USES AND MISUSES OF CAB FORM 41 DATA IN DETERMINATION OF AIRPLANE OPERATING ECONOMICS

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Summary

The Form 41 system is a well established, credible and essential source of cost data for the air transportation industry. Boeing is a major user of this data. It provides the basis for much of the company analyses. It helps provide a better understanding of the past, present, and prospective environment in which Boeing's products operate and compete. It enables assessment of the need for new products, such as the B-767 and B-757, and derivatives of existing products. It also enables more accurate assessment of the economic performance of airplanes. The net impact of these more efficient and productive airplanes is to reduce airline operating cost which will result in lower fares than would otherwise be charged. Thus, the public, the airlines, and the manufacturers all benefit.

Introduction

The CAB Form 41 System is the most comprehensive, well-organized data reporting system of its kind in the world today. This single source of readily available data is widely used throughout the industry, albeit for many purposes and uses.

Boeing depends on Form 41 data: to keep abreast of the financial performance of each reporting airline and the industry; to analyze, interpret, and evaluate trends in traffic, capacities, payloads, yields, costs and airplane operating statistics; to develop airplane operating cost baselines and operating statistics for fleet plans evaluations; to develop economic, traffic, product, and financial forecasts; and to formulate airplane operating cost standards for purposes of comparing airplanes in great detail for new product development and continued improvements for our current line.

Form 41 data in summary, is of enormous benefit in better understanding the past, present, and prospective market environment in which our products are sold, operate and compete.

Supplemented and enhanced by expanded technical and business resources, Form 41 data allows a manufacturer and supplier of products to continually evaluate how its products are performing in actual airline operation. It therefore permits identification of specific areas requiring improvements in production airplanes and develop derivatives and new products to meet the business expectations of the marketplace.

The net impact is to reduce airline operating costs which, in either a regulated or deregualted environment, will result in lower fares than would otherwise be charged. The public, the airlines, and the manufacturers all benefit.

Determining Airplane Operating Economics

The aviation industry has a long tradition of concern for the correct use of commercial airplane cost statistics in satisfying the need for accuracy in the comparison of airplane operating costs. This tradition has produced a continual development of high quality estimating methods.

In 1944 the first consistent set of rules to intelligently address the problem was published by the Air Transport Association (ATA). The ATA developed a formula for estimating airplane direct operating cost (DOC) which used a few simple parameters such as gross weight, airplane price, engine price, number of engines, etc. The ATA has continually updated and improved this method over the years.

In the sixties, Boeing and Lockheed, at the request of the FAA, jointly addressed the problem of establishing a set of rules to estimate airplane indirect operating cost (IOC). Individual indirect operating costs such as food, passenger handling and cargo handling were estimated based on a given parameter such as passengers or passenger miles flown.

Boeing has, over these many years, also improved upon analysis methods for determining airplane operating cost estimates. It has developed a consistent set of extremely detailed rules and costing assumptions. The cost level has been updated as conditions change. These cost levels are called "Standard Cost Levels" - standard in that they are relevant industry average cost levels.

Each airframe and engine manufacturer has a compelling need for accuracy in the determination of "true and meaningful" airplane operating cost baselines in product development studies, and for assessing the productivity of airplanes as applied in particular to airline sales campaigns. For Boeing, Form 41 has become the evolving foundation of our economic data bank, to be tested and adjusted for the variations in the marketplace before making any meaningful comparisons of airplane-in-service experience.

Misuse of Form 41 Data in Determination of Airplane Operating Economics

Turning now to the dangers of misuse of Form 41 data, there exists a potential for serious error. The CAB fully recognizes and addresses this danger when publishing its reports of actual data. Their view of this problem is so clearly stated in the following quotation from the CAB Financial and Cost Division, Office of Economic Analysis, report dated July 1980, entitled "Aircraft Operating Cost and Performance Report":

> "Users are cautioned against drawing conclusions without qualification regarding the merits of a particular aircraft based on the unit cost data presented in this report. Different carriers may use the same type of equipment under quite different operating conditions. In other instances, the data presented is based on limited fleet size and operating experience. Performance and operating data such as fleet size, average stage length, average speed, daily utilization, average seating configuration, etc., have been included in this report as an aid in evaluating the unit cost data. Nevertheless all pertinent information regarding the operations of an aircraft could not be included and thus users should exercise care before making comparisons."

