history has shown that scientific research should not be subjected to direct military control. They are keenly aware of the grave responsibility for their share of defence activities but are convinced that the Canadian system of making the scientist a partner, with responsibility for defence science to the same degree as the Armed Services are responsible for strategy and operations, is a concept with very considerable national importance.

The equal partner concept has been carried to a great extent also in the U.K. In the U.S. however, the situation is not uniform throughout the three Armed Services. DRB scientists expressed the opinion that the most successful U.S. defence laboratories are those where military support has been given without direct military control. MIT's Lincoln Laboratory and the Applied Physics Laboratory of John Hopkins are outstanding examples.

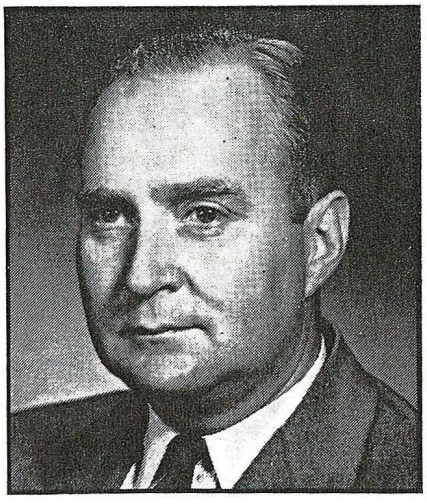
These scientific establishments are operated as defence research laboratories through contracts but operate without direct military technical control.

The U.S. system lacks the technical partnership for defence planning at senior level as the scientists concerned work without direct support from the laboratories.

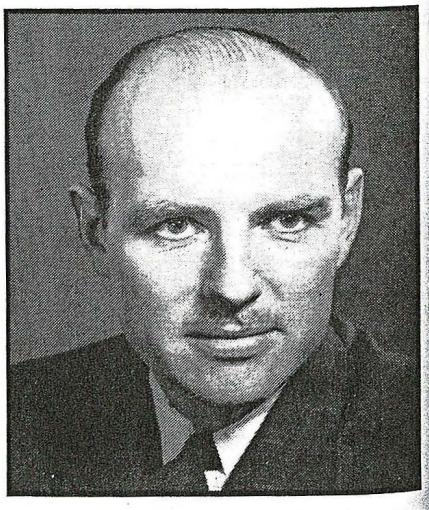
Although Canadian defence scientists realize that improvements could be made in the present organization for defence, particularly with respect to better co-ordination between defence research, development and production, they are confident that the organization within DND is basically sound and that the system's successful performance will demonstrate this fact with time and maturity.



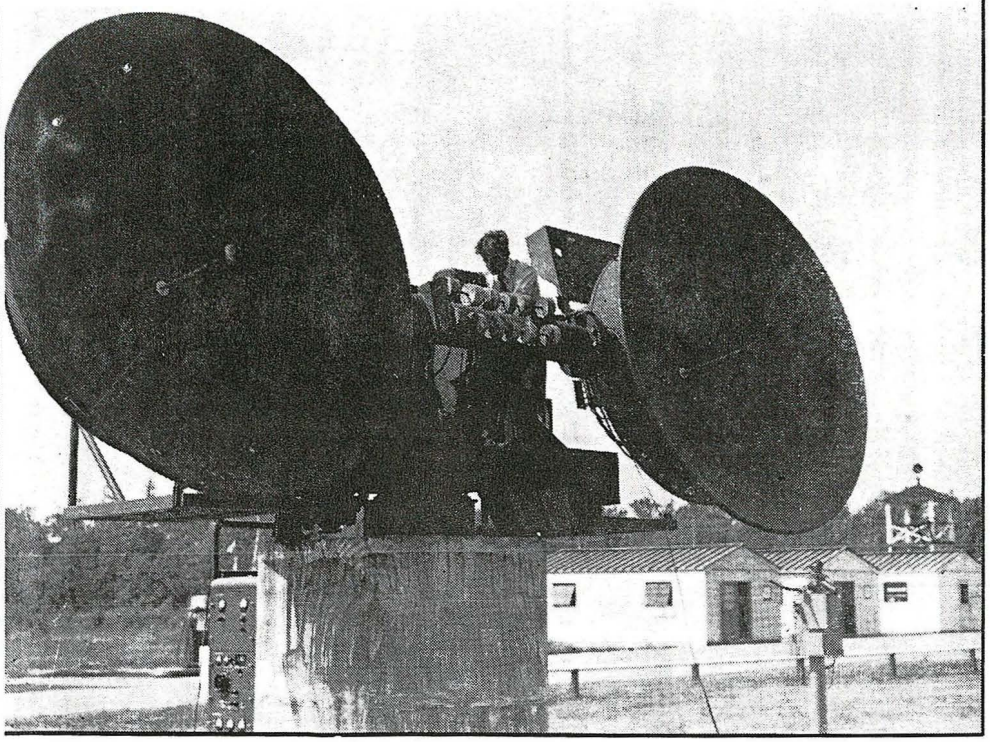
A. HARTLEY ZIMMERMAN
Chairman
Defence Research Board



GORDON D. WATSON
Director of Weapons Research
Defence Research Board



JOHN L. ORR
Director of Engineering Research
Defence Research Board



This is the MPQ-18 precision tracking radar set at the DRB's Point Petre, Ont. missile testing range. The radar tracks missiles fired out over Lake Ontario.

