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U.S. Department  
of Transportation

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Administration

# Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs

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Office of Aviation  
Policy and Plans

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**Economic Values for Evaluation of Federal Aviation Administration  
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## EXECUTIVE SUMMARY

This Report presents economic values, often referred to as “critical values,” for use in the conduct of benefit-cost and other evaluations of investments, including certain Airport Improvement Program (AIP) grants, and regulations subject to Federal Aviation Administration decisionmaking. Application of these values to their corresponding physical quantities permits valuation of the physical quantities in dollars. Conceptually, they can be thought of as measures of the dollar sacrifice associated with each physical quantity outcome—avoided fatality, air frame damage, etc.—resulting from a potential investment or regulatory action that society and users should be willing to make to undertake that investment or regulatory action.

Values presented fall into two general groups. Passenger related values consist of the value of passenger time, the value of an avoided fatality, and the value of avoided injuries. Aircraft related values include aircraft capacity and utilization factors, aircraft operating and ownership costs, and aircraft replacement and restoration costs. Passenger related values are established by Department of Transportation policy which is applicable to all Modal Administrations within the Department. Aircraft related values have been developed by the Office of Aviation Policy and Plans from public and proprietary data sources.

Summary values, which are applicable to benefit-cost analyses conducted in 1998, are presented in Table E-1. Passenger related values reflect current Department of Transportation guidance. Aircraft related values are derived from the detailed values presented in the text. Because text aircraft related values represent 1996, values presented in Table E-1 have been made current using the methodology of Appendix A. *These are summary values only. Analysts and other users should refer to the text of the report for further detailed values.* For aircraft related values, detail for most measures is available by specific aircraft, by generic aircraft classification, such as two engine narrow body, four engine wide body, or single engine piston, and by user profiles such as scheduled commercial service, air taxi, general aviation, or commuter. The various generic categories and user profiles have been constructed so as to anticipate the needs of analysts conducting investment and regulatory studies. Other measures can be developed from the underlying source data. Requests for assistance in developing information required for specific projects should be addressed to the Economic Program Officer, Office of Aviation Policy and Plans, APO-3.

The values presented in this report can be expected to change with the passage of time because of price and income level movements, aviation industry changes, advances in theoretical and empirical research, and policy changes. The Office of Aviation Policy and Plans will provide periodic updates to these values to reflect such changes. Pending such updates, aircraft specific values may be adjusted using the methodology contained in Appendix A.

**Table E-1**

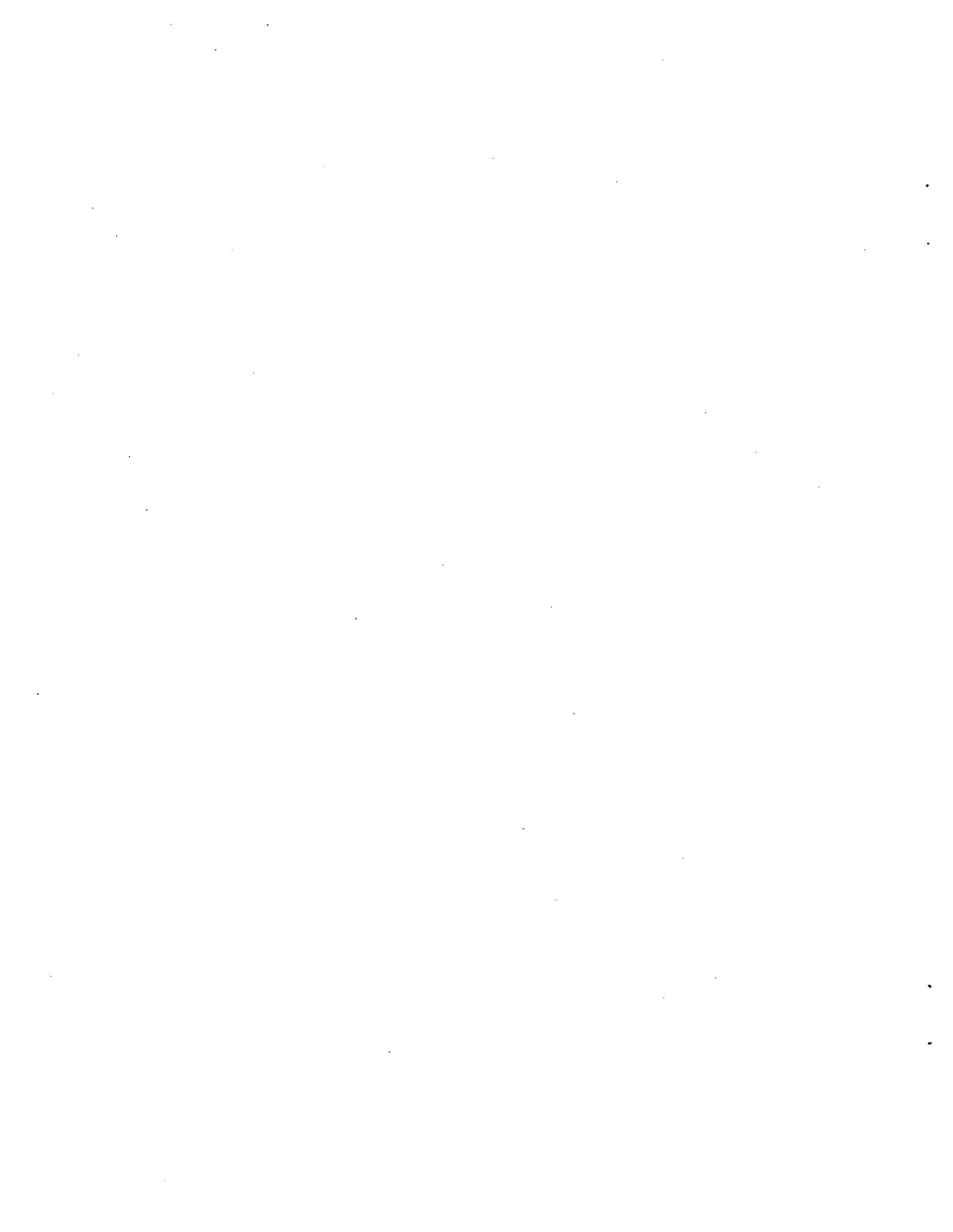
**Economic Values for Use in Analyses Conducted in 1998**

<b>Physical Unit</b>	<b>Value</b>
<b>Value of Passenger Time per Hour</b>	
<u>Air Carrier:</u>	
Personal	\$19.50
Business	\$34.50
All Purposes	\$26.70
 <u>General Aviation:</u>	
Personal	\$26.30
Business	\$37.50
All Purposes	\$31.10
 <b>Avoided Fatality</b>	 \$2,700,000
 <b>Avoided Injuries</b>	
<u>Injury Value by AIS Category (per injury):</u>	
Minor (AIS 1)	\$5,400
Moderate (AIS-2)	\$41,900
Serious (AIS-3)	\$155,300
Severe (AIS-4)	\$506,300
Critical (AIS-5)	\$2,058,800
Fatal after 30 Days (AIS-6)	\$2,700,000
 <u>Other Costs by AIS Category (per victim):</u>	
Minor (AIS 1)	\$2,300
Moderate (AIS-2)	\$6,300
Serious (AIS-3)	\$18,800
Severe (AIS-4)	\$99,200
Critical (AIS-5)	\$266,200
Fatal after 30 Days (AIS-6)	\$119,000
 <u>Injury and Other Costs by ICAO Category (per victim):</u>	
Minor	\$38,500
Serious	\$521,800

Physical Unit	Value
<b>Aircraft Capacity and Utilization Factors</b>	
<u>Scheduled Commercial Service:</u>	
Passenger Capacity	162.3 seats
Crew Size	6
Cargo Capacity	11.6 tons
Passenger Load Factor	70.7%
Cargo Load Factor	44.6%
Daily Utilization	6.9 hours
Average Flight Speed	417 mph
<u>Air Carriers w/o Commuters:</u>	
Passenger Capacity	168.7 seats
Crew Size	6.1
Cargo Capacity	12.2 tons
Passenger Load Factor	71.0%
Cargo Load Factor	44.6%
Daily Utilization	7.4 hours
Average Flight Speed	439 mph
<u>Commuters Only:</u>	
Passenger Capacity	30.6 seats
Crew Size	3
Cargo Capacity	1.6 tons
Passenger Load Factor	52.3%
Cargo Load Factor	33.1%
Daily Utilization	4.5 hours
Average Flight Speed	232 mph
<u>Air Taxi:</u>	
Passenger Capacity	6.6 seats
Passenger Load Factor	44.4%
Useful Load	3,097 lbs.
<u>General Aviation Only:</u>	
Passenger Capacity	5.4 seats
Passenger Load Factor	49.5%
Useful Load	1,894 lbs.
<u>General Aviation and Air Taxi:</u>	
Passenger Capacity	5.5 seats
Passenger Load Factor	49.0%
Useful Load	1,969 lbs.

<b>Physical Unit</b>	<b>Value</b>
<b>Aircraft Operating Costs</b>	
<u>Scheduled Commercial Service:</u>	
Variable Operating Cost per Hour	\$2448
Fixed Cost per Hour	\$645
Total Cost per Hour	\$3093
<u>Air Carrier w/o Commuter:</u>	
Variable Operating Cost per Hour	\$2876
Fixed Cost per Hour	\$727
Total Cost per Hour	\$3603
<u>Commuters Only:</u>	
Variable Operating Cost per Hour	\$572
Fixed Cost per Hour	\$276
Total Cost per Hour	\$848
<u>Air Taxi:</u>	
Variable Operating Cost per Hour	\$424
Fixed Cost per Hour	\$356
Total Cost per Hour	\$780
<u>General Aviation Only:</u>	
Variable Operating Cost per Hour	\$190
Fixed Cost per Hour	\$375
Total Cost per Hour	\$565
<u>General Aviation and Air Taxi:</u>	
Variable Operating Cost per Hour	\$303
Fixed Cost per Hour	\$373
Total Cost per Hour	\$677
<u>Military:</u> Variable Operating Cost per Hour	\$1,631
<b>Replacement Costs of Destroyed Aircraft</b>	
Scheduled Commercial Service	\$16,300,000
Air Carriers w/o Commuters	\$19,480,000
Commuters Only	\$3,740,000
Air Taxi	\$665,000
General Aviation Only	\$522,000
General Aviation and Air Taxi	\$532,000
Military	\$21,600,000

Physical Unit	Value
<b>Restoration Costs of Damaged Aircraft</b>	
Scheduled Commercial Service	\$2,200,000
Air Carriers w/o Commuters	\$2,630,000
Commuters Only	\$501,000
Air Taxi	\$143,000
General Aviation Only	\$133,000
General Aviation and Air Taxi	\$133,000
Military	\$2,920,000



# SECTION 1: TREATMENT OF VALUES OF PASSENGER TIME IN AIR TRAVEL

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## 1.1 APPROACH

This section addresses the treatment of the value of passenger time saved or lost as a result of investments in transportation facilities or regulatory actions. It is based upon guidance furnished by the Office of the Secretary of Transportation (OST).<sup>1</sup>

Time is a valuable economic resource which may be devoted to work or leisure activities. Because traveling consumes time, it imposes an opportunity cost equal to the individual's value of time in the forgone work or leisure activity. Moreover, since travel may take place under undesirable circumstances, including waiting or riding aboard a crowded or uncomfortable vehicle, it can impose an additional cost on travelers. Travel time saved or lost as a result of investments or regulatory actions should be valued in benefit-cost analyses to reflect both the opportunity cost and discomfort, if any, people experience when traveling.

Simple economic theory postulates that individuals will adjust the amount of time they devote to work and leisure such that an additional small increment of either may be valued at the wage rate.<sup>2</sup> More realistic models recognize that constraints on the ability of workers to alter work schedules or the conditions under which time is devoted to either work or leisure can cause the value people place on an incremental gain or loss of time to deviate, perhaps significantly, from the wage rate.<sup>3</sup> Nonetheless, contemporary practice is to value traveler's time as a proportion of the wage rate.

## 1.2 RECOMMENDED VALUES

Department of Transportation recommended values for aviation passenger travel time valuation derived from the wage rate are presented in Table 1-1.

---

<sup>1</sup> "Departmental Guidance for the Valuation of Travel Time in Economic Analysis," Office of the Secretary of Transportation Memorandum, April 9, 1997.

<sup>2</sup> For a presentation of the conventional theory, see James M. Henderson and Richard E. Quandt, *Microeconomic Theory*, New York, McGraw-Hill, 1958, pp. 23-24.

<sup>3</sup> Nils A. Bruzelius, *The Value of Travel Time: Theory and Measurement*, London: Croom Helm, 1979, and Kenneth A. Small, *Urban Transportation Economics*, Philadelphia, Harwood Academic Publishers, 1992, pp. 36-45.

