SPEED SPELLS PROFIT

THE JETLINER GOBBLES FUEL BUT THE ECONOMY OF SPEED MAKES THIS PLANE A WINNER CLAIMS AVRO SALES CHIEF

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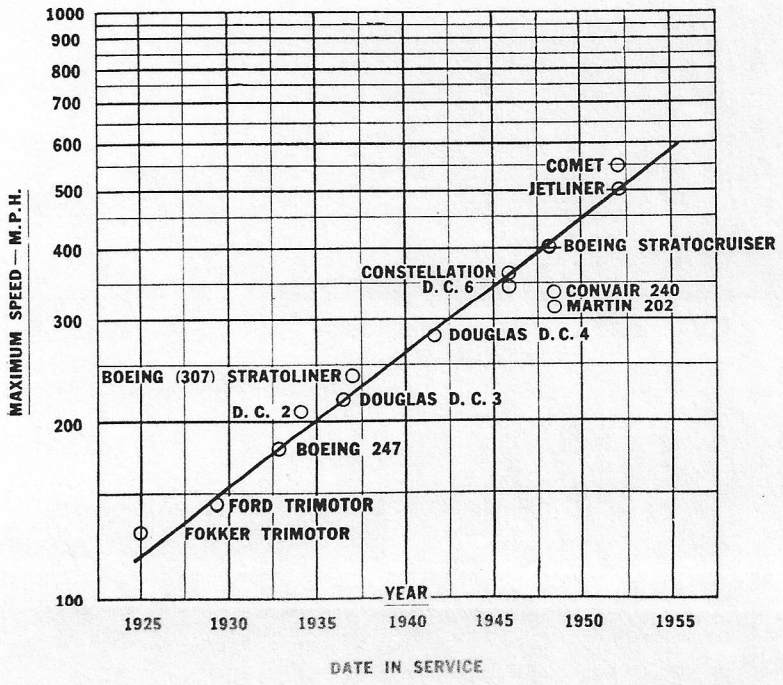
SINCE the Avro Canada Jetliner made its first flight on August 10th, 1949, to become the first commercial gas turbine-powered aircraft to fly on the North American continent, the trend of thought of those watching its progress has now changed from, "Is it practical and operationally sound?" to "Will it perform economically?"

It is my purpose to note some of the economic features of the Avro Jetliner which indicate that its future in competitive airline operation is very bright.

In the Jetliner's early design stages it was generally agreed that if the basic advantages of simplicity and high speed which the jet engine offered could be combined in a commercial transport with the required safety and economy there would be a substantial demand for such an aircraft. You may well ask at this point why we at Avro Canada decided in favor of the turbojet back in the spring of 1946. The new facts in the story are these:

The turbojet engine was chosen as the power plant for the Jetliner because of its inherent simplicity and its relatively advanced stage of development over other types of gas turbine engines. In spite of the fact that midway in the development program we changed from two Rolls-Royce Avon engines to four Derwent engines, our selection was still turbojets for these same reasons of simplicity and dependability.

We were aware as were other designers that in order for an aircraft to follow the logical trend of speed development, an aircraft required for service in 1952 should have a top speed in the neighborhood of 500 mph. This could only be accomplished by using turbojet power plants. Fig. I outlines the trend of aircraft speeds in relation to the date which various types have been placed in service. It is interesting to note how closely the Jetliner conforms to this curve or trend.



An Intricate Design Problem — To produce an aircraft capable of earning profits under intense competition it is essential that the designer must visualize the conditions existing at the time the aircraft is to be placed in service. In some cases this may be four to six years, from the time the initial design is started. The successful completion of the project in terms of production orders would depend almost entirely upon the degree of foresight displayed by the engineering team during these initial stages.

The Avro Jetliner is an outstanding example of an aircraft capable of meeting competition under specialized conditions. I would like to outline the economic potentialities of the aircraft showing how our engineers took advantage of modern technical developments and employed them in such a manner that the aircraft as it will emerge from the production line will be attractive to economy-minded travelers and operators alike.