Points of Interest

THE ORGANIZATION evolved since the creation of the Defence Research Board has progressed markedly toward meeting the varied requirements that led to its creation. The Board itself is the keystone. It consists at present of 14 members, six of whom are ex-officio and six appointed for three-year terms by the Governor-General-in-Council. It reports to the Minister of National Defence.

The Chairman is appointed by the Governor-General-in-Council and serves as the full-time operating head of the organization. His status is that of a Chief of Staff and, as such, he is a member of the Chiefs of Staff Committee. Since the Board reports directly to the Minister and not through the Deputy Minister, the Chairman has many of the financial and other responsibilities of a deputy minister. The current Chairman is A. H. Zimmerman, who succeeded the Board's first Chairman, Dr. O. M. Solandt, in March of 1956.

Ex-officio members of the Board are the Chiefs of Staff of the Armed Services, the Deputy Minister of National Defence, the President of the National Research Council, and a representative of the Department of Defence Production. The six appointed members are representatives of Canada science, chosen from the universities and industry.

DRB Functions: The Board's functions are several in number but in a broad sense, all relate to the application of science to the planning of strategy, the development and production of equipment or the best methods for employing the equipment already in service.

For example, the Board's Operational Research Group provides elements for each of the Services. These specialists assist in the development of military techniques for the development and the use of forces and conduct studies aimed at determining the best locations for air bases and radars.

Under the direction of Dr. William Petrie, ORG has elements which help the Services to define their requirements for equipment by investigating the effectiveness of various types when applied to Canadian use.

The Group works with U.S. operational research scientists to assist the USAF and the RCAF in planning the most efficient method for defending North America against air attack.

Another direct assist on behalf of the Services includes the provision of technical advice on the scientific aspects of development programs.

When the development or the modification of equipment is initiated, DRB either undertakes the project in one of its own laboratories or assists the Service concerned by directing the development to industry.

Applied Research: Another important DRB activity relates to the applied research program carried out in the Board's diversified and well equipped establishments. Here the scientists attempt to provide basic answers to the questions which will be asked 10 or 15 years in the future. In addition, they provide technical answers to more immediate questions of the day. For example, DRB conducts research on fundamental subjects such as atmospheric physics which relates to propagation of radio or radar energy, aerodynamics, the electronics of radar, the physics and chemistry of explosives and rocket fuels and a variety of other defence interests.

This supporting research program must be chosen carefully to solve important problems peculiar to Canadian needs. At the same time, it must ensure that Canada maintains at all times a team of defence scientists who are experts in their own fields and well acquainted with the results of research from other countries. Hence, the results of scientific efforts elsewhere may often be applied to the solution of Canada's particular defence problems.

The Board therefore provides scientific advice to the Minister of National Defence and the Armed Forces at all levels of defence activity. This advice is supported by the work of scientists operating specialist laboratories to ensure a firm foundation for the information governing the final advice extended.

Some DRB officials draw a parallel between their functions and those of the U.S. National Advisory Committee for Aeronautics which is constituted in a similar fashion. This committee reports to the President of the U.S. but also gives advice at all levels which is supported by an extensive system of scientific establishments. The NACA has contributed materially to the superiority of the U.S.A. in the aeronautics field.

DRB Program: The funds allotted to DRB finance the internal programs carried out by 11 establishments.

A small proportion only of these funds is employed for contracts with industry. When development work with defence application is carried out by industry, it is financed from Service allottments and DRB's participation in such developments or in production programs is usually in the role of a scientific consultant.

The Board operates establishments

like the Defence Research Medical Laboratories (DRML) in Toronto, the the Canadian Armament Research and Development Establishment (CARDE) near Quebec City, and the Defence Research Telecommunications Establishment (DRTE) near Ottawa.

Others vary from the Naval Research Establishment (NRE) Dartmouth, N.S., and Pacific Naval Laboratory (PNL), Esquimalt, B.C., both concerned with naval problems, to Suffield Experimental Station (SES), Suffield, Alta., active in the defensive aspects of biological and chemical warfare. The Defence Research Chemical Laboratories (DRCL), is concerned with chemical research and some aspects of atomic investigations and the Defence Research Northern Laboratory (DRNL), with Arctic problems having defence implications.

Security Veil: DRB staff members are unable to reveal details of the complete program because of the necessity for military security. Some of the work however, is known to be related to A. V. Roe's development of the CF-100 and the CF-105 aircraft and to their weapons and fire control system. Other work relates to the development of equipment for the Mid-Canada Early Warning Line and defence communications systems.

DRB's study activities include nuclear energy and its application to warheads, power generation and ship and aircraft propulsion, defence against Inter-Continental Ballistic Missiles (ICBM), anti-submarine warfare equipment and weapons, guided missiles, short take-off and landing (STOL) and vertical take-off and landing (VTOL) aircraft, Service officer training and medical research.

Canada's defence scientists also watch with interest developments and scientific comments in such futuristic subjects as satellite vehicles, space travel, gravity control systems and nuclear propulsion for aircraft and guided missiles.

No Canadian ICBM: It should be pointed out that DRB's interest in the ICBM for instance, does not extend to the possibility of the development in Canada of such a costly and massive rocket vehicle. The Board's interest takes the form of a comprehensive study of every aspect of defence against the ICBM.

The study approaches its subject from the viewpoint of how the ICBM might affect Canada; whether or not any point in this country is likely to be an ICBM target; possible courses of action in the event of ICBM attack; and particularly, warning and defensive techniques against such an attack.

