

The powerful Orenda turbojet engine in its test bed.

Canadian Aircraft Industry Program Stresses Turbines

SENSATIONAL JET DEVELOPMENTS AT AVRO SPEARHEAD VIGOROUS AIR INDUSTRY EFFORT. ACCENT ON INITIATIVE

IT IS not generally realized, but the Canadian aircraft manufacturing industry has made an amazing recovery since the low point of postwar transition in 1945. The achievements in peacetime plane production, if measured financially, could be described in terms of \$100 millions product value. More important than this index, however, is the evidence of a vigor and self-sufficiency notably absent from our pre-war air industry.

Even during the war when our air industry rocketed to first position in the Canadian production picture, the mass-production projects which engaged some 120,000 people at the peak

were, for the most part, merely copy work from the designs of the U. S. and U. K.

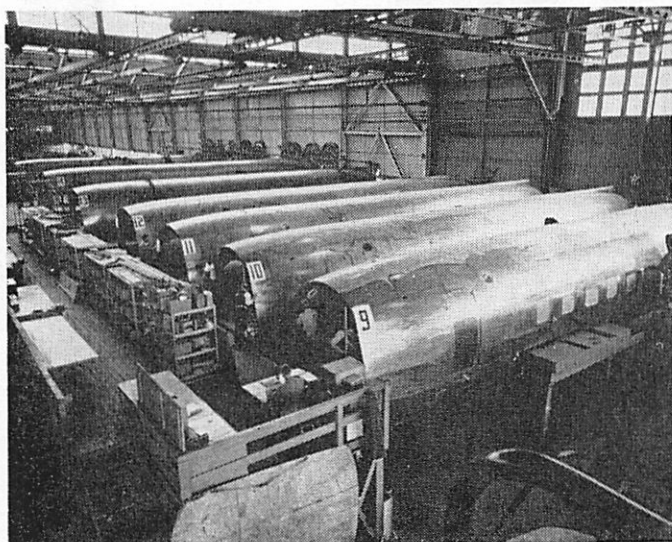
The wartime achievements in turning out four-engined bombers, front-line fighters and myriad trainers defied the predictions of experts and encouraged a few of the industry's leaders to dream of a truly Canadian industry, originating as well as producing airframes and even engines.

Not all of the postwar design ventures have met with success. But a review of the original creations of Canadian plane plants of the past five years yields a remarkable array.

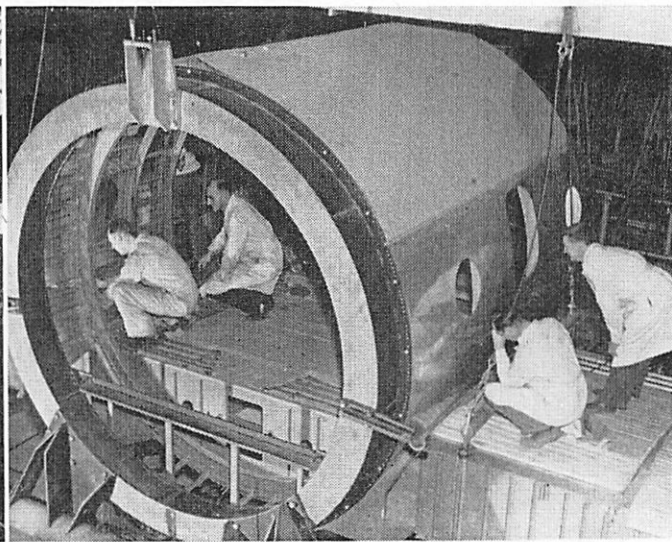
1. Bushplanes—Most successful achievement in this bracket, of course,

is the de Havilland Beaver. During 1949, 42 of these were manufactured and delivered, with a considerable backlog still to go. The Fairchild Husky was produced in limited quantity, although it was conceded to have good prospects until the manufacturer encountered financial headwinds and went out of business. The Cancargo Loadmaster, conceived on the basic Burnelli "airfoil fuselage" patents, originally was designed for a specific application in Central America. Only one of the type has been built. Although not of Canadian design, the Bellanca Skyrocket is manufactured on license at Edmonton by Northwest Industries. The famous