Form 41 airplane type data is misused whenever it is published in news media, studies, and presentations without qualification to limitations inherent in the data. The misinterpretation that can be produced by comparison of reported Form 41 cost statistics is demonstrated by examination of actual 1979 reported data for the B-747 airplane in United States domestic operations. Five carriers operated passenger configured B-747s - American, Braniff, Northwest, Pan Am, and United (Table 1).

The highest average price paid for fuel was by American at 68¢ per gallon and the lowest price of 49¢ was paid by Braniff.

Average cost per block hour for fuel varied by 40 percent, crew by 76 percent, maintenance by 197 percent, and investment related operating cost (depreciation and lease cost) varied by 82 percent.

Average flight length between B-747 fleets varied by 100 percent, daily airplane utilization by 34 percent, seat count by 10 percent, fuel price by 40 percent, fuel burn by 11 percent and block speed by 22 percent.

There are many reasons for these enormous variations. Fuel cost is affected not only by price but also by operational factors such as airplane weights, flight length, and flight pattern. Maintenance costs vary because of contracting practices, the type of maintenance program, fleet age and engine type differences. Accounting policies alone contribute greatly to reported cost differences. To illustrate the range of resulting maintenance cost variation, Braniff's B-747 total maintenance cost is about $1000 per block hour as compared to about $500 for Northwest. This is understandable when it is realized that 92 percent of Braniff cost is contracted and only 10 percent for Northwest. Also consider variations in other carrier contract participation: American 9 percent, United 2 percent, and Pan Am 14 percent.

Accounting policies, price paid for equipment, lease cost, mix of leased versus owned equipment, fleet age and size, utilization, and other factors affect and help explain variations in airline to airline reported investment related costs. For example, Braniff reported investment related operating cost per block hour is 82 percent greater than Northwest. A detailed analysis could explain this difference rather concisely but suffice it to say here that Braniff leases, Northwest owns, and Braniff's fleet is newer and smaller.

As can be seen, the variations are significant. The same would hold true if one were to examine the DC 10-10 fleets. Therefore to draw a conclusion on the relative productivity of the B-747 airplane compared to the DC 10 airplane, for example from the reported data alone, could well be highly misleading.

To be accurate and confident about airplane comparisons, one must establish a consistent set of operational and accounting rules and assumptions. To publish reported Form 41 airplane direct operating cost data, without qualification, is to misuse the data. Such misuse is unfortunately common and is a principal source of confusion about the relative productivity of airplanes.

Table 1. B-747, Passenger configuration, U.S. domestic operation (12 months ending December 31, 1979).

	AA	BN	NW	PA	UA	AVERAGE
Airplanes Assigned	5.00	1.80	7.10	3.80	15.20	32.90
Daily Utilization	9.47	12.70	9.88	12.13	10.76	10.64
Stage Length (S.M.)	2365	2991	1514	1770	2210	2020
Seat Count	370	404	368	405	374	378
Block Speed	461	488	400	444	467	450
Fuel Gallons per Block Hour	3319	3263	3001	3256	3318	3238
Fuel Price per Gallon (¢)	67.8	48.5	59.4	57.6	54.6	57.4
Cost per Block Hour ($)						
Crew	500	357	459	531	630	545
Fuel	2295	1643	1855	1952	1867	1918
Insurance & Other Miscellaneous	19	37	12	21	15	17
Direct Maintenance-Airframe & Other	243	411	176	185	178	202
Direct Maintenance -Engine	178	579	199	190	247	241
Burden Maintenance	318	25	115	409	373	293
Depreciation-Airframe & Other	138	31	337	169	237	223
Depreciation - Engine	27	6	79	238	50	75
Obsol. & Det.-Expend. Parts	30	3	10	10	5	10
Rentals & Amort. Capital Leases	253	733	0	110	191	182
Total Airplane Operating Cost	4001	3825	3242	3815	3793	3706

Source: Aircraft Operating Cost and Performance Report for Calendar Years 1978 and 1979 published July 1980 and prepared by the Financial and Cost Analysis Division, Office of Economic Analysis, Civil Aeronautics Board, Washington, D.C.