An example of a more immediate problem is DRB's active interest in STOL and VTOL aircraft. In the case of the former, DRB is playing the part of a scientific partner of de Havilland Canada in connection with the DHC-4 Caribou project which DHC is carrying out for the Canadian Army. And through the National Aeronautical Establishment, with which DRB is interconnected, a VTO program is being carried on.

John L. Orr, DRB Director of Engineering Research, points out that the development of aircraft with short or vertical take-off capabilities offers a possibility of greatly increased utilization of air transport. Referring to the DHC-4, Orr comments that . . . "it doesn't take much imagination to see what it will do for the Army." A VTO aircraft would similarly have wide application in naval service, giving even the smallest ship an aircraft carrying capability.

"On the civil side," Orr says, "Canadian geography indicates a pretty obvious requirement. In this case, as in many others, military need carries with it a civil application."

Relations with U.S. & U.K.: Access by Canada to U.K. and U.S. information is generally good where a "need to know" can be established. One of the few examples of "holdback" by the U.S. relates to atomic information.

Much of Canada's defence equipment and planning is based on U.K. and U.S. information. When the other two countries develop items of interest to Canada, a team of Board and Service representatives study them and recommend their adoption or otherwise. In addition to proving particularly beneficial for Canada, the procedure often proves of assistance in return.

During the evaluation, the scientists frequently develop data of value to the design originators which can be incorporated before acceptance by Canada.

Gordon Watson points out that "while this ready access to U.K. and U.S. information offers many advantages, it may be argued that it has some disadvantages from the point of view of Canadian science and engineering in civil and military fields." The point is that the tendency for this country to purchase "off-the-shelf" equipment or produce designs developed by other countries has resulted in a smaller proportion of funds for research and development in Canada.

Another result has been the migration of research and engineering personnel to the U.S. where even more challenging work is available. Canada's economy is maturing with the manufacture and development in Canada of more equipment both for military and civil use. As this trend increases, a higher proportion of defence funds must be applied to research and development to maintain the technical personnel with scientific "know-how" in order to support and guide this larger industrial activity."

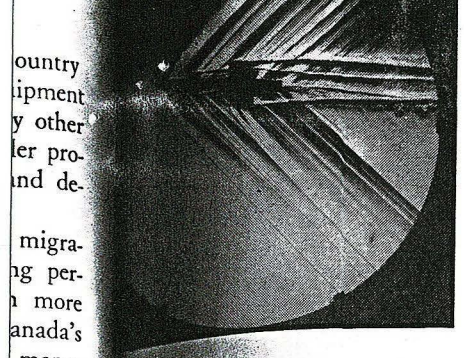
Stimulation: Military research and development is being stimulated currently on a world-wide basis at a rate never before attained in peacetime, Mr. Watson feels. "Military requirements have always stimulated science. However, we are now in a situation where so-called 'cold war' necessitates research and development at 'hot war' rates," he says.

One result of this high rate of stimulation is that every piece of equipment developed has a short life; if built today, something better is available tomorrow. "This forces us into a never-ending cycle of research, development and production. Output of the product must be limited to a quantity that can be used up by the time a better product becomes available.

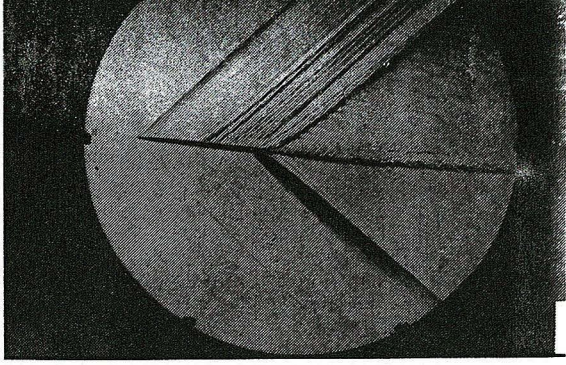
"This rapidly changing picture requires long-term planing if we are to be really effective. It is now hardly possible to take on any new program without considering also the one that is going to succeed it and possibly the one that is going to succeed that also. In this way you are put in the position of getting an inkling of things you will be dealing with 15 years hence." It is impossible to predict accurately so far in advance but it is essential to establish early research and development projects which will lead generally in the right direction. In addition, they must be corrected at intervals as the requirements become clearer.

Says Watson: "There is a real necessity for trying to generate a long-term plan with suitable continuity, but in Canada we have a major difficulty in maintaining this continuity of programs owing to our relatively small research and development program."

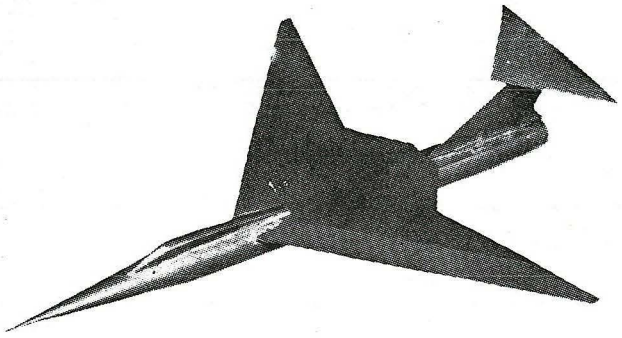
A CARDE COLLECTION



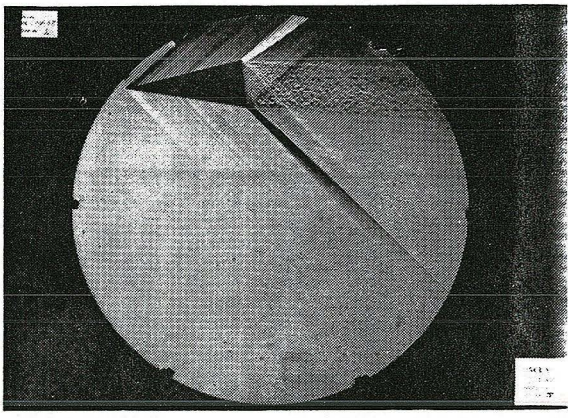
Picture above shows a canard-type cruciform missile configuration in a condition of high lift. Shadowgraph taken at Mach number 1.5.