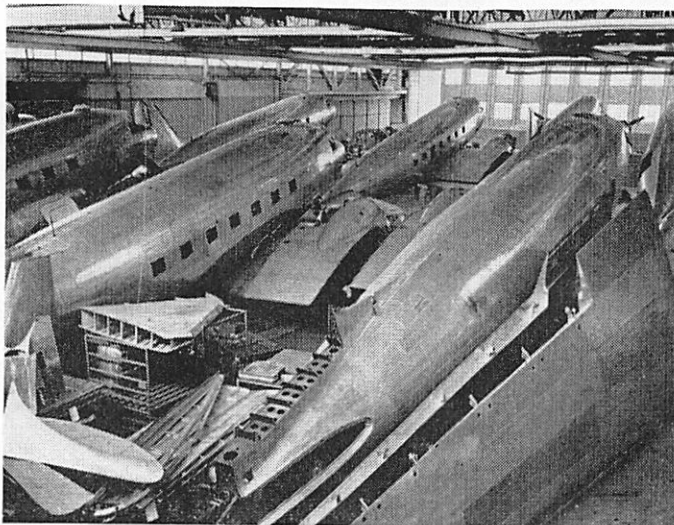
Canadair Four fuselage shells in the vast plant at Cartierville airport near Montreal.



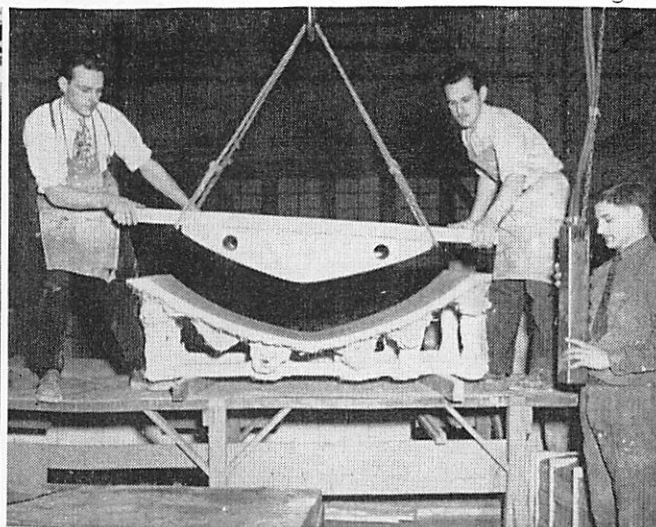
Wing centre section and centre fuselage of the Jetliner during construction of the prototype



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Conversion and overhaul of aircraft is big business. This is a portion of the Northwest Industries plant at Edmonton, with RCAF Dakotas.



The \$30 million Sabre production assignment at Canadair will involve new processes, such as use of laminated plastic dies, shown here.

Norseman bushplane has been manufactured since the war by Canadian Car & Foundry Co. Ltd. at Montreal.

2. Lightplanes—First Canadian postwar lightplane to fly was the Noury, from which was developed the Fleet Canuck. The latter went out of production when market prospects did not measure up to anticipation the Fleet diverted its energies to nonaviation pursuits. The D-H Chipmunk, a distinctive Canadian design, has been acclaimed at home and abroad as an eminently successful design. Its market in Canada to date has been limited because of the RCAF use of the Harvard for all-through training. In the meantime, however, the Chipmunk is being manufactured in England as the standard RAF reserve trainer. The Canadian plant has manufactured 93 Chipmunks for export to England, South Africa, Pakistan, New Zealand, Argentina, Palestine, Egypt, and Thai.

3. Transport Aircraft—In terms of production, by far the greatest achievement of the postwar industry has been the North Star, Canadair Four program at the Canadair plant near Montreal. In less than four years, 70 of these four-engined 40-ton airliners have been delivered, with a total value, including spares, of close to \$70 millions. At the same time, the Canadair plant was converting Dakotas to DC-3 airliners for some 30 different airlines at home and abroad. This impressive activity was supplemented by a multi-million-dollar enterprise in the supply of Douglas spares to the domestic and export market.

4. Jet Aircraft—Typical of the determination to give Canadian de-

sign talent full scope are the two major aircraft projects at the Avro Canada plant, Malton. These are the C-102 Jetliner, first domestic jet transport in the world to fly, and the C-100 jet fighter, described as the most powerful fighter in the world.