Some of the major advantages incorporated in the Avro Jetliner are:

A. Turbojet Engine Power Plants—

1. No propeller purchase, overhaul or maintenance costs.

2. Operation possible on a wide range of low-grade fuels. Increased safety by reducing fire hazard.

3. Simple engine installation, making quick change possible.

4. Almost negligible oil consumption.

5. Engine control simplification. No mixture controls or supercharge controls.

6. Inherent engine simplicity. No timing system, etc.

7. Increased aircraft regularity.

8. Shorter undercarriage—reduced weight, ease of loading and servicing.

9. Reductions effected in parasite and induced drag.

B. Higher Block Speeds—

1. Fewer aircraft required to handle a given traffic.

2. Reduced investment in airline equipment.

3. Reduced crew expenses.

4. Daily revenue mileage increased.

C. Passenger Appeal—

1. Freedom from engine or propeller vibration.

2. Highly pressurized cabin permitting sea level conditions up to 21,500 ft.

3. Cabin is "warm wall" heated, and air is changed once a minute.

4. Trip times reduced by 30-50% over conventional aircraft.

D. Pilot Appeal—

1. Cruising speeds up to 450 mph.
2. Exceptionally high rate of climb.
3. Exceptional acceleration possible on take-off.
4. Normal landing speeds.
5. Silent cockpit.
6. Engines can be started in the air up to cruising altitude.
7. Full directional control with any two engines in operation. Little tendency to yaw.

Few of you have witnessed the exceptional performance of the Avro Jetliner but most of you have probably heard or read various papers dealing with its design and performance details. Very briefly, the highlights of the production version of the Jetliner may be summarized thus:

Four Derwent 5 turbojet engines. Total static thrust at sea level ICAN conditions ..... 14,400 lb.

Maximum Gross Weight (medium-range version ..... 68,000 lb.

Max. Landing Weight .. 52.500 lb.

Cruising Speed at 30,000 ft. 430 mph.

Payload ..... 13,000 lb.

Number of passengers .. 40-60

Four-engine take-off over 50 ft. obstacle at 65,000 lb. sea level, standard atmosphere ..... 3,650 ft.

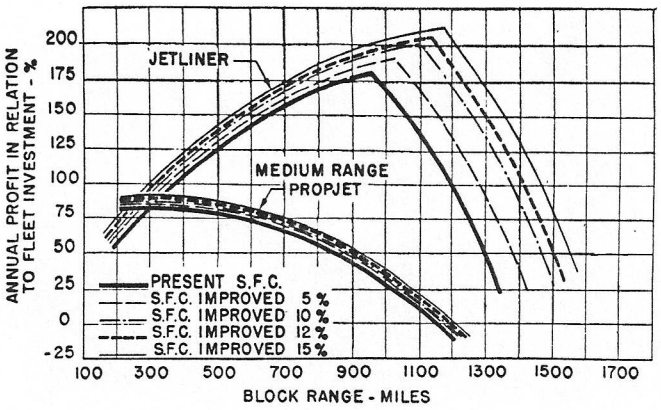
Three-engine take-off, same conditions ..... 4,120 ft.

Landing at maximum landing weight of 52,500 lb.

—Sea Level (ICAN) .... 2,867 ft.

—3,500 ft. (ICAN) ..... 3,064 ft.

From the flight trials conducted to date it is very evident that the Avro Jetliner can be operated from existing runways; its landing and take-off runway requirements are very conventional and it is also capable of taxiing into and out from the passenger loading ramp without danger of singeing the eyelashes of bystanders or leaving in its wake a stream of melted runways and taxi strips.



Airline Economics—It has been repeatedly stated that regardless of all other features which an aircraft may possess, if it cannot be operated to an economic advantage over an airline's own particular route structures it cannot hope to receive more than casual or academic interest. This appears to be very reasonable since like any other business enterprise it is the objective of the commercial operator to realize a profit on his investment.

The obvious question about the Avro Jetliner is, "How does it operate economically in spite of its high fuel consumption?" I would like to point out that although the fuel consumption of the Jetliner is high as compared with propeller-driven aircraft there are, however, certain features which offset this condition and make the Jetliner a definite paying proposition.