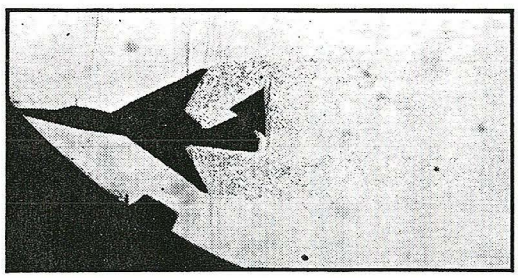
Edge on shadowgraph of flat plate triangular wing at Mach 1.5. Below, Mach. 1.5, aspect ratio 2, triangular flat plate wing in free flight.



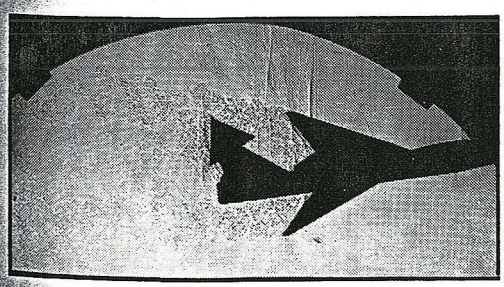
Above right, an airplane model fired in the CARDE Aeroballistics Range in the transonic regime.

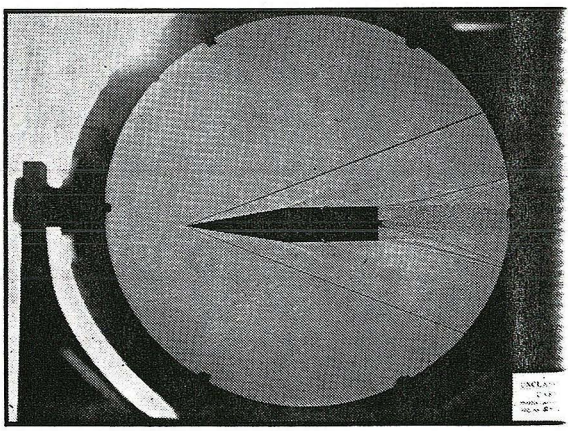


Below, cone with stabilizing base at Mach number of 1.5; this configuration used in boundary layer, shock wave curvature and heating studies.

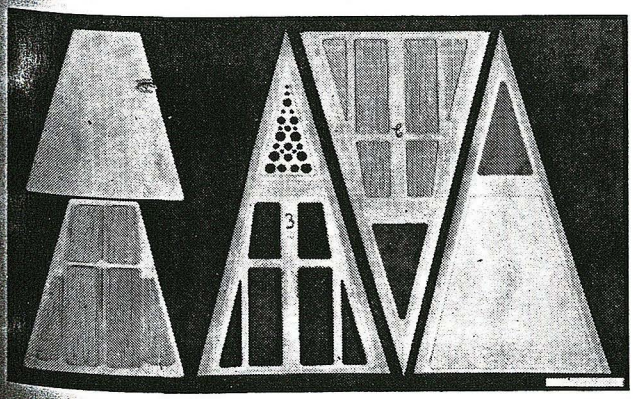


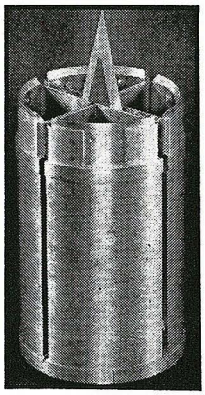
Left, and above, shadowgraphs of the airplane model in flight at Mach number 0.95 show presence of weak shock waves.

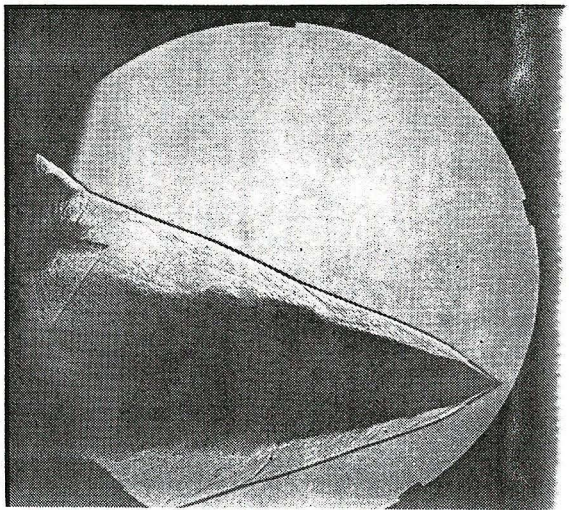




Below, conical projectile at M-4.5; wake distortion due to gas trapping. L, delta wing in sabot ready for firing; & wing construction details.







clearance, and a sensitive pressure altimeter for measuring variations from a chosen pressure altitude. Continuous radar altimeter for measuring terrain clearance and profile readings are indicated on a high speed paper chart recorder. At heights up to 35,000 feet, the APR is capable of measuring terrain profile with an accuracy of plus or minus 10 feet.