**Table 1-1**

**Recommended Hourly Values of Travel Time Savings  
(1995 U.S. dollars per person)**

Category	Recommendation	Sensitivity Range	
		Low	High
<u>Air Carrier:</u>			
Personal	\$19.50	\$16.70	\$25.00
Business	\$34.50	\$27.60	\$41.40
All Purposes	\$26.70	\$21.90	\$32.90
<u>General Aviation:</u>			
Personal	\$26.30	n.r.	n.r.
Business	\$37.50	n.r.	n.r.
All Purposes	\$31.10	n.r.	n.r.

n.r.: No recommendation.

For air carrier passengers, the time values are derived from the Air Transport Association of America *Air Travel Survey*, last conducted in 1993, escalated by the increase in median annual income to U.S. households from 1993 to 1995 as reported in Bureau of the Census, Current Population Reports, *Money Income of Households, Families, and Persons in the United States*, Series P-60. The value for personal travel is 70 percent of the weighted average of annual income categories in the survey for “visit friends,” “sightseeing,” and “other” travel divided by an assumed 2000 hours of work per year. The value for business travel is 100 percent of the annual income category in the survey for “business” divided by 2000 hours of work per year. When considering general aviation passengers as a separate category, a value of 70 percent of the median hourly income of AOPA members is established for personal travel and 100 percent of median hourly income for business travel.

The fractions of 70 percent and 100 percent were recommended by a panel of transportation economists.<sup>4</sup> High and low values representing a plausible range of values based on variation in panel member opinions are furnished for use in conducting sensitivity analysis.

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<sup>4</sup> Those consulted were: Don Pickrell (Volpe Center), Clifford Winston (Brookings Institution), Steven Morrison (Northeastern University), David Lewis (Hickling Lewis Brod), Ted Miller (National Public Services Research Institute), and Daniel Brand (Charles River Associates).

### 1.3 APPLICATION

General Applications: The values in Table 1-1 for air carrier passengers should be used when considering investments and regulations which impact aviation from an overall perspective. Depending on data availability, either the separate personal and business values can be applied to travel time savings or losses experienced, respectively, by personal and business travelers, composite averages can be developed using weights characteristic of the specific application, or the air carrier value for all purposes may be used.

General Aviation Values: Where the composition of air traffic affected by an FAA action can be shown to include an unusually large share of general aviation, the values for general aviation passengers in Table 1-1 may be used in appropriately weighted averages. In such cases, the weights should be selected so as to correspond to the proportion of time saved or lost by each user group as a result of the action under consideration. An analytically equivalent procedure would be to calculate time saved or lost separately for air carrier passengers and general aviation passengers and apply the respective hourly values for each.

Value of Small Time Savings or Losses: There has been significant discussion about whether small increments of time should be valued at lower rates than larger increments. Arguments for valuing smaller increments of time less than larger ones emphasize the difficulties of making effective use of smaller increments, particularly when unanticipated. The present state of theoretical and empirical knowledge does not appear to support valuing small increments of time less than larger ones. Therefore, the values in Table 1-1 should be used for all valuations, irrespective of the size of individual increments of time either saved or lost.

Sensitivity Analysis: Because uncertainty surrounds the recommended values, a range of values is also presented in Table 1-1. Analysts should test the sensitivity of analyses to the ranges of uncertainty specified. Should the outcome of an analysis change across the range of values, this should be identified and reported.

Updating Values: Updates of the recommended values utilizing newly published source data upon which the recommended values are built will be provided periodically by OST. Pending such updates, analysts should not make interim adjustments using economy-wide measures of general price inflation.



## SECTION 2: TREATMENT OF THE VALUES OF LIFE AND INJURY IN ECONOMIC ANALYSES

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### 2.1 APPROACH

This section addresses the treatment of the values of life and injury in economic analyses that support rulemakings or investment decisions in the FAA. It is based on guidance furnished by Office of the Secretary of Transportation (OST) via memorandum January 8, 1993. This guidance provides recommendations to all modal administrators on the treatment of the values of life and injury in economic analyses. It specifies that values of life and injury be based on the "willingness to pay" (WTP) by society for reduced risks of fatalities and injuries.<sup>1</sup>

WTP is the theoretically correct approach to valuing all benefits arising from public investments or regulatory actions including fatalities and injuries avoided as a result of aviation accident risk reduction. This is because it represents the maximum amount of value yielded by other goods and services individuals would be willing to forgo and still be as well off after the introduction of an accident risk reduction as they were before it.

The basic approach taken to value an avoided fatality is to determine how much an individual or group of individuals is willing to pay for a small reduction in risk. Once this amount is known, it is necessary to determine how much risk reduction is required to avoid one fatality. The total willingness to pay for the amount of risk reduction required to avoid one fatality is termed the value of life or sometimes the value of a statistical life.<sup>2</sup> For example, if people are willing to pay \$2.70 to reduce the risk of a fatality by one chance in one million, this implies they will be willing to pay \$2.7 million to prevent one fatality. From another perspective, \$2.7 million represents the amount a group as a whole would be willing to pay to purchase the risk reduction necessary to avoid one expected fatality among its members.

In theory, the same approach could be used to value injuries. However, in practice it cannot currently be done because of data limitations. As will be indicated below, an alternative approach is used which values avoided injuries as a fraction of an avoided fatality.

---

<sup>1</sup> "Treatment of Value of Life and Injuries in Preparing Economic Evaluations," Office of the Secretary of Transportation Memorandum, January 8, 1993.

<sup>2</sup> The terms value of life and value of statistical life are misleading at best in that they refer to the sum of payments associated with many small fatality risk reductions undertaken prior to the occurrence of a fatality. They have no application to the actual death of any identifiable individual.

## 2.2 VALUE OF LIFE

For analyses conducted in 1993, OST guidance suggested that \$2.5 million be used as the minimum value of a statistical fatality avoided. This value was based upon a survey of studies performed by Ted Miller and others at the Urban Institute, adjusted to 1993 dollars.<sup>3</sup> The OST guidance also provided that OST would update this value early each year using the Gross Domestic Product implicit price deflator. Subsequently, OST updated the value of life for analyses to be conducted in 1994 to \$2.6 million per fatality averted.<sup>4</sup> The latest OST guidance establishes a minimum value of \$2.7 million per fatality averted.<sup>5</sup> This \$2.7 million value and the injury values based on it (presented below) should be used in all FAA analyses until revised by OST.

## 2.3 VALUE OF INJURIES

The January 8, 1993, OST guidance also establishes a procedure for valuing averted injuries based on the current value of life and the Abbreviated Injury Scale (AIS). AIS is a comprehensive system for rating the severity of accident-related injuries which recognizes six levels of injury severity. It classifies nonfatal injuries into five categories depending on the short-term severity of the injury. A sixth category corresponds to injuries that result in death after 30 days of the accident. The five nonfatal AIS categories are based primarily upon the threat to life posed by an injury. Table 2-1 gives an overview of the classification of different injuries by AIS level and their threat to life.

To establish valuation for each AIS severity level injury, the level is related to the loss of quality and quantity of life resulting from an injury typical of that level. This loss is expressed as a fraction of a fatality. WTP to avoid an injury of a particular AIS level is estimated by multiplying the fractional fatality value associated with the AIS level by the value of life. AIS levels, their associated fractional fatality values,<sup>6</sup> and the corresponding WTP value of each injury level (based on a \$2.7 million value of life) are provided in Table 2-2.

Where specific information is available on separate injuries by AIS level, the Office of Aviation Policy and Plans (APO) recommends that the WTP to avoid each specific injury be separately valued according to Table 2-2. Often, more than one injury will be associated with a person injured in an aviation accident. If valuation is to be presented on a per victim basis, WTP values for each injury suffered by the same person should be aggregated.

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<sup>3</sup> The Urban Institute, *The Cost of Highway Crashes*, Final Report, June 1991.

<sup>4</sup> "Update of Value of Life and Injuries for Use in Preparing Economic Evaluations," Office of the Secretary of Transportation Memorandum, March 15, 1994.

<sup>5</sup> "Update of Value of Life and Injuries for Use in Preparing Economic Evaluation," Office of the Secretary of Transportation Memorandum, March 14, 1995.

<sup>6</sup> These values were derived from Ted R. Miller, C. Philip Brinkman, and Stephen Luchter, "Crash Costs and Safety Investments," *Proceedings of the 32nd Annual Conference*, Association for the Advancement of Automotive Medicine, Des Plaines, Illinois, 1988.

**Table 2-1**

**Selected Sample of Injuries by the  
Abbreviated Injury Scale (AIS)**

AIS Code	Injury Severity Level	Selected Injuries
1	Minor	Superficial abrasion or laceration of skin; digit sprain; first-degree burn; head trauma with headache or dizziness (no other neurological signs).
2	Moderate	Major abrasion or laceration of skin; cerebral concussion (unconscious less than 15 minutes); finger or toe crush/amputation; closed pelvic fracture with or without dislocation.
3	Serious	Major nerve laceration; multiple rib fracture (but without flail chest); abdominal organ contusion; hand, foot, or arm crush/amputation.
4	Severe	Spleen rupture; leg crush; chest-wall perforation; cerebral concussion with other neurological signs (unconscious less than 24 hours).
5	Critical	Spinal cord injury (with cord transection); extensive second- or third-degree burns; cerebral concussion with severe neurological signs (unconscious more than 24 hours).
6	Fatal	Injuries which although not fatal within the first 30 days after an accident, ultimately result in death .

**Table 2-2**

**WTP Values Per AIS Injury Level**

AIS Code	Description of Injury	Fraction of WTP Value of Life	WTP Value
AIS 1	Minor	0.20 Percent	\$5,400
AIS 2	Moderate	1.55 Percent	\$41,900
AIS 3	Serious	5.75 Percent	\$155,300
AIS 4	Severe	18.75 Percent	\$506,300
AIS 5	Critical	76.25 Percent	\$2,058,800
AIS 6	Fatal	100.00 Percent	\$2,700,000

## 2.4 OTHER COSTS

Costs other than WTP values are generally associated with transportation fatalities and injuries. These include the costs of emergency services, medical care, and legal and court services (the cost of carrying out court proceedings--not the cost of settlements). These other avoided costs should be considered as separate benefits, additional to the WTP value.

Because medical and legal costs of separate injuries to the same victim are not necessarily additive, APO advises that medical and legal costs be valued on a per victim basis. Table 2-3 provides direct per victim medical and legal costs classified according to the worst AIS injury sustained by each aviation accident victim. Thus, the values in Table 2-3 should be added only once to the aggregated sum of the WTP values for injuries suffered by any particular individual.<sup>7</sup>

**Table 2-3**

**Per Victim Medical and Legal Costs Associated with Injuries  
(1998 dollars)**

AIS Code	Description of Maximum Injury	Emergency/ Medical	Legal/Court	Total Direct Costs
AIS 1	Minor	\$600	\$1,700	\$2,300
AIS 2	Moderate	\$3,500	\$2,800	\$6,300
AIS 3	Serious	\$14,500	\$4,300	\$18,800
AIS 4	Severe	\$63,700	\$35,500	\$99,200
AIS 5	Critical	\$193,500	\$72,700	\$266,200
AIS 6	Fatal	\$46,300	\$72,700	\$119,000

Source: *Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs*, FAA-APO-89-10, October 1989, Section 3, as adjusted for price level changes.

## 2.5 ICAO INJURY CLASSIFICATIONS

Although the methodology specified above should be used when possible, aviation injury data are often incomplete and/or unavailable at the AIS level. Most frequently, aviation injuries

<sup>7</sup> Similar direct costs apply in the case of fatalities. However, APO estimates that these direct costs are less than \$50,000 per fatality--not enough to shift the \$2.7 million WTP value after allowances for the rounding convention--to the nearest \$100,000--used by OST.

are reported by the number of victims suffering "serious" and "minor" injuries as defined by the International Civil Aviation Organization (ICAO). Under this classification, serious injury victims are typically (but not always) those with at least one injury at AIS 2 or higher, whereas minor injury victims typically (but not always) have injuries at the AIS 1 level only.

To calculate economic values for the ICAO serious and minor injury categories, APO analyzed aviation injury data maintained by the National Transportation Safety Board (NTSB) that contain both ICAO and complete AIS injury codes. AIS values for all injuries sustained by accident victims in each ICAO category were summed and then divided by the number of victims in each category to determine per victim WTP values.<sup>8</sup> These WTP values are reported in Table 2-4. Medical and legal direct costs reported in Table 2-4 reflect weighted averages of the values listed in Table 2-3.

**Table 2-4**

**Average Per Victim Injury Values for Serious and Minor Injuries**

ICAO Code	Description of Maximum AIS Injury	WTP Values	Emergency/ Medical	Legal/ Court	Total Value
MINOR (ICAO 2)	AIS 1	\$34,000	\$2,000	\$2,500	\$38,500
SERIOUS (ICAO 3)	AIS 2 to 6	\$482,000	\$27,600	\$12,200	\$521,800

<sup>8</sup> Eric Gabler, "Update of FAA Values of Avoided Injury," Draft Working Paper, Office of Aviation Policy and Plans, February 1994.



