

Reply by Author to J. Mayers

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IN his comment on the paper "Advanced Subsonic Transports—A Challenge for the 1990's" by Richard E. Black and John A. Stern, J. Mayers has made a strong and convincing argument for an increase in the level of government support for aeronautical research and development. No one can disagree with his position on this critical issue. However, reduced government research and development support for aeronautics is not the major reason for the delay in the appearance of an all new advanced technology transport. A change in the economic environment and the resulting impact upon the market for new aircraft is the major factor. Historically high rates of inflation combined with depressed economic conditions have characterized this environment. The domestic airlines have had to contend with lower passenger traffic growth rates and rapidly rising costs (Fig. 1). The international airlines have had the same general problem except that their individual costs have risen at different rates. Airline earnings and their ability to purchase new aircraft have been affected by these developments. Some airlines have experienced substantial operating losses over a period of years while others have experienced a continuing inadequate level of earnings.

Slower traffic growth rates, combined with the uncertainty produced by an inflationary environment, cause both airlines and commercial aircraft manufacturers to emphasize economic factors. The average annual rate of U.S. inflation was 3.5 times higher from 1965 to 1975 than from 1955 to 1965. Technology advances, as applied to commercial aircraft, must result in increases in economic productivity which exceed the price increases caused by inflation. In earlier periods of commercial aircraft development, significant operational improvements, such as increased speed, range, and comfort, caused existing aircraft to become obsolete. In addition, operating costs were steadily decreased. With the advent of pure jet transports in 1958-1959, a new high level of comfort was achieved. Aircraft manufacturers, using available technology, have not yet found an economical way to significantly exceed the speed standards of those aircraft. Thus, new and more expensive advanced technology aircraft must offer significantly improved operating economics which offset adverse aircraft operating cost trends. The airlines usually will not consider re-equipping their fleets unless the aircraft manufacturer offers direct operating cost reductions on the order of 10 to 20 percent because of the high introduction cost of new aircraft. Therefore, since aircraft price is a major factor determining direct operating costs, the use of advanced technology must improve economic productivity commensurate with its cost, "it must pay its way."

Received Dec. 17, 1976.

Index categories: Air Transportation Systems; Aircraft Economics; Aircraft Performance.

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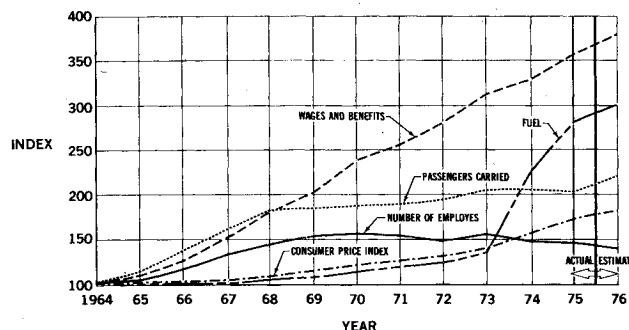


Fig. 1 Domestic airline cost trends, 1964-1976.

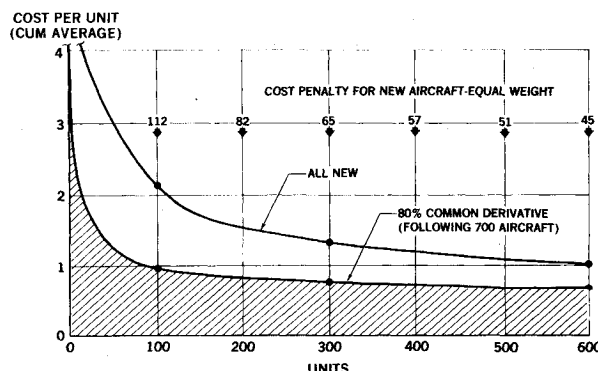


Fig. 2 Aircraft program cost comparison, constant dollars—equal weights.

Other factors must also be considered. Launching costs of aircraft programs have increased substantially (Ref. 1). The start-up costs of a new large commercial aircraft, measured in constant dollars, which do not include inflation, have also risen sharply in recent years. This is attributable to more stringent government regulations and additional airline requirements. In order to be attractive to the airlines, new aircraft must also be able to overcome the pricing advantage offered by existing aircraft, and their derivatives, due to the impact of the learning curve on recurring costs (Fig. 2) as well as substantially increased development cost.

An all new advanced technology transport will be introduced, but only when the application of advanced technology results in increases in economic productivity which exceed the price increases caused by inflation, government regulations, and new airline requirements. This means that new aircraft must have lower direct operating costs than current aircraft.

The literature contains several additional papers pertinent to this position (Refs. 2 and 3).

References

1. J. M. Ramsden, "Boeing, Douglas, Lockheed—and Europe," *Flight International*, June 12, 1976, p. 1549.
2. F. A. Cleveland, "Challenge to Advanced Technology Transport Aircraft Systems," *Journal of Aircraft*, Vol. 13, Oct. 1976, pp. 737-744.
3. J. E. Steiner, "Problems and Challenges—a Path to the Future," *Aeronautical Journal*, Jan. 1975.