This high degree of accuracy is achieved by using the hypsometer system for obtaining height deviation information. Another modern technique used in the APR is the application of plug-in printed circuitry to the radar timing and control circuits, which simplifies servicing while in flight.

Barden Rep in Canada

Philip French Sales, Ltd., Montreal, has been appointed Canadian representative for The Barden Corp., manufacturer of precision ball bearings. The Canadian firm is a new organization headed by Philip B. French, president, who was formerly associated with Lyman Tube & Bearing Ltd.

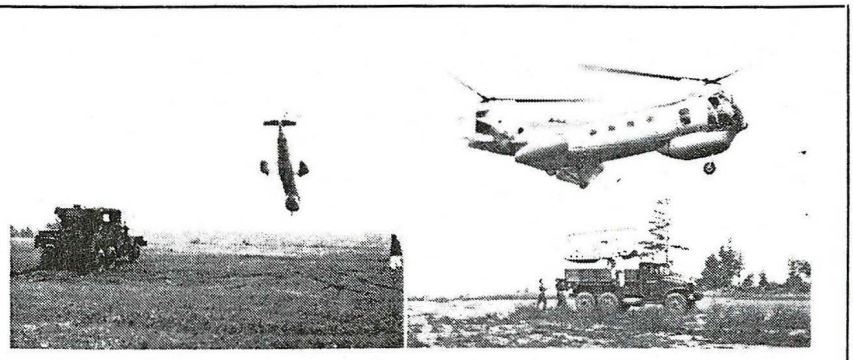
Turboprop Beech 18

A turboprop-powered version of the familiar Beech 18 series light transport aircraft is now flying in France. The Beech, a D18 type, is being used as a flying testbed for the new Turboméca Bastan turboprop, which first ran on the test bench just slightly over a year ago.

First flight of the Bastan Beech took place on Sept. 19 at Bordeaux-Mérignac.

The Bastan has a take-off rating of 716 ehp (650 shp plus 172 lb./th.). A scaled-up version of the Artouste 3 turboprop, it has a one-stage axial and a one-stage centrifugal compressor. The combustor is of the annular type, and there is a two-stage turbine. The engines used on the Bastan Beech are fitted with Ratier-Figeac propellers.

The 18 series Beech is normally fitted with two Pratt & Whitney R-985 Wasp Jr., having a take-off rating of 450 hp each.



VERTOL 44 DEMONSTRATED: Vertol Aircraft Co. (Canada) Ltd., recently demonstrated a float-equipped Vertol 44 transport to representatives of the armed forces. Left: Helicopter tows an Army M-62 medium 17-ton truck wrecker out of the mud. Right: Precision drop of a two-piece articulated light snow tractor (Rat) onto back of stake truck.

U.S. Contracts Here?

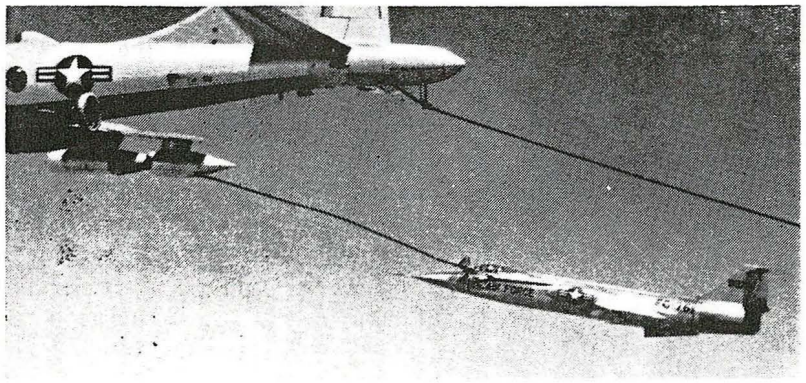
Frank Coffin, a U.S. Congressman who was recently in this country studying Canadian-U.S. economic relations, said, in a Vancouver speech, that the United States is studying a plan which will allow Canadian manufacturers to bid on defence production contracts. At the present time, Canadians generally are allowed only to bid on the production of components. The American government is considering a procedure that will permit Canadian bidding on whole items.

"Also, we are anxious to create an atmosphere in which Canadians will feel they are participating fully in defence production programs." Mr. Coffin said the over-all temperature of Canadian-American economic relations is better than prior to a report on the situation made to the U.S. Congress last spring.

Ultra Light Visitor

A British military jet helicopter, the Fairey Ultra Light, is being demonstrated this month in Canada. The helicopter is powered by Fairey pressure jet units mounted at the tips of the two blade rotor. These are supplied with compressed air by a Blackburn Palouste gas turbine air generator.

The demonstration flights to the RCAF are being flown at Uplands, outside of Ottawa. The helicopter is then scheduled to be flown to the Canadian Army Proving Ground, Ottawa, where is is to be fitted as a casualty pick-up and air ambulance. For the Navy it is required to take off and land from a tiny platform on the afterend of a frigate. Civil authorities and civilian operators will also be given demonstrations of the Fairey Ultra Light's capabilities. The entire demonstration has been organized by The Fairey Aviation Co. of Canada Ltd.



STARFIGHTER REFUELING: First aerial refueling photo of the F-104C Starfighter shows the world speed record holder easing up to the drogue of an FB-50J tanker. Unique feature of the F-104's refueling equipment is that it has a removable probe. When extra-long misisons, or ferrying purposes, require it, probe is fitted on left side of forward fuselage.