## SECTION 3: AIRCRAFT CAPACITY AND UTILIZATION FACTORS

---

### 3.1 INTRODUCTION

Aircraft capacity and utilization factors apply primarily to the evaluation of FAA investment and regulatory programs that affect time spent in air transportation, system capacity and utilization. The utilization of available capacity affects the benefits and costs accrued directly by aircraft operators and indirectly by users and society.

In this and the next two sections, where available, data for four user groups are presented together with the sub-groupings shown below:

- Group 1: Air carrier operations of passenger aircraft.
  - A: Large jets (wide body and narrow body)
  - B: Commuter subgroups (propellers and regional jets)
  
- Group 2: Air carrier operations of freighter aircraft.
  - A: Large jets (wide body and narrow body)
  - B: Commuter subgroups (propellers and regional jets)
  
- Group 3: General aviation aircraft, including air taxi.
  - A: General aviation only
  - B: Air taxi only
  
- Group 4: Military aircraft.

Within each group, data are reported by generic aircraft classifications. Detailed aircraft specific information, where available, is also provided in the supporting tables at the end of each section. Finally, user profiles are constructed for selected user groupings. These profiles are designed to provide various aggregations of data likely to be relevant to the conduct of analyses that can be potentially anticipated. They are provided to relieve analysts of the requirement to aggregate data. Provision of the underlying data permits analysts to make alternative aggregations where warranted.

The following factors are evaluated for air carrier and general aviation, respectively, with differences based on data limitations:

Factor	Air Carriers (Groups 1 and 2)	General Aviation (Group 3)
Aircraft seating capacity	x	x
Number of crew (including flight attendants)	x	—
Cargo capacity	x	—
Passenger load factor	x	x
Cargo load factor	x	—
Aircraft utilization	x (day)	x (year)
Average speed	x	—
Total useful load	—	x

The air carrier sub-groupings for passenger and freight are defined by type of aircraft. Freighters are those aircraft that report no passenger traffic. Passenger aircraft produce both passenger and cargo services by using empty space in aircraft compartments to carry air freight. Air cargo capacity on passenger aircraft is estimated as total aircraft capacity minus passenger capacity utilized.

General aviation capacity data are also summarized in two sub-groupings: General aviation only and air taxi only. The averages for the sub-groupings are based upon hours of use.

Information on capacity and utilization factors for military aircraft is generally not publicly available, and thus is not presented here. From a regulatory or system investment standpoint, FAA actions will primarily affect military flight time; the associated costs of changes in military operations are covered in Sections 4 and 5.

Data limitations do not allow for complete analysis of each capacity factor for each aircraft type or classification. The most complete data are available for the large air carriers, while small commuter air carriers report lesser amounts of data, and general aviation fleet data are limited. Individual tables show specific definitions for each element.

### 3.2 AIR CARRIER AIRCRAFT

Aircraft capacity and utilization factors for the year 1996 were obtained from data submitted by air carriers on BTS Form 41 for large air carriers, and Form 298C for small (commuter) carriers.<sup>1,2</sup> They are shown for generic aircraft classifications and for the total fleet. Detailed aircraft specific information is shown in the supporting tables at the end of this section.

<sup>1</sup>Form 41 Traffic and Financial Data, and Form 298-C-Commuter Airlines, (Washington, DC: Bureau of Transportation and Statistics, various dates).

<sup>2</sup>FAA Aviation Forecasts Fiscal Years 1998-2009 (Washington, DC, 1998).

Data for air carrier aircraft are reported by the following classifications:

1. Two-engine narrow body jet
2. Two-engine wide body jet
3. Three-engine narrow body jet
4. Three-engine wide body jet
5. Four-engine narrow body jet
6. Four-engine wide body jet
7. Regional jet under 40 seats
8. Regional jet with 40-59 seats
9. Regional jet over 59 seats<sup>3</sup>
10. Turboprops under 20 seats
11. Turboprops with 20 or more seats
12. Piston

There are detailed data available for the first six categories, since carriers with these large aircraft are required to submit detailed operating and financial data to DOT on Form 41. Categories 7 through 9 are primarily newer aircraft, and data are limited for categories 7 and 8 and were not reported in the base period for category 9. Categories 10 through 12 are small aircraft, for which detailed data do not have to be filed.

Air carrier data are provided in four tables that represent the different reporting requirements under Forms 41 and 298-C. Form 41 air carrier passenger operations are shown in Table 3-1. The column dealing with crew size includes both flight crew and cabin crew. The number of flight deck crew for the aircraft in each grouping is identified by reference to the relevant editions of *Jane's All the World's Aircraft*.<sup>4</sup> The number of flight attendants varies based on the size of the aircraft<sup>5</sup> and staffing policy of individual carriers. Previous editions<sup>6</sup> of this study recommend estimating flight attendants for aircraft groups using an average of one flight attendant per 45 seats (rounding up). This assumption is continued here, reflecting the actual practice of some carriers of providing more attendants than the regulatory minimum. Air carrier all-freight operations are shown in Table 3-2.

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<sup>3</sup> No data are reported for these aircraft which are in the planning process and have yet to enter service.

<sup>4</sup> *Jane's All the World's Aircraft* (Surrey, UK: Jane's Information Group Limited, various years).

<sup>5</sup> FAR 121.391(a) generally requires a minimum of one flight attendant for each 50 installed seats in an aircraft, for aircraft above 9 or 19 seats (depending on aircraft weight).

<sup>6</sup> *Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs*, (Washington, DC, 1989).

**Table 3-1  
1996 Air Carrier Capacity and Utilization Factors**

Economic Values Class	(Column 1) Passenger Load Factor	(Column 2) Cargo Load Factor	(Column 3) Passenger Capacity	(Column 4) Cargo Capacity (Tons)	(Column 5) Daily Utilization (Hours)	(Column 6) Crew Size	(Column 7) Average Block Speed (MPH)	(Column 8) Block Hours	(Column 9) Average Airborne Speed (MPH)	(Column 10) Airborne Hours
Two-engine narrow body jet	67.1%	26.9%	138	5.1	8.2	5	350	9,622,195	420	8,015,424
Two-engine wide body jet	71.7%	38.3%	214	18.4	10.4	7	442	1,080,550	489	977,047
Three-engine narrow body jet	67.5%	32.2%	150	4.6	6.6	7	359	1,478,241	437	1,216,170
Three-engine wide body jet	75.4%	41.3%	277	18.0	9.0	10	455	879,513	507	789,247
Four-engine narrow body jet	53.0%	26.2%	90	11.6	4.9	6	300	68,930	370	55,950
Four-engine wide body jet	74.9%	41.1%	401	23.9	10.2	12	495	448,155	525	423,086
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	48.6%	16.5%	19	0.5	5.8	2	183	491,669	237	378,221
Turboprops with 20 or more seats	53.6%	24.5%	40	0.9	5.9	3	187	1,081,703	238	850,086
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	69.4%	33.9%	161	7.8	7.9	6	351	15,150,956	418	12,705,231

Source: Form 41 Data, Year End 1996.

NR = No data reported.

Col 1: Revenue passenger miles divided by available seat miles.

Col 2: Revenue ton miles divided by available ton miles. Available ton miles are net of passenger load, using 200 pounds per passenger mile.

Col 3: Available seat miles divided by aircraft miles (average passenger capacity).

Col 4: Available ton miles (net of passenger load) divided by aircraft revenue miles.

Col 5: Airborne hours per aircraft day.

Col 6: Flight crew from *Jane's All The World's Aircraft* plus one flight attendant for each 45 passenger seats above 19 seats.

Col 7: Aircraft miles divided by block hours.

Col 8: Block hours from source document. Time calculated from gate to gate.

Col 9: Aircraft miles divided by airborne hours.

Col 10: Airborne hours from source document. Time calculated from takeoff to landing.

With the exception of some larger commuter operators, smaller air carriers generally report on Form 298-C. Less information on capacity and utilization by aircraft type is required on this form. The results for Alaskan Form 298-C carriers have been separated from other Form 298-C carriers to provide information on the unique operating environment in Alaska. Capacity and utilization data for Form 298-C Alaska operators are shown in Table 3-3; data for all other 298-C carriers are summarized in Table 3-4.

Data by specific aircraft type that relate to Tables 3-1 through 3-4 are provided at the end of this section in Supporting Tables 3-8 through 3-11.

**Table 3-2  
1996 Air Freight Carrier Capacity and Utilization Factors**

Economic Values Class	(Column 1) Cargo Capacity (Tons)	(Column 2) Cargo Load Factor	(Column 3) Daily Utilization (Hours)	(Column 4) Crew Size	(Column 5) Average Block Speed (MPH)	(Column 6) Block hours	(Column 7) Average Airborne Speed (MPH)	(Column 8) Airborne Hours
Two-engine narrow body jet	40.5	52.1%	3.7	2	378	117,509	439.6	100,981
Two-engine wide body jet	51.8	61.8%	4.2	2	399	84,089	460.9	72,758
Three-engine narrow body jet	24.4	56.9%	2.0	3	355	298,091	424.4	249,253
Three-engine wide body jet	87.9	63.6%	6.5	3	454	167,381	494.9	153,648
Four-engine narrow body jet	47.7	60.4%	3.3	3	402	274,755	462.4	238,710
Four-engine wide body jet	110.5	66.0%	4.7	3	453	144,927	496.1	132,322
Regional jet under 40 seats	NR (1)	NR (1)	NR (1)	NR (1)	NR (1)	NR (1)	NR (1)	NR (1)
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	1.8	45.4%	1.4	2	148	147,200	168.8	129,217
Turboprops with 20 or more seats	17.0	40.5%	2.4	2	221	41,926	255.8	36,175
Piston	6.6	40.2%	2.2	2	193	75,007	225.4	64,368
All Aircraft	53.2	61.8%	2.8	3	356	1,350,920	408.6	1,177,482

Source: Form 41 Year End 1996.

NR = No data reported.

(1) Data reported is sparse and inconsistent, but are included in "all aircraft" row for the sake of completeness.

Col 1: Available ton miles divided by aircraft miles.

Col 2: Cargo revenue ton miles divided by available ton miles.

Col 3: Airborne hours per aircraft day.

Col 4: Flight crew from *Jane's All The World's Aircraft*.

Col 5: Aircraft miles divided by block hours.

Col 6: Block hours from source document. Time calculated from gate to gate.

Col 7: Aircraft miles divided by airborne hours.

Col 8: Airborne hours from source document. Time calculated from takeoff to landing.

Note: The following aircraft types were reported in Form 41, but are not included due to incomplete filings: F28-1000; A310-300;

5 air hours; Bae-146-200; C-336: 1 block hour; C-411: 2 block hours; AERO-1121: 1 block hour; HFB-320; EMB-110: 1 air hour; CV-540.

**Table 3-3  
1996 Alaska Operators Capacity and Utilization Factors  
298-C Operations (Weighted by Block Hours)**

<b>Economic Values Class</b>	<b>(Column 1) Seats</b>	<b>(Column 2) Crew Size</b>	<b>(Column 3) Cargo Capacity (Tons)</b>	<b>(Column 4) Block Hours</b>	<b>(Column 5) Airborne Hours</b>
Two-engine narrow body jet	123	4	NR	111	88
Two-engine wide body jet	NR	NR	NR	NR	NR
Three-engine narrow body jet	146	4	39.6	878	697
Three-engine wide body jet	NR	NR	NR	NR	NR
Four-engine narrow body jet	97	4	NR	580	461
Four-engine wide body jet	NR	NR	NR	NR	NR
Regional jet under 40 seats	8	1	3.6	1,557	1,236
Regional jet with 40-59 seats	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR
Turboprops under 20 seats	15	2	2.3	70,463	55,948
Turboprops with 20 or more seats	40	3	5.1	11,991	9,521
Piston	6	1	0.9	294,247	233,632
<b>All Aircraft</b>	<b>9</b>	<b>1</b>	<b>1.3</b>	<b>379,827</b>	<b>301,583</b>

Source: Analysis of Year End 1996 Form 298C data.

NR = No data reported.

Col 1: *Jane's All The World's Aircraft* (various issues) *op. cit.*

Col 2: Standard flight crew complements per analysis of *Jane's All The World's Aircraft*, *op. cit.*, plus one flight attendant per each 45 passenger seats above 19 seats.

Col 3: *Jane's All The World's Aircraft*, *op. cit.*

Col 4: Form 298-C.

Col 5: Block hours from Form 298-C multiplied by ratio of airborne hours/block hours for similar aircraft from Form 41.

**Table 3-4  
1996 Non-Alaska Operators Capacity and Utilization Factors  
Other 298-C Carriers (Weighted by Block Hours)**

<b>Economic Values Class</b>	<b>(Column 1) Seats</b>	<b>(Column 2) Crew Size</b>	<b>(Column 3) Cargo Capacity (Tons)</b>	<b>(Column 4) Block Hours</b>	<b>(Column 5) Airborne Hours</b>
Two-engine narrow body jet	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR
Regional jet under 40 seats	8	1	5.3	535	425
Regional jet with 40-59 seats	50	4	9.1	147,443	117,070
Regional jet over 59 seats	NR	NR	NR	NR	NR
Turboprops under 20 seats	18	2	3.0	370,813	294,426
Turboprops with 20 or more seats	37	3	6.0	973,201	772,722
Piston	32	2	1.6	97,774	77,633
All Aircraft	30	3	4.6	1,589,766	1,262,276

Source: Analysis of Year End 1996 Form 298C data.