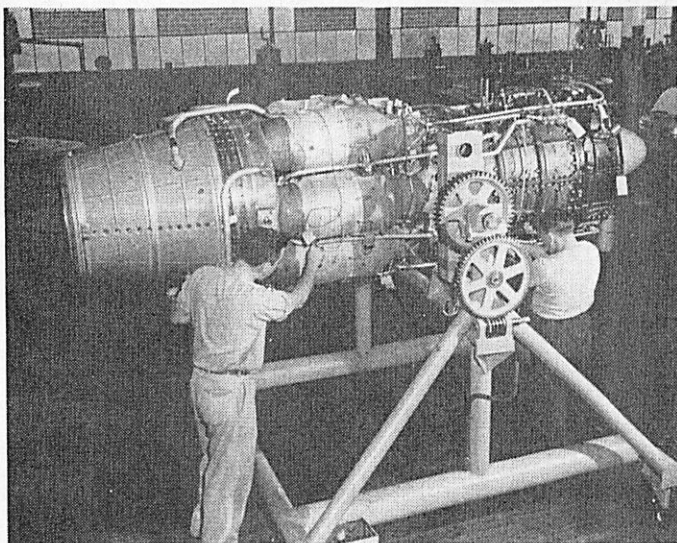
5. Turbine Power Plants—For years the experts had been claiming that aircraft engines never could be built, let alone designed in Canada. Avro has confounded the critics by creating the Orenda, one of the most powerful jet engines in the world today. (It was preceded by the Chinook, a smaller engine designed as a development engine at Avro). The Orenda has exceeded expectations in its test bed runs to date. As this is written it is being prepared for flight tests. Plans call for installation of the Orenda in the CF-100 fighter (the prototype has Rolls-Royce Avons) as well as in the Canadian-manufactured Sabre.

6. Sabre Program—The Canadair plant is being prepared for manufacture, on license from North American Aviation, or F-86 Sabre jet fighters for the Royal Canadian Air Force. (See Canadian Aviation, Feb. 1950). This order, which amounts to over \$30 millions, will provide the Canadian industry with the plant equipment and the experience necessary for modern assembly-line production.

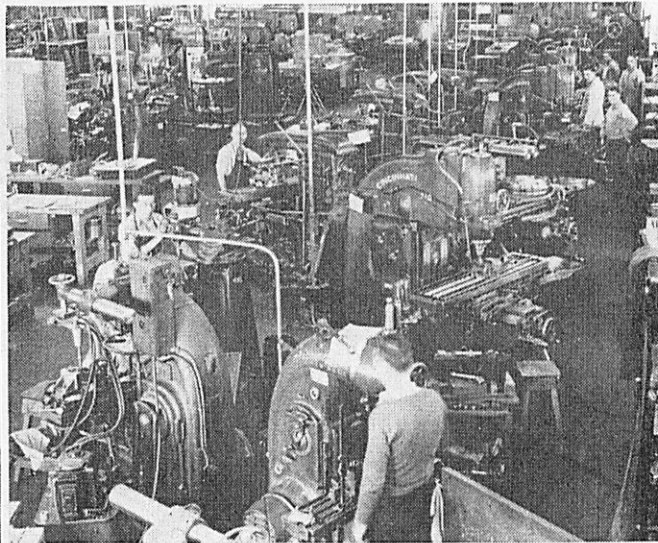
7. Overhaul Activity—Although less spectacular than the design and production of airframes and engines, the overhaul business is an essential and a considerable feature of the Canadian aircraft industry. Over-all estimates are difficult because of the "bits and pieces" nature of airframe and engine overhaul business. However, on the RCAF account alone, 1949 overhaul contracts amounted to about \$12 millions. This dollar value would be exceeded by the volume of civilian maintenance and overhaul.

Although the Avro Canada plant is a Hawker - Siddeley subsidiary, the effort is 98% Canadian. This photo was taken during construction of the prototype jetliner.





It is anticipated that the Orenda turbojet, shown here at the final assembly stage, will rate up to 9,000 lb. ST. It will be flight tested soon.



Part of the milling machine section in the Avro Canada plant. Precision machining of myriad small parts is a requirement of turbojet manufacture.