New Digital Computer

Standard Telephones & Cables Mfg. Co. (Canada) Ltd. has released details of the latest electronic digital computer, Stantec-Zebra. Among the lower priced computers, it nevertheless offers great flexibility in wide variety of different applications.

One use of Stantec-Zebra is to facilitate the making of geographical surveys by analyzing aerial photographs. It is also being used in the calculations

RESEARCH AND DEVELOPMENT IN CANADA

An Assessment

AERONAUTICS is now such a demanding science that it has become foolhardy for any nation to embark on an aircraft production program without backing this up with a comprehensive research and development program.

Canada's achievements in the field of aircraft production have been widely publicized. Not so well known are the number and achievements of the Canadian government and industry research and development projects and organizations that are regularly making exploratory scientific excursions into the future.

The purpose of these excursions is to enable the scientists to select the direction in which the next major step in aeronautical progress should be pointed.

State of Health

WHAT IS the state of aeronautical research and development in Canada?

It is small and young, but it is relatively healthy. To some extent, the Government's attitude toward scientific research in many fields . . . especially that of aeronautics . . . is immature. That is, although it is now generally accepted that there is a definite need for Canada to maintain a design and development capability to meet certain uniquely Canadian requirements, there is still uncertainty that it is necessary to support this capability with research facilities. Thus the future of research in Canada is still subject to political whim.

A striking example of this immaturity is to be found in the handling of the Velvet Glove guided missile program. In this field, as in the aircraft field, there are those who sincerely believe that Canada should leave design and development to other, richer countries and concentrate on license production. The opposing school of thought is, of course, that apart from the fact that there are certain types of equipment which are not obtainable in this manner, even a license-built production program must be backed up by development facilities.

It seems likely that Canada's scientific immaturity, as exemplified by the Velvet Glove case, may be traced to the comparative youth of the country's science and industry.

On the credit side, the Government has shown considerable maturity in its recognition of Canadian defence research (and hence, aeronautical research) as an important branch of defence by itself. This recognition, which came about during World War II as a result of the National Research Council's scientific contributions to the Allied war effort, was reflected following the War in the creation of the Defence Research Board.

The DRB shares equally with the Navy, the Army and the Air Force, responsibility for Canadian defence. In the high councils of the country, its status is equal in every way to those of the three military services.

This apparent Government awareness of the powers of science in the defence field, seemingly in contradiction to many Government actions in connection with Canadian research, has its source in the premise that science cannot perform efficiently if it is simply an adjunct to a military organization.

The free-ranging scientific mind is incompatible with the rigid, unyielding patterns of behavior that are essential to a military organization. Were defence science directly controlled by each interested service, the researchers would be confined to certain highways in their journeys in search of new knowledge. But in science, as in everyday living, sometimes the sideroads produce more interesting and profitable results than the super highways.

The fact that defence science is accepted as a separate entity is a healthy and encouraging state of affairs. It bodes well for the future of research and development in Canada.

It is of interest to note that this Canadian acceptance of the equal status of defence science is diametrically opposed to the situation in the U.S. There each of the services has set up and controls its own research establishment. Research programs are directed by men who are essentially military officers, trained to run the organizations they head along the set lines of the military machine. For reasons stated in the preceding paragraphs, it just can't be done properly.

In view of the massive contributions made by U.S. defence science, these comments may seem niggling. Yet Canadian defence scientists state flatly that this country gets more for its research dollar than does the U.S.

American sources say that the reservoir of basic scientific accumulated by a century of research is now almost exhausted and is not being replenished. This is blamed on the fact that U.S. defence science is controlled by men who do not understand it and thus do not recognize its importance.

Running to Keep Up

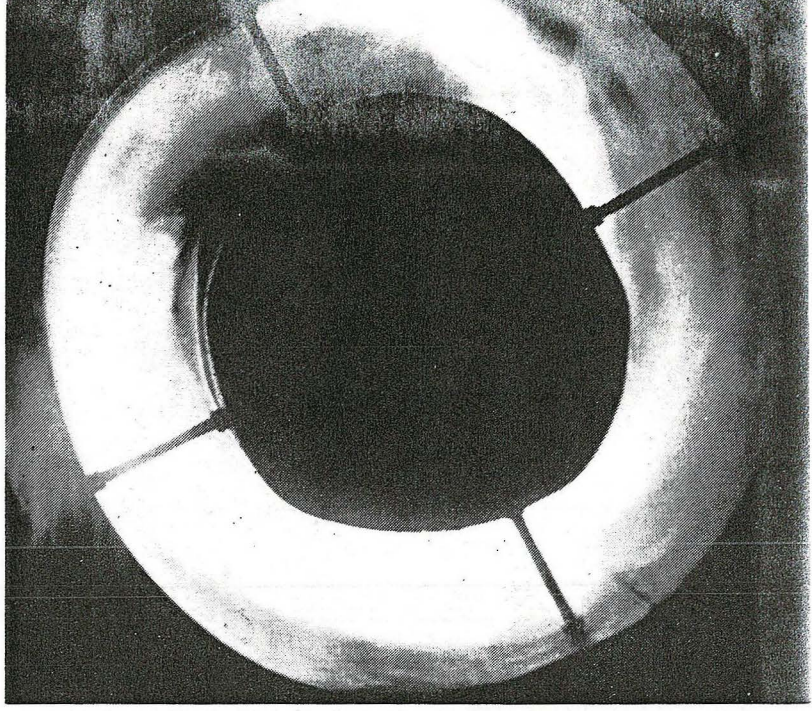
IN THIS modern world, it soon becomes obvious that a major effort, run with utmost efficiency, is required of a nation merely to keep abreast of other countries scientifically. Or perhaps the case was best presented by Lewis Carroll as he recorded it in his "Alice's Adventures in Wonderland":