NR = No data reported.

Col 1: *Jane's All The World's Aircraft* (various issues) *op. cit.*

Col 2: Standard flight crew complements per analysis of *Jane's All The World's Aircraft, op. cit.*, plus one flight attendant per each 45 passenger seats above 19 seats.

Col 3: *Jane's All The World's Aircraft, op. cit.*

Col 4: Form 298-C.

Col 5: Block hours from Form 298-C multiplied by ratio of airborne hours/block hours for similar aircraft from Form 41.

### 3.3 GENERAL AVIATION AIRCRAFT

Data for general aviation aircraft are presented for 23 classifications of aircraft:

- Piston
  - 1) 1-3 seats single engine
  - 2) 4-9 seats single engine
  - 3) 1-9 seats two engines
  - 4) 10-19 seats single engine
  - 5) 10-19 seats two engines
  - 6) 20+ seats two engines
  - 7) 20+ seats four engines

- Turboprops

- 8) 1-9 seats single engine
- 9) 1-9 seats two engines
- 10) 10-19 seats single engine
- 11) 10-19 seats two engines
- 12) 20+ seats two engines
- 13) 20+ seats four engines

- Turbojet/fan

- 14) Two-engine, less than 20,000-lbs. gross weight
- 15) Two-engine, greater than 20,000-lbs. gross weight
- 16) Multi-engine, less than 20,000 lbs. gross weight
- 17) Multi-engine, greater than 20,000 lbs. gross weight
- 18) Commercial, greater than 65,000 lbs. gross weight

- Rotor

- 19) Normal Piston, less than 7,000 lbs. gross weight
- 20) Normal Turbine, greater than 7,000 lbs. gross weight
- 21) Transport Piston, less than 7,000-lbs. gross weight
- 22) Transport Turbine, greater than 7,000-lbs. gross weight

- Other

- 23) All other aircraft, including experimental, balloon, home built aircraft, etc.

These classifications were established to reflect categories that have relevance for FAA economic analyses including benefit-cost evaluations of operations and certification regulation.

Weighted capacity and utilization factors for general aviation aircraft were derived from three primary sources:

- *General Aviation and Air Taxi Activity and Avionics Survey*, FAA, CY1995 (GA Survey), is based on a random sample of registered general aviation aircraft owners. The information in this report was resorted based on the classes of aircraft established for this study.<sup>7</sup> Fleet size and hours of utilization (for total activity and air taxi) were the data used from this source.<sup>8</sup>

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<sup>7</sup>The *General Aviation and Air Taxi Activity and Avionics Survey* for CY 1995 (latest year available) was resorted after aircraft in the sample base were reclassified to the 23 categories established for this study, instead of the 19 GA Survey categories. The resorting was based on data in the FAA Registry Make/Model/Series (MMS) database, maintained by AFS-700, Oklahoma City, OK.

<sup>8</sup>The Survey (*ibid*) reports flight hours for GA and air taxi operators; these are equivalent in concept to airborne hours reported for commercial operators in Tables 3-1 through 3-4.

- *Aviation Accident Data* from the NTSB were used to derive the average occupancy of general aviation aircraft.<sup>9</sup> Estimates of the average number of seats by equipment groups were based on NTSB general aviation accidents and incidents reported over the period 1983 to 1997. It is assumed that, on average, the number of occupants on a given aircraft model that has experienced an accident or incident is typical of the normal occupancy of that aircraft model. Passenger load factor by equipment groups is calculated to be the average number of seats occupied as a percent of the seats in the aircraft.
- The *Aircraft Bluebook-Price Digest* provided operating characteristics including type and number of engines, and empty weight.<sup>10</sup>
- The *Federal Aviation Aircraft Registry* provided data on aircraft weight and seat capacity.<sup>11</sup>

Estimation of general aviation fleet characteristics began with a resorting of the 1995 General Aviation Survey based on the classifications of general aviation aircraft developed for this study. In analyzing the general aviation fleet, it should be understood that older aircraft are generally used considerably less than newer aircraft. The results for the overall GA fleet for all aircraft are shown in Table 3-5 (Group A). Data for aircraft built in 1981 and before are reported in Table 3-5 (Group B), and for aircraft built after 1981 in Table 3-5 (Group C).

Estimates of the average number of seats occupied by make/model were based on analysis of NTSB general aviation accidents and incidents reported over the 1983-1997 period. The number of occupants in general aviation aircraft includes the pilot(s). The total useful load is calculated using the certificated gross takeoff weight minus the operator empty weight. Operator empty weight is a standard in general aviation that includes oil and lubricants but assumes a zero fuel weight. See Table 3-6.

### 3.4 PROFILES

Table 3-7 summarizes the capacity and utilization factors for profiles of scheduled, non-scheduled commercial, and non-commercial user groups. Because of variations in reporting requirements, data are not available for all users for every capacity and utilization factor.

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<sup>9</sup>*Aviation Accident Data System* (Washington, DC: National Transportation Safety Board, updated monthly).

<sup>10</sup>*Aircraft Bluebook-Price Digest* (Overland Park, KS: Intertec Publishing, Spring 1997).

<sup>11</sup>FAA Make/Model/Series database maintained by Federal Aviation Administration, AFS-700, Oklahoma City, OK.

**Table 3-5  
1995 General Aviation Survey Summary By Economic Values Categories**

<b>Group A: All Aircraft</b>							
<b>Economic Values Category</b>	<b>(Column 1) Active Aircraft</b>	<b>(Column 2) Estimated Total Hours Flown</b>	<b>(Column 3) Estimated Air Taxi Hours Flown</b>	<b>(Column 4) Estimated Average Hours Total</b>	<b>(Column 5) Estimated Average Hours- Air Taxi</b>	<b>(Column 6) Estimated Average Hours-Other</b>	
1 Piston 1-3 Seats	43,560	4,888,517	6,696	112.2	0.2	112.1	
2 Piston 4-9 Seats 1 Eng	88,921	11,716,993	253,124	131.8	2.8	128.9	
3 Piston 4-9 Seats 2 Eng	16,378	2,651,296	495,281	161.9	30.2	131.6	
4 Piston 10-19 Seats 1 Eng	1	49	NA	37.4	NA	NA	
5 Piston 10-19 Seats 2 Eng	469	144,430	74,056	308.1	158.0	150.1	
6 Piston 20+ Seats 2 Eng	135	33,856	17,156	250.8	127.1	123.7	
7 Piston 20+ Seats 4 Eng	51	3,034	NA	59.7	NA	NA	
8 Turboprop 1-9 Seats 1 Eng	772	299,391	98,845	387.8	128.0	259.8	
9 Turboprop 1-9 Seats 2 Eng	1,163	269,755	13,856	232.0	11.9	220.1	
10 Turboprop 10-19 Seats 1 Eng	25	3,868	1,367	154.6	54.6	100.0	
11 Turboprop 10-19 Seats 2 Eng	2,453	765,381	152,516	312.0	62.2	249.8	
12 Turboprop 20+ Seats 2 Eng	168	98,662	5,584	587.3	33.2	554.0	
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	
14 Turbojet/fan 2 Eng <20,000	2,986	931,072	105,448	311.8	35.3	276.5	
15 Turbojet/fan 2 Eng >=20,000	1,272	368,562	27,299	289.7	21.5	268.2	
16 Turbojet/fan 3+ Eng <20,000	2	953	NA	414.2	NA	NA	
17 Turbojet/fan 3+ Eng >=20,000	193	51,447	795	267.1	4.1	263.0	
18 Turbojet/fan >=65,000	196	42,836	NA	218.8	NA	NA	
19 Rotor Piston <7,000	1,455	355,599	NA	244.5	NA	NA	
20 Rotor Turbine <7,000	2,257	1,002,095	93,288	443.9	41.3	402.6	
21 Rotor Piston >=7,000	42	4,854	NA	114.4	NA	NA	
22 Rotor Turbine >=7,000	1,527	854,615	169,295	559.6	110.9	448.8	
23 Other	17,316	960,699	15	55.5	0.0	55.5	
All Piston	149,514	19,438,175	846,314	130.0	5.7	124.3	
All Turboprop	4,581	1,437,057	272,169	313.7	59.4	254.3	
All Turbojet	4,649	1,394,870	133,542	300.0	28.7	271.3	
All Rotor	5,281	2,217,163	262,584	419.8	49.7	370.1	
All Other	17,316	960,699	15	55.5	0.0	55.5	
All Aircraft	181,341	25,447,963	1,514,623	140.3	8.4	132.0	

**Table 3-5 (continued)**  
**1995 General Aviation Survey Summary By Economic Values Categories**

<b>Group B: Aircraft Built Before 1982</b>						
<b>Economic Values Class</b>	<b>(Column 1) Active Aircraft</b>	<b>(Column 2) Estimated Total Hours Flown</b>	<b>(Column 3) Estimated Air Taxi Hours Flown</b>	<b>(Column 4) Estimated Average Hours Total</b>	<b>(Column 5) Estimated Average Hours- Air Taxi</b>	<b>(Column 6) Estimated Average Hours-Other</b>
1 Piston 1-3 Seats	41,135	4,411,991	6,696	107.3	0.2	107.1
2 Piston 4-9 Seats 1 Eng	83,224	10,496,635	232,732	126.1	2.8	123.3
3 Piston 4-9 Seats 2 Eng	15,285	2,384,478	476,119	156.0	31.2	124.9
4 Piston 10-19 Seats 1 Eng	1	49	NA	37.4	NA	NA
5 Piston 10-19 Seats 2 Eng	392	92,872	72,329	237.0	184.6	52.4
6 Piston 20+ Seats 2 Eng	135	33,856	17,156	250.8	127.1	123.7
7 Piston 20+ Seats 4 Eng	51	3,034	NA	59.7	NA	NA
8 Turboprop 1-9 Seats 1 Eng	109	18,248	NA	166.9	NA	NA
9 Turboprop 1-9 Seats 2 Eng	992	196,026	13,856	197.6	14.0	183.6
10 Turboprop 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA
11 Turboprop 10-19 Seats 2 Eng	1,573	484,066	117,047	307.7	74.4	233.3
12 Turboprop 20+ Seats 2 Eng	64	18,251	5,584	284.5	87.0	197.4
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	1,308	328,802	50,843	251.3	38.9	212.5
15 Turbojet/fan 2 Eng >=20,000	650	178,561	22,046	274.5	33.9	240.6
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	84	14,150	NA	168.0	NA	NA
18 Turbojet/fan >=65,000	107	27,684	NA	258.4	NA	NA
19 Rotor Piston <7,000	820	139,352	NA	170.0	NA	NA
20 Rotor Turbine <7,000	1,302	454,741	23,466	349.2	18.0	331.2
21 Rotor Piston >=7,000	42	4,854	NA	114.4	NA	NA
22 Rotor Turbine >=7,000	554	195,172	8,816	352.0	15.9	336.1
23 Other	5,509	316,395	1	57.4	0.0	57.4
All Piston	140,222	17,422,915	805,033	124.3	5.7	118.5
All Turboprop	2,739	716,592	136,487	261.6	49.8	211.8
All Turbojet/fan	2,150	549,196	72,890	255.4	33.9	221.5
All Rotor	2,719	794,120	32,282	292.1	11.9	280.2
All Other	5,509	316,395	1	57.4	0.0	57.4
All Aircraft	153,339	19,799,218	1,046,693	129.1	6.8	122.3