T. J. Emmert, until recently an executive of Canadair Ltd., has made some pertinent observations on our aircraft industry. In a recent talk he dropped some hints concerning Canadair's future plans.

"Our sales department" he said, "is currently planning a sales campaign for the three-engined Trader transport (A Northrop design—Ed.) which will assert itself in realms of short-haul passenger, cargo and general utility transportation, particularly to areas where landing facilities are inadequate for aircraft types now available.

"I am not at liberty to disclose the nature of our current design efforts, but you may draw your own conclusions from the fact that our engineering and preliminary design staffs in particular are being expanded. We are most enthusiastic about what is coming from behind locked doors in these departments.

"Aircraft manufacturing is one of Canada's youngest industries. From virtual nonexistence only two decades ago, the Canadian aircraft manufacturing industry took its place as 61st among manufacturing industries in Canada just before the war, and rose to fourth place during the peak of its wartime production.

"The industry has returned to about 61st place among Canadian manufacturing industries but here in Montreal the aircraft industry holds 16th place.

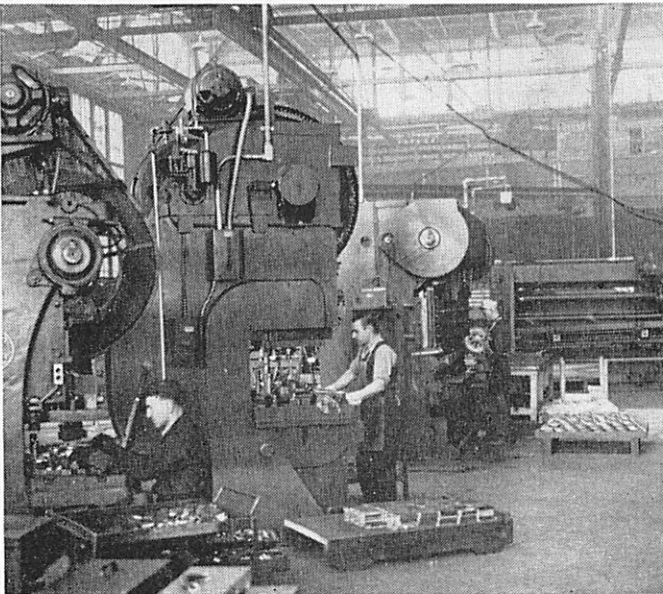
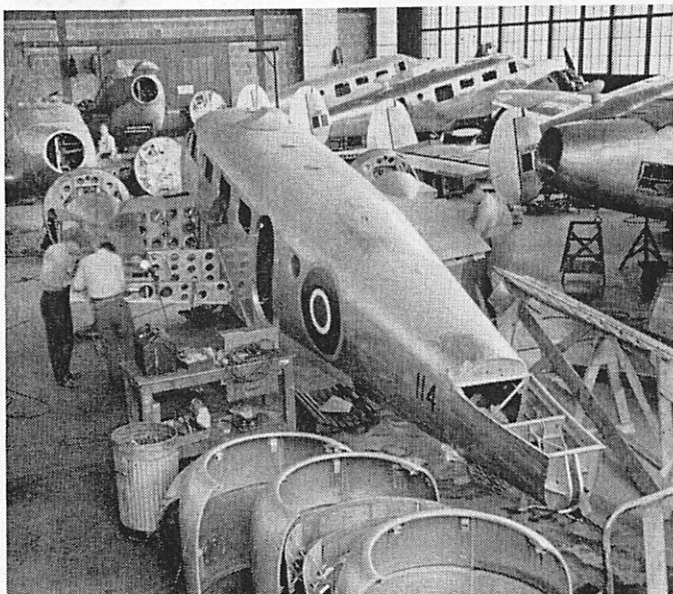
"At capacity production, in 1944, Canada produced just over 4,000 aircraft. In that same year, Britain produced 30,000 aircraft and the United States 96,000.

"Canada's new aircraft production in 1949 totaled just over 100 aircraft. United States aircraft production in the same year reached about 9,000, mostly for the United States Government.

"Canada's most striking postwar success has been in the production of transport aircraft for sale in the highly competitive world market for commercial transport types. Immediately after the last war there was no such thing as a Canadian-built four-engined commercial transport aircraft.