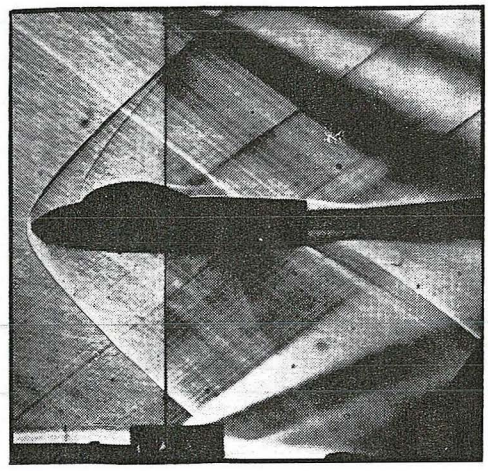
. . . still the Queen kept crying "Faster! Faster!", but Alice felt she could not go faster, though she had no breath left to say so. However fast they went they never seemed to pass anything.

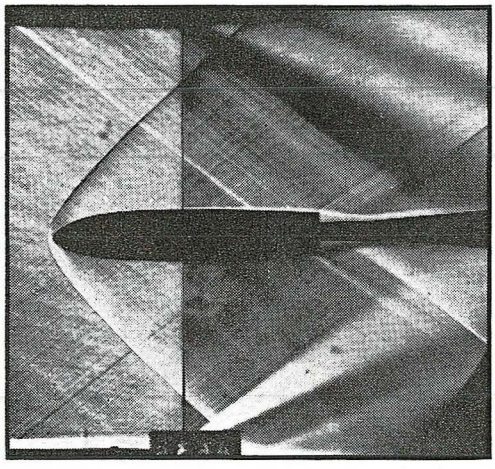
"Well, in our country," said Alice, still panting a little, "you'd generally get to somewhere else — if you ran very fast for a long time as we've been doing."

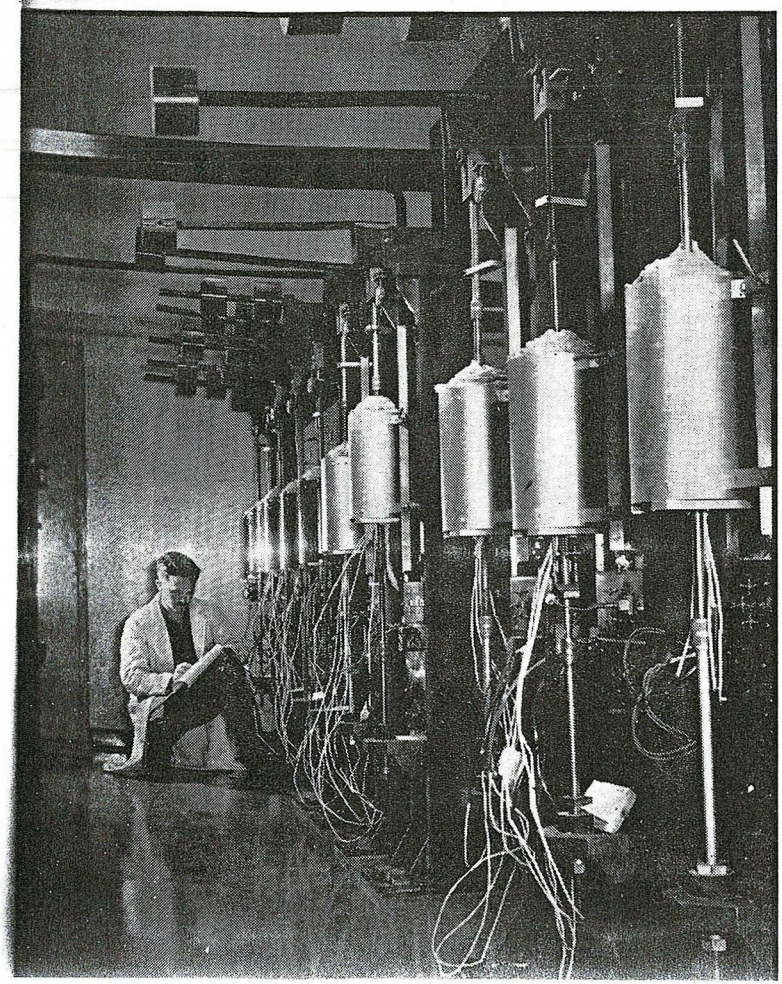
"A slow sort of country," said the Queen. "Now here, *you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that."*

Right, NAE engine lab photo shows rotating flame in the primary zone of an annular combustion chamber. Picture at bottom of page is from Orenda Engines' Sir Thomas Sopwith Laboratory and shows creep machines testing reaction of metals to heat and stress.









Pictures directly above and to left and above are Schlieren photographs from the NAE's aerodynamics laboratory, showing a fuselage model with and without its canopy at a speed equal to Mach 1.6.

THE AIRBORNE SERVICES

CAS on Tour

The RCAF's Chief of the Air Staff, Air Marshal C. Roy Slemon, returned to Ottawa, March 31, after a sixteen day tour of USAF establishments as the guest of General Nathan Twining, Chief of Staff, USAF. Purpose of the tour, which also embraced visits to U.S. aircraft manufacturers and research establishments, was to permit Air Marshal Slemon to see first hand the USAF organization, some of its equipment, and its operations and training procedures.