**Table 3-5 (continued)**  
**1995 General Aviation Survey Summary By Economic Values Categories**

<b>Group C: Aircraft Built in 1982 and Beyond</b>							
<b>Economic Values Class</b>	<b>(Column 1)</b>	<b>(Column 2)</b>	<b>(Column 3)</b>	<b>(Column 4)</b>	<b>(Column 5)</b>	<b>(Column 6)</b>	
	<b>Active Aircraft</b>	<b>Estimated Total Hours Flown</b>	<b>Estimated Air Taxi Hours Flown</b>	<b>Estimated Average Hours Total</b>	<b>Estimated Average Hours-Air Taxi</b>	<b>Estimated Average Hours-Other</b>	
1 Piston 1-3 Seats	2,425	476,526	NA	196.5	NA	NA	
2 Piston 4-9 Seats 1 Eng	5,697	1,220,358	20,393	214.2	3.6	210.6	
3 Piston 4-9 Seats 2 Eng	1,093	266,818	19,162	244.1	17.5	226.6	
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	
5 Piston 10-19 Seats 2 Eng	77	51,558	1,726	670.6	22.5	648.1	
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	
8 Turboprop 1-9 Seats 1 Eng	663	281,143	98,845	424.2	149.2	275.1	
9 Turboprop 1-9 Seats 2 Eng	171	73,729	NA	432.3	NA	NA	
10 Turboprop 10-19 Seats 1 Eng	25	3,868	1,367	154.6	54.6	100.0	
11 Turboprop 10-19 Seats 2 Eng	880	281,315	35,469	319.8	40.3	279.5	
12 Turboprop 20+ Seats 2 Eng	104	80,411	NA	774.4	NA	NA	
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	
14 Turbojet/fan 2 Eng <20,000	1,678	602,270	54,605	358.9	32.5	326.3	
15 Turbojet/fan 2 Eng >=20,000	622	190,001	5,253	305.6	8.4	297.1	
16 Turbojet/fan 3+ Eng <20,000	2	953	NA	414.2	NA	NA	
17 Turbojet/fan 3+ Eng >=20,000	108	37,296	795	344.2	7.3	336.8	
18 Turbojet/fan >=65,000	89	15,153	NA	170.8	NA	NA	
19 Rotor Piston <7,000	635	216,247	NA	340.7	NA	NA	
20 Rotor Turbine <7,000	955	547,354	69,823	573.1	73.1	500.0	
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	
22 Rotor Turbine >=7,000	973	659,443	160,479	678.0	165.0	513.0	
23 Other	11,807	644,304	14	54.6	0.0	54.6	
All Piston	9,291	2,015,259	41,281	216.9	4.4	212.5	
All Turboprop	1,842	720,465	135,681	391.2	73.7	317.5	
All Turbojet/fan	2,499	845,674	60,652	338.4	24.3	314.1	
All Rotor	2,563	1,423,043	230,302	555.3	89.9	465.5	
All Other	11,807	644,304	14	54.6	0.0	54.6	
All Aircraft	28,002	5,648,745	467,930	201.7	16.7	185.0	

Source: Analysis of responses to the FAA *General Aviation and Air Taxi Activity and Avionics Survey, 1995*.

Individual responses were sorted to classifications and expanded. Totals may not add due to rounding.

Col 1: Active aircraft are those flown at least once during the year.

Col 2: Total hours flown by active aircraft, including air taxi.

Col 3: Reported air taxi hours (also included in Column 2).

Col 4: Column 2 divided by Column 1.

Col 5: Col 3 divided by Col 1.

Col 6: Column 4 minus Column 5.

Note: NA indicates that the population for which costs were available was insufficient to provide reliable results.

**Table 3-6  
General Aviation Capacity and Utilization**

<b>Economic Values Class</b>	<b>(Column 1) Average Seats</b>	<b>(Column 2) Percent of Seats Occupied</b>	<b>(Column 3) Total Useful Load</b>
1 Piston 1-3 Seats	2.3	70.0	729
2 Piston 4-9 Seats 1 Eng	5.3	43.7	942
3 Piston 4-9 Seats 2 Eng	5.4	45.7	2,212
4 Piston 10-19 Seats 1 Eng	13.3	11.8	NA
5 Piston 10-19 Seats 2 Eng	10.4	36.6	2,612
6 Piston 20+ Seats 2 Eng	31.5	41.8	NA
7 Piston 20+ Seats 4 Eng	15.5	20.0	NA
8 Turboprop 1-9 Seats 1 Eng	1.9	67.0	3,304
9 Turboprop 1-9 Seats 2 Eng	6.7	45.9	4,189
10 Turboprop 10-19 Seats 1 Eng	10.0	60.0	3,617
11 Turboprop 10-19 Seats 2 Eng	11.6	33.8	4,037
12 Turboprop 20+ Seats 2 Eng	27.0	25.6	7,805
13 Turboprop 20+ Seats 4 Eng	27.8	27.5	NA
14 Turbojet/fan 2 Eng <20,000	6.7	50.2	7,935
15 Turbojet/fan 2 Eng >=20,000	10.1	49.7	23,304
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	10.9	40.8	18,664
18 Turbojet/fan >=65,000	134.3	50.5	13,018
19 Rotor Piston <7,000	2.4	66.6	639
20 Rotor Turbine <7,000	4.7	45.7	1,563
21 Rotor Piston >=7,000	3.9	41.3	NA
22 Rotor Turbine >=7,000	6.4	35.9	2,335
23 Other	NA	NA	NA
Average - GA Only	5.4	49.5	1,969
Average - Air Taxi	6.6	44.4	3,079
Source: Noted below.			
NA = Data not available.			
Col 1: Seats installed, based on NTSB records for accidents and incidents, weighted by hours.			
Col 2: Percentage of seats occupied, or load factor, based on NTSB records for accidents and incidents (using the sum of passengers and the sum of seats), weighted by hours.			
Col 3: Gross takeoff weight less empty weight. Based on data in <i>Aircraft Bluebook-Price Digest</i> , (Overland Park, KS: Intertec Publishing, Spring 1997).			

**Table 3-7  
Capacity and Utilization Profiles**

	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
	Passenger Load Factor*	Cargo Load Factor**	Passenger Capacity*	Cargo Capacity** (Tons)	Daily ** Utilization (Hours)	Crew Size*	Average Airborne Speed** (MPH)	Total Airborne Hours*	Useful Load (lbs.)	Block Hours*
Scheduled commercial service										
Passengers	69.4%	33.9%	161.3	7.82	7.9	6.3	418	14,269,090	NA	17,120,549
Freight only	NA	61.8%	NA	53.21	2.8	2.8	409	1,177,482	NA	1,350,920
All combined	69.4%	44.6%	161.3	11.59	6.8	6.0	417	15,446,572	NA	18,471,469
Air Carrier without Commuters										
Passengers	69.6%	34.0%	168.7	8.23	8.2	6.1	437	11,476,924	NA	13,577,584
Freight only	NA	62.0%	NA	58.32	3.2	2.1	460	947,672	NA	1,086,752
All combined	69.6%	44.6%	168.7	12.21	7.3	6.1	439	12,424,596	NA	14,664,336
Commuter only										
Passengers	51.4%	22.9%	29.8	0.79	5.9	3.0	238	2,792,166	NA	3,542,965
Freight only	NA	41.1%	NA	4.33	1.7	2.1	198	229,810	NA	264,168
All combined	51.4%	33.1%	29.8	1.55	4.4	3.0	232	3,021,976	NA	3,807,133
Non-scheduled commercial (air taxi)										
	44.4%	NR	6.6	NR	NR	NR	NR	1,514,623	3,097	NA
Non-commercial (GA and military)										
GA and air taxi	49.0%	NR	5.5	NR	NR	NR	NR	25,447,963	1,969	NA
GA only	49.5%	NR	5.4	NR	NR	NR	NR	23,933,340	1,894	NA
Military	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

NA: Not applicable.

NR: No data reported.

\*For scheduled services: Form 41 and Form 298-C carriers.

\*\*For scheduled services: Form 41 carriers only.

Col 1: For scheduled service: revenue passenger miles divided by available passenger seat miles; for air taxi and general aviation: percentage of seats occupied from NTSB accident records.

Col 2: For scheduled passenger service: cargo revenue ton miles divided by available ton miles (net of passenger load); for all-freight service: cargo revenue ton miles divided by available ton miles.

Col 3: For scheduled passenger service: available seat miles divided by aircraft miles; for air taxi and general aviation: seats installed from NTSB records.

Col 4: For scheduled passenger operations: available ton miles (net of passenger load) divided by revenue miles; for all-freight operations: available ton miles divided by revenue miles.

Col 5: Airborne hours per aircraft day.

Col 6: For scheduled passenger operations: flight crew plus one flight attendant per 45 passenger seats above 19 seats; for all-freight operations: flight crew only.

Col 7: Aircraft miles divided by airborne hours.

Col 9: Gross takeoff weight less empty weight.

**SUPPORTING TABLES**  
**AIRCRAFT CAPACITY AND UTILIZATION FACTORS**

**Table 3-8**  
**Detail Supporting Table 3-1**  
**1996 Air Carrier Capacity and Utilization Factors**

Economic Values Class	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
	Passenger Load Factor	Cargo Load Factor	Passenger Capacity	Cargo Capacity (Tons)	Daily Utilization (Hours)	Crew Size	Average Block Speed (MPH)	Block Hours	Average Airborne Speed (MPH)	Airborne Hours
Two-engine narrow body jet	67.1%	26.9%	138	5.1	8.2	5	350	9,622,195	420	8,015,424
A320-1/2	68.2%	30.0%	148	5.5	9.7	6	395	442,582	456	383,236
B-737-1/2	66.1%	25.8%	112	4.0	7.0	5	313	954,174	386	775,127
B-737-2C	58.3%	39.8%	79	5.2	7.1	4	292	98,762	373	77,435
B-737-3	67.5%	28.2%	131	4.3	9.1	5	350	1,858,836	414	1,570,316
B-737-4	68.0%	25.8%	144	5.3	7.9	6	349	310,134	413	261,865
B-737-5	68.6%	26.7%	110	3.9	8.6	5	342	448,452	412	372,952
B-757	68.4%	28.0%	187	7.8	9.5	7	402	1,548,322	463	1,341,922
DC-9-10	58.7%	33.7%	71	2.5	5.9	5	294	100,289	378	77,990
DC-9-15	61.6%	16.3%	91	3.3	4.8	6	330	9,285	400	7,662
DC-9-30	61.6%	30.0%	101	3.1	6.3	5	309	808,628	389	642,432
DC-9-40	62.8%	30.9%	109	3.3	6.5	5	302	45,592	386	35,637
DC-9-50	63.0%	29.1%	121	3.9	6.4	5	285	188,154	375	142,913
F-28	62.7%	18.2%	65	2.9	5.6	4	273	61,244	348	48,152
FOKR-100	66.6%	28.9%	98	2.7	7.2	5	302	400,855	377	320,360
FOKR-70	76.9%	10.9%	77	4.9	9.5	4	380	7,387	422	6,655
MD-80	67.2%	24.1%	142	5.6	8.5	6	359	2,279,138	431	1,900,678
MD-87	47.8%	5.8%	140	13.8	9.5	6	342	8,010	407	6,738
MD-90	59.9%	21.0%	153	5.8	8.5	6	382	52,351	461	43,354
Two-engine wide body jet	71.7%	38.3%	214	18.4	10.4	7	442	1,080,550	489	977,047
A300-600	72.2%	38.1%	266	15.6	7.3	8	389	110,112	460	92,943
A300-X4	61.3%	31.8%	256	15.0	3.3	8	403	18,382	476	15,562
B-767-2/ER	72.0%	38.7%	181	14.8	10.5	7	440	368,093	485	333,977
B-767-3/ER	71.2%	37.4%	216	20.5	12.1	7	452	525,665	494	480,968
B-777	75.7%	44.7%	291	26.2	11.5	9	470	58,298	511	53,597
Three-engine narrow body jet	67.5%	32.2%	150	4.6	6.6	7	359	1,478,241	437	1,216,170
B-727-1	68.5%	5.5%	45	3.4	1.3	4	378	895	439	772
B-727-2	67.6%	32.2%	150	4.6	6.6	7	359	1,474,680	437	1,213,062
B-727-QC	45.9%	34.8%	59	6.7	2.8	5	334	2,666	381	2,336
Three-engine wide body jet	75.4%	41.3%	277	18.0	9.0	10	455	879,513	507	789,247
DC-10-1	73.6%	35.3%	286	17.6	7.8	10	440	195,771	498	173,020
DC-10-3	77.3%	40.0%	273	21.3	10.2	10	476	166,122	515	153,489
DC-10-4	77.8%	38.3%	284	20.3	9.3	10	443	81,057	501	71,728
L-1011	74.8%	46.3%	305	9.7	7.3	11	421	211,053	492	180,958
L-1011-5	76.2%	44.5%	222	14.8	12.0	8	477	80,966	522	74,061
MD-11	75.0%	45.3%	261	25.6	11.8	9	493	144,544	524	135,991
Four-engine narrow body jet	53.0%	26.2%	90	11.6	4.9	6	300	68,930	370	55,950
BAE-146-1	52.2%	19.1%	70	1.7	5.7	4	323	1,174	386	981
BAE-146-2	49.7%	17.4%	88	2.6	5.1	4	210	12,547	288	9,131
BAE-146-3	56.2%	19.1%	94	2.8	5.8	5	267	37,210	335	29,649
DC-8-62	47.1%	27.7%	70	28.4	3.5	6	427	16,446	474	14,799
DC-8-63	56.7%	17.7%	250	7.3	4.8	9	471	1,553	526	1,390
Four-engine wide body jet	74.9%	41.1%	401	23.9	10.2	12	495	448,155	525	423,086
B-747-1	74.7%	39.1%	410	21.2	8.6	13	481	216,962	513	203,531
B-747-2/3	77.3%	48.0%	369	23.0	10.3	12	497	55,707	531	52,226
B-747-4	74.5%	41.1%	400	27.3	13.2	12	512	175,486	537	167,329