The MacDonald Bros. Aircraft plant at Winnipeg employs 400 and uses 150,000 sq. ft. of plant area. About 75% of the company's

current activity is devoted to aircraft work. The presses, at right, are part of a varied installation to handle aircraft conversion and overhaul.



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But with the delivery in 1947 of the first Canadair North Stars to Trans-Canada Air Lines, we were able to claim that approximately 2% of new four-engined commercial aircraft entering service during that year were built in Canada.

"In 1948, approximately 20% of new four-engined commercial aircraft which entered service on the world's airlines were Canadian-built.

"With the delivery in 1949 of 26 Canadair Four aircraft to Canadian Pacific Air Lines and British Overseas Airways Corp., over 25% of new four-engined aircraft entering service on the world's airlines during the year were built in Canada."

At the Avro Canada plant, where some 3,600 people are now employed, and close to 5,000 are anticipated a year from now, it is estimated by the president, Sir Roy Dobson, that about \$32 millions have been invested since the war in the company's three main projects. (About half of this amount represents government investment.)

Program at Critical Phase

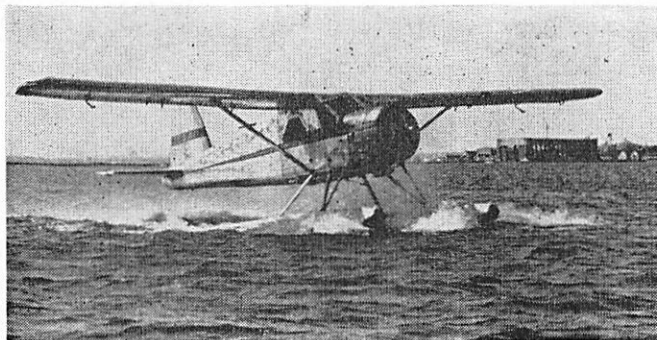
These projects are: 1. The 50-passenger Jetliner 460-mph. transport which is undergoing flight trials prior to official type approval. 2. The CF-100 RCAF all-weather long-range fighter, powered by two RR Avon jet engines (each about 6,500 lb. ST). The CF-100 has made several successful test flights. 3. The Orenda turbojet engine, soon to make its first flight in an airborne test bed. To date this engine has measured up with the best anywhere and there are hopes that it will be rated as high as 9,000 lb. ST.

It is thus apparent that the Avro program has reached a critical stage in each of its phases, the transition from the development stage to production. In the case of the Orenda and the CF-100, production will be determined largely by the placement of orders by the RCAF, although there is some prospect that both of these military products may be offered in the export market too.

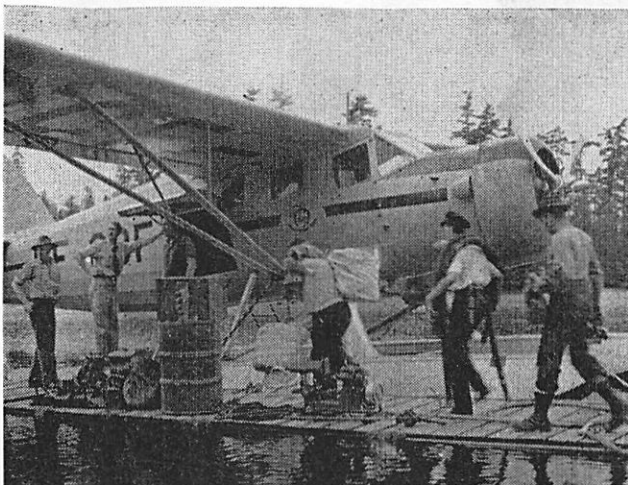
However, the Jetliner now faces the challenge of capturing markets at home and in the highly-competitive export field.