Points of call for the CAS's party included: Strategic Air Command HQ, Offut AFB, Omaha; North American Aircraft Corp., Inglewood, Calif.; Consolidated Vultee Aircraft Corp., San Diego, Calif.; White Sands Proving Grounds; Air Defence Command HQ, Colorado Springs, Colorado; Air Research & Development Command HQ, Baltimore, Maryland; USAF HQ, Washington, D.C.

Air Marshal Slemon was accompanied by three staff officers: Air Commodore F. S. Carpenter, chief of air operations; Air Commodore Clare L. Annis, chief staff officer for the RCAF's Air Defence Command; Squadron Leader A. R. Durston, personal staff officer to the CAS; Colonel R. M. Cram, secretary of the Canada/U.S. Regional Planning Group.

The CAS's visit to the U.S. may be considered significant of the growing co-operation between the USAF and the RCAF. A similar tour of Canadian establishments was made a short time ago by the USAF's General Twining, and commanding generals of a number of USAF formations (most often, Air Defence Command) are frequent visitors to Canada.

In the March 1 issue of U.S. News & World Report, Admiral Arthur W. Radford, chairman of the U.S. Joint Chiefs of Staff, comments on the co-operation of the military services of the two countries. Admiral Radford termed Canadian co-operation with the U.S. "excellent", especially in air defence planning. He implied that relations between the USAF and the RCAF are as close as between the various branches of the U.S.'s own forces.

Said the Admiral: "Because the U.S. and Canada must be alert to the common threat, we are working side by side to develop the most effective air defence possible. Our task is made easier because basically, we are old traditional friends."

The Eyes Have It

Early in March, supervisors of the Eastern Canada division of the Ground Observer Corps met at RCAF Station North Bay for a two-day session of briefings on such subjects as the national and international role of the GOC, how the Corps fits into the air defence team, aircraft recognition, reporting procedures, the significance of vapor trails, etc.

The supervisors, over a hundred in number, provide liaison between the RCAF and some 6,000 ground observers who keep their eyes on the skies over approximately 138,000 sq. miles of Canada's northland, stretching from Sault Ste. Marie, Ont., in the west to Senneterre, P.Q., in the east, and as far north as the icy wastes topping Hudson Bay. The observers—trappers, Hudson Bay factors, rangers from the Ontario Department of Lands & Forests, etc.—are spotted at intervals of about eight miles in a belt that extends some 4,000 miles in a looping curve to the north.

Commander of the Corps is Squadron Leader C. E. Harris, who took advantage of the meeting to present the observers with new GOC badges. These badges are in the shape of a golden eagle atop a disc of blue. On the disc, in raised gold lettering, are the initials "RCAF", and below that "Ground Observer Corps". The observers serve on a voluntary basis, without pay.

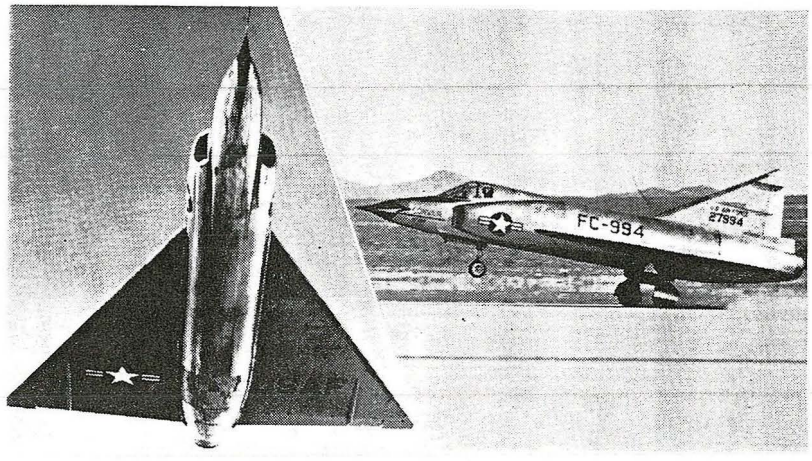
Participating in the two-day meeting were two USAF officers, Captain R. Tawny and Captain R. Sherbundy.

The RCAF on Canvas

Robert S. Hyndman of Ottawa, a wartime RCAF fighter pilot and war artist, has left for Europe where he will make a pictorial record on canvas of present RCAF activities in Europe, it has been announced by AFHQ. Mr. Hyndman has been appointed to a temporary RCAF commission while engaged on the project.

Robert Hyndman, who left the service in 1946 with the rank of flight lieutenant, has since continued his career as an artist, in Ottawa.

Educated in the Toronto Academic & Arts School, Mr. Hyndman spent a further two years training in London, England. Joining the RCAF in 1940, he became a pilot and instructed for two years in Canada before going overseas. Flying Spitfires on sweeps over France, strafing rail and highways, dive bombing ground installations, and flying close support to bombers during the invasion, F/L Hyndman obtained first hand impressions which he later depicted on canvas. At the War's end,



NEW GENERATION: First photos of the USAF's Convair F-102 supersonic all-weather delta interceptor were released in February. The F-102 is based on the earlier experimental XF-92, which was the first delta aircraft to fly after the war, and was based on studies made in Germany during World War II. F-102 prototypes, which are powered by the P & W J-57, have been flying for some time. One was damaged in an emergency landing in November, 1953.