**Table 3-8 (Continued)**  
**Detail Supporting Table 3-1**  
**1996 Air Carrier Capacity and Utilization Factors**

	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
Economic Values Class	Passenger Load Factor	Cargo Load Factor	Passenger Capacity	Cargo Capacity (Tons)	Daily Utilization (Hours)	Crew Size	Average Block Speed (MPH)	Block Hours	Average Airborne Speed (MPH)	Airborne Hours
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	48.6%	16.5%	19	0.5	5.8	2	183	491,669	237	378,221
B-1900	47.1%	13.6%	19	0.6	6.0	2	184	373,433	239	287,113
JETST-31	52.4%	35.0%	19	0.3	5.1	2	167	79,253	219	60,323
METRO-III	55.7%	39.5%	18	0.3	5.2	2	201	38,983	255	30,785
Turboprops with 20 or more seats	53.6%	24.5%	40	0.9	5.9	3	187	1,081,703	238	850,086
ATR-42	53.8%	35.3%	46	0.7	6.4	4	174	238,969	222	187,998
ATR-72	55.3%	23.3%	65	1.5	6.4	4	182	154,978	238	118,076
BAE-ATP	45.0%	29.0%	64	0.9	5.4	4	162	21,466	212	16,416
DHC8-100	59.1%	27.4%	37	0.9	6.3	3	188	66,395	238	52,427
DHC8-300	51.9%	44.5%	44	0.4	5.4	3	218	17,669	257	14,974
DO-328	60.6%	27.5%	31	0.9	5.9	3	232	29,983	294	23,682
EMB-120	51.4%	19.4%	30	0.8	6.3	3	199	345,838	246	279,330
JETST-41	45.8%	9.5%	30	1.3	6.3	3	190	58,612	243	45,726
L-188A	42.5%	48.0%	55	4.5	3.4	5	313	3,743	347	3,373
SF-340	56.4%	31.8%	34	0.6	5.1	3	187	114,491	248	86,351
SHORT360	58.0%	10.5%	34	1.7	2.6	3	113	29,559	153	21,733
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	69.4%	33.9%	161	7.8	7.9	6	351	15,150,956	418	12,705,231

Source: Form 41 Data, Year End 1996.

NR = No data reported.

Col 1: Revenue passenger miles divided by available seat miles.

Col 2: Cargo revenue ton miles divided by available ton miles. Available ton miles are net of passenger load, using 200 pounds per passenger mile.

Col 3: Available seat miles divided by aircraft miles (average passenger capacity).

Col 4: Available ton miles (net of passenger load) divided by aircraft revenue miles.

Col 5: Airborne hours per aircraft day.

Col 6: Flight crew from *Jane's All The World's Aircraft* plus one flight attendant for each 45 passenger seats above 19 seats.

Col 7: Aircraft miles divided by block hours.

Col 8: Block hours from source document. Time calculated from gate to gate.

Col 9: Aircraft miles divided by airborne hours.

Col 10: Airborne hours from source document.

**Table 3-9**  
**Detail Supporting Table 3-2**  
**1996 Air Freight Carrier Capacity and Utilization Factors**

Economic Values Class	(Column 1) Cargo Capacity (Tons)	(Column 2) Cargo Load Factor	(Column 3) Daily Utilization (Hours)	(Column 4) Crew Size	(Column 5) Average Block Speed (MPH)	(Column 6) Block Hours	(Column 7) Average Airborne Speed (MPH)	(Column 8) Airborne Hours
Two-engine narrow body jet	40.5	52.1%	3.7	2	377.7	117,509	439.6	100,981
B-757	44.0	52.2%	4.0	2	395.3	99,783	458.7	85,989
DC-9-15	10.6	50.1%	1.7	2	251.4	9,865	293.3	8,454
DC-9-30	18.0	51.1%	14.7	2	314.7	6,431	381.7	5,302
FALCON	2.5	33.1%	2.4	2	306.5	350	356.4	301
HS-125	2.0	36.4%	7.3	2	309.1	1,080	357.0	935
Two-engine wide body jet	51.8	61.8%	4.2	2	398.8	84,089	460.9	72,758
A300-600	54.4	65.3%	4.9	2	405.9	32,634	470.2	28,174
A310-2CF	40.1	59.6%	3.2	2	379.7	32,074	451.0	27,005
B-767-3/ER	65.0	58.9%	6.0	2	418.3	19,381	461.1	17,579
Three-engine narrow body jet	24.4	56.9%	2.0	3	354.9	298,091	424.4	249,253
B-727-1	20.6	55.0%	1.7	3	341.1	107,345	411.2	89,028
B-727-2	27.5	57.3%	2.1	3	362.5	165,462	432.2	138,764
B-727-QC	19.6	61.2%	3.2	3	363.7	25,284	428.4	21,461
Three-engine wide body jet	87.9	63.6%	6.5	3	454.3	167,381	494.9	153,648
DC-10-1	70.1	66.5%	4.8	3	398.0	24,116	465.1	20,635
DC-10-3	85.3	60.6%	5.9	3	446.1	61,449	495.6	55,319
DC-10-F	81.0	71.0%	5.6	3	478.6	7,248	505.3	6,864
L-1011	66.6	57.7%	3.3	3	520.9	7,550	436.1	9,018
MD-11	99.0	65.1%	10.4	2	471.9	67,018	511.7	61,812
Four-engine narrow body jet	47.7	60.4%	3.3	3	401.7	274,755	462.4	238,710
B-707-3C	48.6	48.8%	11.6	3	406.7	9,315	475.9	7,961
DC-8-50	47.3	38.8%	5.0	3	426.0	6	511.2	5
DC-8-50F	48.8	52.5%	4.1	3	403.0	30,686	471.0	26,256
DC-8-61	44.3	51.8%	2.3	3	381.2	9,086	438.7	7,896
DC-8-62	38.4	60.3%	2.1	3	374.8	16,863	444.3	14,224
DC-8-63	48.1	58.5%	3.0	3	370.1	8,325	429.7	7,171
DC-8-63F	49.0	67.4%	2.5	3	391.1	31,761	454.1	27,355
DC-8-71	46.5	63.7%	2.8	3	383.4	73,343	449.1	62,617
DC-8-73	53.1	54.5%	5.1	3	427.5	64,565	477.2	57,848
DC-8-73F	41.6	75.9%	3.8	3	428.6	30,805	482.3	27,377
Four-engine wide body jet	110.5	66.0%	4.7	3	453.0	144,927	496.1	132,322
B-747-1	109.7	61.9%	3.4	3	454.2	84,435	497.3	77,109
B-747-2/3	118.4	65.2%	9.5	3	448.0	24,322	487.7	22,340
B-747-F	107.2	76.6%	10.3	3	453.6	36,170	499.1	32,873
Regional jet under 40 seats	0.9	80.0%	2.8	2	161.3	35	112.9	50
LEAR-24	0.0	NR	2.5	2	396.0	1	79.2	5
LEAR-25	0.9	75.0%	3.0	2	197.6	22	161.0	27
LEAR-35	1.1	100.0%	2.6	2	75.3	12	50.2	18

**Table 3-9 (continued)**  
**Detail Supporting Table 3-2**  
**1996 Air Freight Carrier Capacity and Utilization Factors**

Economic Values Class	(Column 1) Cargo Capacity (Tons)	(Column 2) Cargo Load Factor	(Column 3) Daily Utilization (Hours)	(Column 4) Crew Size	(Column 5) Average Block Speed (MPH)	(Column 6) Block Hours	(Column 7) Average Airborne Speed (MPH)	(Column 8) Airborne Hours
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	1.8	45.4%	1.4	2	148.2	147,200	168.8	129,217
BECH-99	1.9	66.7%	2.0	2	100.8	16	115.2	14
BECH-C99	1.6	52.9%	2.3	2	143.1	1,339	149.2	1,284
B-1900	2.8	52.9%	2.5	2	207.6	2,076	238.6	1,807
C-208	1.7	43.4%	1.6	1	138.6	127,347	158.2	111,567
METRO-II	1.3	74.6%	3.1	2	194.6	272	228.2	232
METRO-III	2.3	51.5%	0.8	2	217.4	15,897	244.9	14,109
MU-2/B	1.3	30.4%	1.8	2	144.8	253	179.6	204
Turboprops with 20 or more seats	17.0	40.5%	2.4	2	220.7	41,926	255.8	36,175
CV-580	7.3	65.2%	2.7	2	231.6	2,459	270.7	2,104
CV-600	6.0	54.7%	0.9	2	164.2	8,034	195.6	6,746
CV-640	8.3	34.1%	3.2	2	185.6	2,356	218.6	2,000
L-188A	28.4	31.1%	3.3	3	218.8	7,995	269.4	6,491
L-382E	19.1	43.5%	5.4	3	263.0	17,857	291.0	16,141
SD3-30	3.3	47.2%	2.1	2	130.3	1,004	166.2	787
SHORT360	3.7	46.5%	2.7	2	157.4	2,221	183.4	1,906
Piston	6.6	40.2%	2.2	2	193.5	75,007	225.4	64,368
B-55	0.5	35.7%	2.9	2	167.5	1,168	184.9	1,058
BECH-18	1.5	73.2%	1.3	2	142.3	456	166.9	389
C-185	5.6	33.2%	2.2	2	206.8	51,554	238.0	44,794
C-310	0.6	25.0%	1.5	1	143.7	418	165.9	362
C-401	0.8	25.0%	2.7	1	153.6	138	182.7	116
C-402	0.8	28.9%	3.1	1	145.4	754	167.9	653
C-404	0.8	100.0%	1.2	2	148.8	8	198.3	6
CES-206/7	0.5	31.8%	1.2	1	120.7	730	135.0	653
CV-240	5.5	50.0%	3.0	2	167.2	13	181.2	12
D-35	0.5	33.3%	2.1	2	165.4	34	181.4	31
DC-6	14.1	52.4%	2.3	2	174.5	13,788	213.1	11,291
DO-28	2.3	42.0%	2.6	2	155.4	2,262	194.1	1,811
PA-30'S	0.7	47.9%	2.3	2	145.5	3,263	168.0	2,825
PA-32	0.6	30.0%	2.7	2	160.6	421	184.2	367
All Aircraft	53.2	61.8%	2.8	3	356.2	1,350,920	408.6	1,177,482

Source: Form 41 Data, Year End 1996.

NR = No data reported.

Col 1: Available ton miles divided by aircraft miles.

Col 2: Cargo revenue ton miles divided by available ton miles.

Col 3: Airborne hours per aircraft day.

Col 4: Flight crew from *Jane's All The World's Aircraft*.

Col 5: Aircraft miles divided by block hours.

Col 6: Block hours from source document. Time calculated from gate to gate.

Col 7: Aircraft miles divided by airborne hours.

Col 8: Airborne hours from source document. Time calculated from takeoff to landing.

Note: The following aircraft types were reported in Form 41, but are not included due to incomplete filings: F28-1000; A310-300: 5 air hours;

Bae-146-200; C-336: 1 block hour; C-411: 2 block hours; AERO-1121: 1 block hour; HFB-320; EMB-110: 1 air hour; CV-540.