The Economy of Speed—Much has been said in the past as to whether or not the direct operating costs per passenger or ton mile is a true measure of the relative merits of various types of aircraft. Our opinion at Avro is that where aircraft having similar speed, payload and engine characteristics are compared, a true measure of their relative earning merits is reflected in their respective direct operating cost per unit mile. But, where the characteristics of aircraft vary greatly such as in the case of a turbojet and a piston-engined aircraft, such direct operating costs comparisons may be very misleading.

Those who are acquainted with the notorious thirst for fuel which the jet engines have, find it difficult at first to understand how the Jetliner can be operated at a profit. The only manner in which the true economic merits of an aircraft can be judged is by its ability to earn revenue, pay overhead expenses and provide a profit. In the case of the Jetliner its secret is simple — its economy lies in its speed. Its speed enables it to fly more miles per day and thus earn additional revenue

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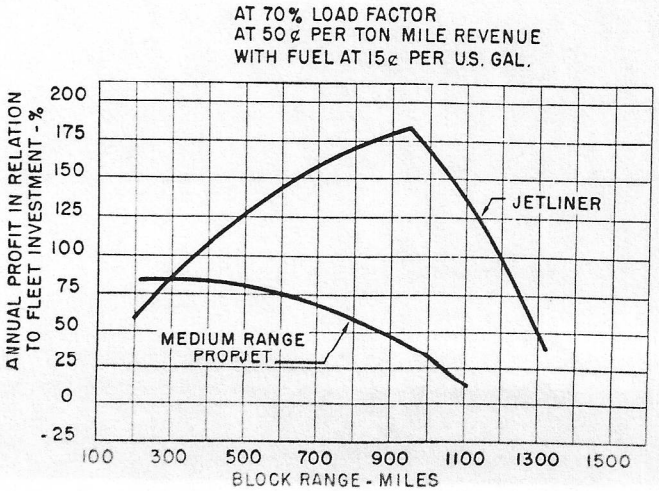

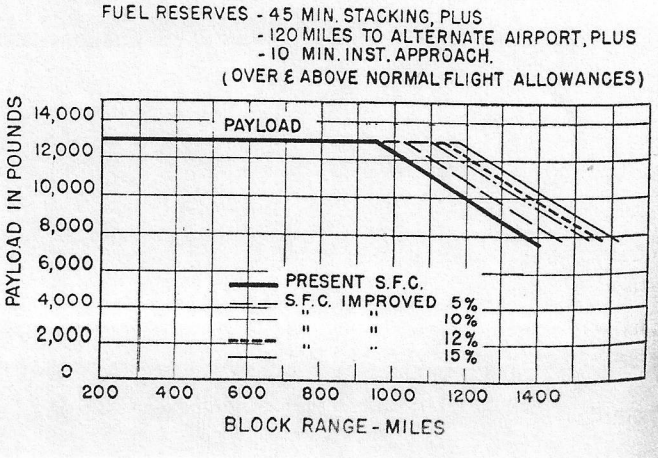

Speed Spells Profits

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which more than offsets the increased price of fuel which it consumes.

I would like to give you an example showing that while the turbojet transport may have higher direct operating costs than conventional aircraft due to its high fuel consumption, nevertheless its ability to earn revenue is indeed exceptional.

Here we see that the direct operating cost per ton mile for conventional aircraft is 10% lower, but in spite of this the net profit earned by the Jetliner is 65% higher.

Additional savings associated with turbojet aircraft which help to offset the higher fuel costs may be summarized as follows: By using jet engines without the usual complications of propellers, engine superchargers, propeller controls, oil coolers, radiators and cowl flaps, engine maintenance costs on the Jetliner are greatly reduced.

A further reduction in the number of aircraft required is made possible through the high speed of the Jetliner. It follows that the total airframe and engine maintenance costs and depreciation, hangar space, ground handling equipment, stores equipment, spares and crew expenses are also reduced.

In addition to these savings there are certain intangible items which definitely favor the use of Jet Transports on the commercial airways but it is very difficult to assess these merits in terms of dollars and cents. To the traveling public the Jetliner offers certain long-sought-for features. Depending, of course, upon the distance traveled it is possible that various trips by air can be reduced in time from 30% to 50% compared to existing airline schedules.