Plans call for energetic sales efforts in the United States as well as in Europe. Should U. S. restrictions block Jetliner sales to American airlines, there is a possibility that it might be manufactured in the U. S. on license. Plans call for flying the prototype Jetliner to England in time for the SBAC Show in September. By that time Avro hope to have the

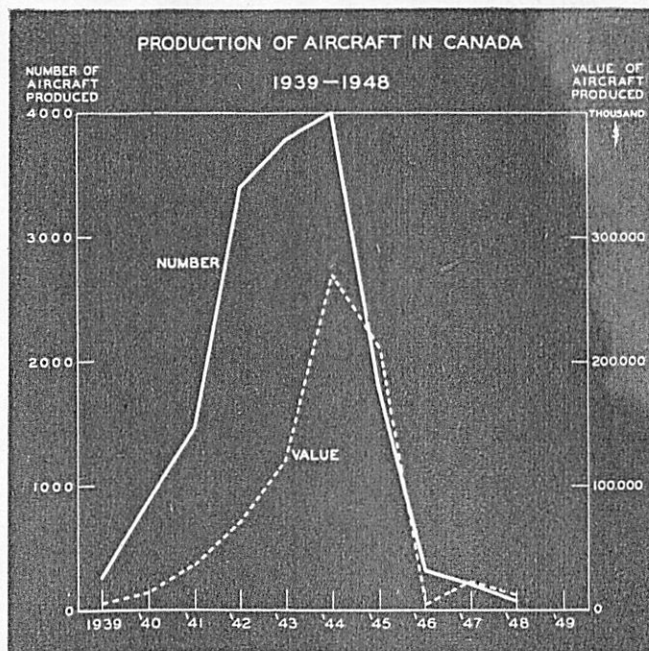
The D-H Beaver, highly successful Canadian bush-plane, designed since the war. During 1949, 42 of these were delivered.



The veteran Norseman, pre-war Canadian design, has been in steady demand for bush flying. It is manufactured by Canadian Car & Foundry Co. Ltd., Montreal.



The Fairchild Husky had a number of unique features but was discontinued when the manufacturer went out of business.



The spectacular decline of the aircraft manufacturing industry at the end of the war is illustrated in this Dominion Bureau of Statistics chart. It shows number and value of aircraft produced.

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Aircraft Industry

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second prototype ready for demonstration flights.

Fred T. Smye, assistant general manager of Avro Canada, summarizes his company's 1950 plans in the following words:

"With limited preproduction contracts for the Orenda and the CF-100 fighters, we are now busily engaged in tooling and in all other respects preparing for their production. We have reasonable assurances that there will be further production contracts

soon if the CF-100 proves successful and if its performance comes up to its design specification.

"In 1950 more of our energy will be devoted to production of Orendas and CF-100 fighters or more specifically to the plans and preparations for their production and delivery.

"There will be substantial plant rearrangement, including the establishment of a production layout for the CF-100 and a production shop for the Orenda. Most of the tool design and tooling for both engine and fighter should be completed during the year.

"Materials, bought-out parts and

equipment will be purchased and a substantial amount of work should be in progress so that our products can come off the line in early 1951. In fact, the first of the production fighters are scheduled for completion during the latter half of 1950.

"As far as the Jetliner is concerned, this year will be devoted to extensive test flights, construction of the second aircraft and a concentrated sales effort."

During a recent visit to Canada, Sir Roy Dobson, who is a director of the parent Hawker-Siddeley Aircraft group in England and president of Avro Canada, indicated that the know-how of the English group deserved a lot of credit for the achievements at Malton. However, he said, "the operation here is 95% or 98% Canadian right now. Maybe it's higher."

Referring to the degree of achievement by the Canadian industry he said:

"I am delighted. I think it has surprised everybody at home. And I think it has surprised a lot of people in Canada too."

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Test Flying Jets

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there were two schools of thought for optimum fuel economy—one was that it was more economical to climb to optimum altitude and provide for a long slowly-descending approach, and the second was for cruising at the optimum altitude until close to destination, then descending rapidly by employing air brakes. It would appear that before this argument can be resolved, operational data will have to be compiled for comparison.

The use of air brakes or an air brake flap system is almost mandatory in high-speed high-altitude turbine-powered aircraft, for the reason that since maximum efficiency is attained only at optimum altitude and speed it follows that the stalling speed increases to the point where there is considerably less margin between the stall and the critical Mach number.

At high altitudes, the slightest depression of the nose results in rapid increases of speed where a dangerous condition might result by too close an approach to the critical Mach number. The careful manipulation of the throttles also is required at high altitudes to avoid losing engines. It is here that the air brake becomes necessary to slow down sufficiently to maintain safe control and also to