**Table 3-10**  
**Detail Supporting Table 3-3**  
**1996 Alaska Operators Capacity and Utilization Factors**  
**298-C Operations**

Economic Values Class	(Column 1) Seats	(Column 2) Crew Size	(Column 3) Cargo Capacity (Tons)	(Column 4) Block Hours	(Column 5) Airborne Hours
Two-engine narrow body jet	123	4	NR	111	88
OTHER 2-ENGINE TURBO-FAN JET	123	4	NR	111	88
Two-engine wide body jet	NR	NR	NR	NR	NR
Three-engine narrow body jet	146	4	39.6	878	697
BOEING 727-200/231A	97	4	39.6	NR	NR
OTHER 3-ENGINE TURBO-FAN JET	146	4	NR	878	697
Three-engine wide body jet	NR	NR	NR	NR	NR
Four-engine narrow body jet	97	4	NR	580	461
OTHER 4-ENGINE TURBO-FAN JET	97	4	NR	580	461
Four-engine wide body jet	NR	NR	NR	NR	NR
Regional jet under 40 seats	8	1	3.6	1,557	1,236
GATES LEARJET LEAR-35	8	1	3.6	1,557	1,236
Regional jet with 40-59 seats	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR
Turboprops under 20 seats	15	2	2.3	70,463	55,948
BEECH 1900 A/B/C	19	2	2.9	3,493	2,773
BEECH 200 SUPER KINGAIR	13	2	2.3	4,191	3,328
BEECH 99 AIRLINER	15	2	2.2	2,960	2,350
BEECH C99	15	2	2.2	3,157	2,507
BEECH KING AIR C-90	6	1	1.8	631	501
CESSNA 208 CARAVAN	9	1	1.9	12,911	10,251
CESSNA C-441	9	1	NR	880	699
DEHAVILLAND TWIN OTTER DHC-6	19	2	2.6	13,147	10,439
FAIRCHILD-HILLER FH-227	18	2	NR	178	141
FLOAT/AMPHIB TURBINE	12	2	NR	1,110	881
GRUMMAN G-21G (TURBO-GOOSE)	12	2	2.6	263	209
LAND-TURBINE	9	1	NR	515	409
PIPER T-1040	11	2	1.9	7,675	6,094
SHORTS HARLAND SC-7 SKYVAN	19	2	2.1	2,307	1,832
SWEARINGEN METRO II	19	2	2.3	614	488
SWEARINGEN METRO III	19	2	2.4	14,539	11,544
SWEARINGEN METRO MERLIN	6	1	NR	139	110
VOLPAR TURBO 18	15	2	2.2	1,753	1,392
Turboprops with 20 or more seats	40	3	5.1	11,991	9,521
CASA 235	44	3	5.7	371	295
CASA/NURTANIO C212 AVIOCAR	26	3	2.6	658	522
CONVAIR CV-580	44	3	NR	5,918	4,699
DEHAVILLAND DHC4 CARIBOU	30	3	4.7	334	265
DEHAVILLAND DHC8-100 DASH-8	37	3	5.4	4,710	3,740

**Table 3-10 (continued)**  
**Detail Supporting Table 3-3**  
**1996 Alaska Operators Capacity and Utilization Factors**  
**298-C Operations**

Economic Values Class	(Column 1) Seats	(Column 2) Crew Size	(Column 3) Cargo Capacity (Tons)	(Column 4) Block Hours	(Column 5) Airborne Hours
Piston	6	1	0.9	294,247	233,632
BEECH 18 C-185	9	1	2.2	2,910	2,311
BEECH BARON (55 SERIES)	6	1	0.9	503	399
CESSNA 172 SKYHAWK	4	1	0.4	5,412	4,297
CESSNA 180	6	1	0.5	1,271	1,009
CESSNA 185A/B/C SKYWAGON	6	1	0.8	6,606	5,245
CESSNA C206/207/209/210 STATIONAIR	6	1	0.8	93,260	74,048
CESSNA C-401	8	1	1.1	931	739
CESSNA C-402/402A	8	1	1.1	11,279	8,956
DEHAVILLAND DHC2 BEAVER	2	1	NR	27,128	21,540
DEHAVILLAND DHC3 OTTER	9	1	1.6	6,928	5,501
GRUMMAN G-21A (GOOSE)	11	2	2.6	1,245	989
GRUMMAN G-44/44A (WIDGEON)	4	1	NR	908	721
HELIO H-250	4	1	NR	277	220
LAND-PISTON-LT 450 HP	6	1	NR	19,734	15,669
MCDONNELL DOUGLAS DC-3/A/C,C-47/B	28	3	3.8	609	484
PILATUS BRITTEN-NORMAN BN2/A ISLANDER	8	1	1.4	3,159	2,508
PIPER PA-18 (SUPER-CUB)	2	1	0.4	1,481	1,176
PIPER PA-22 (TRI-PACER)	4	1	0.4	0	0
PIPER PA-24 (COMANCHE)	6	1	NR	15	12
PIPER PA-28 (CHEROKEE)	4	1	0.5	5,598	4,445
PIPER PA-31 (NAVAJO)	6	1	1.1	54,449	43,233
PIPER PA-32 (CHEROKEE 6)	6	1	0.7	41,340	32,824
PIPER PA-34/39 (TWIN COMMANCHE)	6	1	0.6	5,321	4,225
PIPER T-1020	8	1	NR	3,883	3,083
<b>All Aircraft</b>	<b>9</b>	<b>1</b>	<b>1.3</b>	<b>379,827</b>	<b>301,583</b>

Source: Analysis of Year End 1996 Form 298C data.

NR = No data reported.

Col 1: *Jane's All The World's Aircraft* (various issues) *op. cit.*

Col 2: Standard flight crew complements per analysis of *Jane's All The World's Aircraft*, *op. cit.*, plus one flight attendant per each 45 passenger seats above 19 seats.

Col 3: *Jane's All The World's Aircraft*, *op. cit.*

Col 4: Form 298-C.

Col 5: Block hours from Form 298-C multiplied by ratio of airborne hours/block hours for similar aircraft from Form 41.

**Table 3-11**  
**Detail Supporting Table 3-4**  
**1996 Other (Non-Alaska) 298-C Operators Capacity and Utilization Factors**

Economic Values Class	(Column 1) Seats	(Column 2) Crew Size	(Column 3) Cargo Capacity (Tons)	(Column 4) Block Hours	(Column 5) Airborne Hours
Two-engine narrow body jet	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR
Regional jet under 40 seats	8	1	5.3	535	425
ROCKWELL SABRELINER	8	1	5.3	535	425
Regional jet with 40-59 seats	50	4	9.1	147,443	117,070
CANADAIR RJ-100/RJ-100ER	50	4	9.1	147,443	117,070
Regional jet over 59 seats	NR	NR	NR	NR	NR
Turboprops under 20 seats	19	2	3.1	370,813	294,426
BEECH 1900 A/B/C	19	2	3.2	49,673	39,440
BRITISH AEROSPACE JETSTREAM 31	19	2	3.5	186,933	148,425
DEHAVILLAND TWIN OTTER DHC-6	19	2	2.8	3,343	2,654
SWEARINGEN METRO II	19	2	2.5	5,315	4,220
SWEARINGEN METRO III	19	2	2.6	125,549	99,686
Turboprops with 20 or more seats	35	3	5.3	973,201	772,722
AEROSPATIALE/AERITALIA ATR-42	46	4	7.1	42,601	33,825
BRITISH AEROSPACE JETSTREAM 41	29	3	3.1	87,791	69,706
DEHAVILLAND DHC8-100 DASH-8	37	3	6.0	203,498	161,577
DORNIER 328	30	3	5.3	9,688	7,692
EMBRAER EMB-120 BRASILIA	30	3	4.8	296,977	235,800
FOKKER FRIENDSHIP F-27/FAIRCHILD F-27/A/B/F/J	44	3	10.2	4,835	3,839
SAAB-FAIRCHILD 340/B	37	3	5.5	327,811	260,282
SHORTS 360	36	3	4.6	0	0
Piston	54	2	1.2	97,774	77,633
CESSNA C206/207/209/210 STATIONAIR	6	1	0.9	3,584	2,846
CESSNA C-402/402A	8	1	1.2	50,974	40,473
CONVAIR CV-340/440	52	4	NR	498	395
LOCKHEED L-049	112	4	NR	42,686	33,893
MCDONNELL DOUGLAS DC-3/A/C,C-47/B	28	3	4.2	32	25
All Aircraft	33	3	5.0	1,589,766	1,262,276

Source: Analysis of Year End 1996 Form 298C data.

NR = No data reported.

Col 1: *Jane's All The World's Aircraft* (various issues) op. cit.

Col 2: Standard flight crew complements per analysis of *Jane's All The World's Aircraft*, op. cit., plus one flight attendant per each 45 passenger seats above 19 seats.

Col 3: *Jane's All The World's Aircraft*, op. cit.

Col 4: Form 298-C.

Col 5: Block hours from Form 298-C multiplied by ratio of airborne hours/block hours for similar aircraft from Form 41.

## SECTION 4: AIRCRAFT OPERATING COSTS

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### 4.1 INTRODUCTION

This section provides estimates of variable and fixed aircraft operating costs. Aircraft variable operating costs are important factors in the evaluation of FAA investment and regulatory programs that bear on the time spent in air transportation. The variable operating costs of aircraft affect aircraft operators directly and users of air service indirectly in the form of higher fares or taxes. Fixed aircraft costs may also be important in evaluating the effects of FAA investment and regulatory programs that affect fleet size or cause aircraft to be out of service for extended periods of time.

Costs in this section are shown for 1996 data for air carrier, general aviation and military equipment types. Data are presented for various aircraft categories and more aggregate user profiles. Detailed aircraft specific data are provided in supporting tables. Summary data are weighted by hours, except for military data, which are weighted by fleet.

Cost data are defined for air carrier and general aviation aircraft as variable or fixed. Variable costs change in proportion to aircraft usage, and include fuel and oil, maintenance and crew costs. Fixed costs show little or no change in proportion to changes in activity. There are two estimates of fixed costs provided. The first is fixed accounting charges including depreciation, insurance, and rental charges reported by carriers in Forms 41 and 298-C, or estimated for GA operators by independent services.

A second estimate of fixed costs is provided for commercial aircraft only. If an FAA initiative improves system efficiency, an operator may be able to provide the same service with fewer aircraft; alternatively, an FAA initiative may cause aircraft to be out of service or to be deleted from the fleet entirely. In either case, an estimate of the benefit or cost to the carrier of an FAA initiative would include the carrier's opportunity costs—the value of the aircraft in its next best use. One immediate alternative use of an aircraft might be to lease it out to another operator. Since there is a well-defined market for operating (short-term) leases for most aircraft types, one can use the average monthly lease rate as a good proxy for the benefit or cost over a defined period of time.

### 4.2 AIR CARRIER AIRCRAFT

Cost data for air carriers were derived from Bureau of Transportation Statistics (BTS) Form 41 and Form 298-C data. Form 41 data cover large air carriers (generally those with

annual revenues of at least \$100 million<sup>1</sup>). Form 298-C data cover smaller air carriers (generally commuters). Data are shown for the following categories of cost for each equipment type:

- Fuel and Oil: Aircraft fuel and oil costs are the dollar value of stocks issued for flight operations.
- Maintenance: Maintenance costs include labor, parts, materials, and burden for aircraft and engine maintenance.
- Crew: Includes flight deck crew and flight attendants. Flight attendant costs are not available by equipment type, and are here allocated to equipment types by available seat miles.
- Depreciation: Depreciation measures the consumption of a fixed asset over its life, due to use and time. Depreciation charges recorded by air carrier flight equipment, engines and related equipment are included in this category. It is based on historical cost.
- Rentals: The amortization (for capital leases) and rental charges (for operating leases) for fixed assets are recorded in this category. Air carriers that file on Form 298-C do not report separate amounts for rentals and amortization.
- Insurance: These are charges typically paid to indemnify operators for accidents.
- Other: Insurance costs are reported as “other” costs in Form 298-C.<sup>2,3</sup>

For air carriers, costs are reported on both a per block hour and per airborne hour basis. Tables 4-1A and B summarize variable and fixed costs per block hour and per airborne hour for large passenger (Form 41) air carriers. Tables 4-2A and B report the same information for Form 41 all freight airlines.

The variable operating costs in each table are comprised of Fuel and Oil, Total Maintenance, and Crew. Selected ownership costs are those most closely related to the carrier’s cost of ownership of the aircraft, namely depreciation, amortization, rentals, and insurance.

Tables 4-3A and B and 4-4A and B summarize per hour variable and fixed costs per block hour and per airborne hour by Part 298-C commuter operations. Tables 4-3A and B provide data on the unique operating environment of Part 298-C carriers in Alaska, while Tables 4-4A and B report on all other Part 298-C carriers.

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<sup>1</sup> Some carriers have exemptions from reporting Form 41 data.

<sup>2</sup> See FAR 298.63 reporting requirements for complete definitions.

<sup>3</sup> “Other” is defined as including “general (hull) insurance and all other expenses incurred in the inflight operation of aircraft and holding of aircraft and aircraft operational personnel in readiness for assignment to inflight status, which are not provided for otherwise in this schedule.” See FAR 298.63(d)(l)(iii).

**Table 4-1A  
Large (Form 41) Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Two-engine narrow body jet	777	554	429	1,760	320	133	11	464	2,224	9,622,195
Two-engine wide body jet	1,348	1,041	705	3,094	548	302	13	863	3,957	1,080,550
Three-engine narrow body jet	982	842	585	2,410	92	85	7	184	2,594	1,478,241
Three-engine wide body jet	1,778	1,639	1,310	4,727	337	821	15	1,173	5,900	879,513
Four-engine narrow body jet	473	673	803	1,949	659	48	52	759	2,708	68,930
Four-engine wide body jet	2,349	2,551	1,604	6,504	971	453	26	1,450	7,955	448,155
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	114	89	110	314	75	43	7	124	438	491,669
Turboprops with 20 or more seats	181	114	250	545	215	46	8	268	813	1,081,703
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	879	695	530	2,104	321	181	11	513	2,618	15,150,956

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total block hours.

Col 6: Total depreciation charges divided by block hours.

Col 7: Total insurance costs divided by total block hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Block hours reported in Form 41.

**Table 4-1B  
Large (Form 41) Carriers Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Two-engine narrow body jet	928	665	515	2,108	384	159	13	557	2,122	8,015,424
Two-engine wide body jet	1,489	1,152	780	3,420	606	334	14	954	3,434	977,047
Three-engine narrow body jet	1,188	1,025	712	2,925	112	104	9	224	2,934	1,216,170
Three-engine wide body jet	1,981	1,827	1,459	5,268	375	915	17	1,307	5,285	789,247
Four-engine narrow body jet	582	829	990	2,401	813	59	64	935	2,465	55,950
Four-engine wide body jet	2,488	2,703	1,699	6,890	1,029	479	28	1,536	6,918	423,086
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	149	116	143	408	97	55	9	162	417	378,221
Turboprops with 20 or more seats	228	145	318	692	273	58	10	341	702	850,086
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	1,044	829	632	2,506	383	216	14	612	2,519	12,705,231

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total airborne hours.