A pleasant surprise is in store for the traveler who makes his first flight in a Jetliner. Gone is the tedious and annoying vibration from engines and propellers. The high degree of cabin pressurization in the Jetliner permits sea-level cabin altitude conditions to be maintained to 21,500 ft., thus minimizing the ear-pressure problems previously experienced during climb and descent on high altitude flights.

The Jetliner travels above the weather and at altitudes where the continuously turbulent air is not annoying to passengers with delicate stomachs. The knowledge that the plane in which he is riding burns kerosene rather than gasoline thus greatly reducing fire hazards commonly associated with air travel adds materially to the travelers' peace of mind. A pilot can shut down one or two engines without passengers even being aware of it. Having once made a flight in the Avro Jetliner it is already apparent that the public will be dissatisfied with any other method of getting from A to B.

Jetliner Operational Considerations —It has often been pointed out that the changes which accompany progress invariably necessitate a measure of temporary discomfort. Moreover, the degree of departure from routine often indicates the extent to which progress is being made.

The advent of the commercial jet transport may be regarded in a very similar light when it is realized that the potentialities of air progress

Operating Cost and Earning Power Comparison

	Aircraft A 4-Piston Engine	Aircraft B Jetliner
Block distance — miles	500	500
Block speed — mph	240	320
Payloads — tons	6.5	6.5
Direct operating cost per hour	$190.00	$275.00
Overhead — per hour	$190.00	$190.00
Total operating cost per hour	$380.000	$465.000
Direct operating cost per aircraft ($)	.79	.86
Total operating cost per aircraft mile ($)	1.58	1.45
Direct operating cost per ton mile (c)	12.1	13.2
Total operating cost per ton mile (c)	24.3	22.4
Revenue earned in 10 hours flying at 65% load factor and 50c per ton mile	$5,060	$6,750
Expenses for 10 hours flying	3,800	4,650
NET PROFIT	$1,260	$2,100

	Jetliner Time	Present Flight Time
Toronto-New York	1 hr. 05 min.	1 hr. 55 min.
New York-Chicago	2 hr. 50 min.	3 hr. 30 min.
Detroit-New York	1 hr. 25 min.	2 hr. 10 min.
New York-Miami	3 hr. 10 min.	4 hr.
New York-Bermuda	2 hr. 20 min.	3 hr. 25 min.

These are average times to and from destination.

which are now within our grasp cannot be secured without some alteration to existing flight operations. Jet flight procedures will open up operational potentialities which only a few years back were considered to be somewhat futuristic.

The commercial jet transport possesses certain characteristics which can make remarkable contributions to both the airline operators and the traveling public. However, to attempt to use the jet transport exactly like a conventional aircraft would be as if modern highway traffic was to be regulated according to horse and buggy standards . . .

As a member of a firm which has given several years of thought and research to the subject of jetflight economics I feel that the conclusions indicate that commercial jet aircraft can and will be made to operate both safely and economically in a manner permitting reasonable fuel economies to be affected.

Importance of Selecting the Right Aircraft — Like any other business concern, the objective of the airline operator is to make a profit on his investment. Consequently, the transport aircraft may be regarded as his one and only medium from which any appreciable dividends may be realized. The only product airlines really sell is transportation which unlike other products cannot be stored, or exhibited in advance but must be produced upon demand. Unsold units cannot be salvaged for future sale.

Air transportation must be made available at a price which attracts the buyer and at the same time makes it possible for the operator to show a profit.

The aircraft selected must produce revenue sufficient to:

—Purchase, operate and maintain the aircraft itself.

—Pay for hangars, building, repairs, ticket offices, engineering, advertising, etc.

—Pay for the training of air crews.

—Pay for personnel salaries.

—Provide for the purchase of new aircraft and over and above all this make a profit for the company. From this you can see the importance of selecting the right aircraft.

I am happy to be able to say that our experience thus far at Avro Canada has indicated that the Jetliner's performance is surpassing all expectations. The aircraft promises to provide the realization of many ambitions shared by the traveling public and airline operators. From the flight testing program the soundness of the design has been firmly established. The final specification for the production aircraft is now in the process of being drafted and will we hope, determine the type of air transportation which we may expect to see in scheduled service in the near future.