Col 6: Total depreciation charges divided by airborne hours.

Col 7: Total insurance costs divided by total airborne hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Airborne hours reported in Form 41.

**Table 4-2A  
Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Two-engine narrow body jet	1,012	829	799	2,640	647	602	45	1,294	3,934	117,509
Two-engine wide body jet	926	991	1,505	3,422	1,953	392	53	2,398	5,820	84,089
Three-engine narrow body jet	1,229	789	1,535	3,553	232	870	28	1,129	4,683	298,091
Three-engine wide body jet	1,292	1,636	2,313	5,241	1,607	273	45	1,925	7,166	167,381
Four-engine narrow body jet	692	764	1,174	2,631	213	303	48	564	3,195	274,755
Four-engine wide body jet	1,371	2,296	2,736	6,403	798	473	62	1,333	7,737	144,927
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	35
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	NR	35	NR	35	317	0	0	317	352	147,200
Turboprops with 20 or more seats	607	516	902	2,025	0	365	170	534	2,560	41,926
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	75,007
All Aircraft	1,057	1,137	1,637	3,831	703	497	46	1,247	5,077	1,350,920

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total block hours.

Col 6: Total depreciation charges divided by block hours.

Col 7: Total insurance costs divided by total block hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Block hours reported in Form 41.

**Table 4-2B  
Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Two-engine narrow body jet	1,179	966	931	3,076	754	702	53	1,508	4,584	100,981
Two-engine wide body jet	1,071	1,145	1,740	3,955	2,257	453	61	2,771	6,727	72,758
Three-engine narrow body jet	1,483	952	1,852	4,288	279	1,050	34	1,363	5,651	249,253
Three-engine wide body jet	1,409	1,785	2,523	5,718	1,753	297	49	2,100	7,818	153,648
Four-engine narrow body jet	797	879	1,352	3,028	245	348	56	649	3,677	238,710
Four-engine wide body jet	1,502	2,515	2,996	7,013	874	518	68	1,460	8,474	132,322
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	50
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	NR	41	NR	41	375	0	0	375	416	129,217
Turboprops with 20 or more seats	672	571	998	2,241	0	404	188	591	2,832	36,175
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	64,368
All Aircraft*	1,213	1,304	1,877	4,395	806	571	53	1,430	5,825	1,177,482

Source: BTS Form 41 for year-end 1996.

\*Averages calculated using data from carriers reporting both cost and airborne hours; Column 10 data includes hours for carriers not reporting cost data.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total airborne hours.

Col 6: Total depreciation charges divided by airborne hours.

Col 7: Total insurance costs divided by total airborne hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Airborne hours reported in Form 41.

**Table 4-3A  
Alaskan Form 298-C Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Depreciation and Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Block Hours
Two-engine narrow body jet	68	50	226	344	259	250	509	853	111
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	57	22	55	135	23	25	49	183	878
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	231	181	719	1,132	129	326	455	1,587	580
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	416	282	442	1,140	291	53	344	1,484	1,557
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	98	108	165	371	94	31	125	496	70,463
Turboprops with 20 or more seats	215	268	461	944	91	66	157	1,101	11,991
Piston	54	51	69	174	22	12	34	208	294,247
All Aircraft	69	69	102	240	39	18	57	297	379,827

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total block hours.

Col 6: Total other (primarily insurance) costs divided by total block hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Block hours reported in 298-C.

**Table 4-3B  
Alaskan Form 298-C Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Per Airborne Hours
Two-engine narrow body jet	85	63	285	433	326	315	641	1,074	88
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	72	28	70	169	30	32	61	231	697
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	292	228	906	1,425	162	411	573	1,999	461
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	524	355	557	1,435	366	67	434	1,869	1,236
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	124	136	208	468	118	39	157	625	55,948
Turboprops with 20 or more seats	270	338	581	1,189	115	83	198	1,387	9,521
Piston	68	64	87	219	28	15	43	262	233,632
All Aircraft	87	87	128	302	49	22	72	374	301,583

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total airborne hours.

Col 6: Total other (primarily insurance) costs divided by total airborne hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Airborne hours estimated as block hours reported in Form 298-C multiplied by the ratio of (airborne hrs/block hrs) reported for commuter operations in Form 41.

**Table 4-4A  
Non-Alaskan Form 298-C Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Block Hours
Two-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	310	474	554	1,338	486	137	623	1,961	535
Regional jet with 40-59 seats	190	287	127	604	405	46	451	1,055	147,443
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	108	80	139	327	124	24	148	475	370,813
Turboprops with 20 or more seats	157	123	214	494	211	28	239	733	973,201
Piston	42	66	80	188	69	13	83	271	97,774
All aircraft	141	125	180	447	200	28	228	675	1,589,766

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total block hours.

Col 6: Total other (primarily insurance) costs divided by total block hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Block hours reported in 298-C.

**Table 4-4B  
Non-Alaskan Form 298-C Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Airborne Hours
Two-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	390	597	698	1,685	612	173	785	2,470	425
Regional jet with 40-59 seats	240	362	160	761	510	58	568	1,329	117,070
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	136	101	175	412	156	30	187	599	294,426
Turboprops with 20 or more seats	197	155	270	622	265	36	301	923	772,722
Piston	53	83	101	237	87	17	104	342	77,633
All Aircraft	178	157	227	563	252	35	287	850	1,262,276

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total airborne hours.

Col 6: Total other (primarily insurance) costs divided by total airborne hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Airborne hours estimated as block hours reported in Form 298-C multiplied by the ratio of (airborne hrs/block hrs) reported for commuter operations in Form 41.

More detailed information by aircraft type is provided in Supporting Tables 4-1 through 4-18.

#### 4.2.1 Alternative Ownership Cost

There is a broad mix of aircraft ownership arrangements among carriers and, as a result, fixed accounting charges may not reflect the opportunity costs of ownership. For example, some carriers' fleets may be very new and their accounting costs for ownership (depreciation, amortization) and operating leases (rentals) may reflect recent market conditions. But, other carriers with older fleets will report ownership and lease accounting data that may be significantly out of date. When FAA initiatives cause a temporary or permanent change in air carrier fleets, the benefits (if FAA efficiency improvements result in the carrier being able to produce the same service with fewer aircraft) or costs of fleet changes might better be approximated by operating lease rates for specific air carrier aircraft. These lease rates can be interpreted as the next best use (the opportunity cost) for an aircraft. Current operating lease rates for aircraft types are shown in Table 4-5; more detailed data by aircraft type can be found in Table 4-19.

**Table 4-5**  
**Summary CY 1996 Average Monthly Lease Rate**  
**(\$thousands/month, averages weighted by fleet)**

Equipment Type	Monthly Lease Rate <sup>1</sup>	
	Passenger	Freight
1. Two-engine narrow body jet	236	106
2. Two-engine wide body jet	544	552
3. Three-engine narrow body jet	72	73
4. Three-engine wide body jet	279	562
5. Four-engine narrow body jet	60	237
6. Four-engine wide body jet	646	509
7. Regional jet under 40 seats <sup>2</sup>	NR	NR
8. Regional jet with 40-59 seats	145	NR
9. Regional jet over 59 seats <sup>2</sup>	NR	NR
10. Turboprops under 20 seats	22	NR
11. Turboprops with 20 or more seats, 2 eng	48	NR
12. Turboprops with 20 or more seats, 4 eng	22	NR
13. Piston	NR	NR
<b>All Aircraft</b>	<b>188</b>	
<p><sup>1</sup>The operating lease rates are the median values for actual observed transactions in 1996. The rates are for the aircraft only, and exclude such items as deposits, maintenance, fuel and crew costs. Operating leases generally last from one to seven years, with a typical lease running for five years. Rates vary by value, age, condition, term, creditworthiness of lessee and general market conditions. Operating lease rates for newer aircraft are generally a lower percentage of market value because the residual value (the future value at the end of the lease term) is higher for new aircraft than for old.</p> <p><sup>2</sup>These are primarily planned aircraft not yet in service. While some older aircraft (e.g., Lear jets and DC-9-10's) exist in these classes, no general lease value is estimated for these aircraft. NR means no data reported.</p> <p>Source: GRA Aviation Specialists, Inc., "The Guide" (Herndon, VA, 1996).</p>		

### 4.3 GENERAL AVIATION AIRCRAFT

The unit variable costs of general aviation aircraft were derived from analysis of data in *The Aircraft Cost Evaluator*, published by Conklin and deDecker Associates, Inc.<sup>4</sup> The cost data are available in considerable detail for more than 100 specific aircraft. Following are the variable cost categories included in the Conklin and deDecker database:

- Fuel and fuel additives, assuming fuel prices average \$2.02 per gallon
- Mature level maintenance, based on review of data from operations, factory, National Business Aviation Association (NBAA) and other sources
- Engine allowances, including amortization of overhauls of engines and props
- Crew costs per hour based on average salaries and benefits
- Other direct expenses, including landing fees and small supplies

Fixed costs are also developed in the Conklin and deDecker data. They reflect corporate missions and include typical hangar cost, hull and liability insurance, miscellaneous overhead (recurrent training, weather services, navigation chart services, etc.) and depreciation. The price assumed for calculating depreciation is the new price for the aircraft. Aircraft are depreciated over eight years to a 20 percent residual value. Because fixed costs for GA aircraft are subject to considerable variation, they should be used with care. For example, one would not use such costs on a broad fleet of aircraft. As shown in a number of tables, the fleet of GA aircraft is fairly old, with the majority of the fleet built before 1982. This fleet is largely depreciated and calculating fixed cost as shown in these tables may result in excessive estimates of cost.

Cost estimates were developed from the Conklin and deDecker source data as follows. The costs for the 100 plus aircraft in the source data were assigned as appropriate to a larger list of aircraft types that resulted from analysis of the FAA GA Survey.<sup>5</sup> An example illustrates the approach. The Cessna 172 (a class 2 aircraft) shows up in *The Aircraft Cost Evaluator* only once, but those cost estimates are applied to some 17 different variants of the Cessna 172 in the full list of aircraft. In Tables 4-6, 4-7 and 4-8, the individual estimates are averaged for the classes shown.

No cost estimates were available through Conklin and deDecker data for aircraft classes 1, 4, 6, 7, 13, 16, 21, and 23 as indicated by NA in Tables 4-6 through 4-8. For classes 4, 6, 7, 13, 16, and 21 this is not a significant problem in that these classes comprised only 1.7 percent of total GA hours in 1995. A cost estimate for Class 1 was not available from *The Aircraft Cost Evaluator* and had to be developed, as explained in notes to the tables. For class 23, which

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<sup>4</sup> Conklin and deDecker Associates, Inc., *The Aircraft Cost Evaluator* (Orleans, MA, Spring, 1997).

<sup>5</sup> While there were over 100 specific aircraft types in *The Aircraft Cost Evaluator*, there were over 1,200 specific aircraft types identified in the GA Survey.

comprises a diverse group including home-built aircraft, experimental aircraft, gliders, and balloons, costs can not be reliably estimated. When analysis requires an estimate of costs for aircraft in this class, the analyst should undertake a more detailed review of the specific aircraft of interest.

Summary general aviation and air taxi fleet and cost data are shown in Table 4-6. Table 4-6 has been divided into three segments: The first page of Table 4-6 reports GA and air taxi costs for all aircraft types; the second page of Table 4-6 reports costs for aircraft built before 1982; the third page of Table 4-6 reports costs for aircraft built in 1982 and beyond. This segregation reflects the changes in the composition of the GA and air taxi fleets since 1982. More detailed information by aircraft type is shown in Table 4-20. Tables 4-7 and 4-8 provide information on the GA and air taxi fleet individually.

#### **4.4 MILITARY AIRCRAFT**

Military aircraft are summarized in several broad classifications based generally on the aircraft mission. The classes are:

- Turbojet/fan with 3 or more engines—Mostly military transports, fueling aircraft, and bombers
- Turbojet/fan attack/fighter
- Turbojet/fan other—Mostly trainers, and special purpose aircraft
- Turboprops—Mostly observation, patrol and specialty aircraft
- Pistons—Trainer aircraft
- Rotary—Mostly troop transport, attack, and special purpose vertical lift aircraft

Just over half of the military fleet is made up of rotary lift aircraft. Analysts should carefully review the specific military aircraft types that are potentially affected by FAA regulations or air traffic system improvements under review. The only aircraft category for which an estimate of cost was not available was the small fleet of piston aircraft, which are used almost exclusively for training. If an estimate of operating cost is required for this fleet, the cost for a Cessna 172, a common piston trainer aircraft, should be used.

**Table 4-6**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**All Hours**

<b>Group A: All Aircraft Types</b>									
<b>Economic Values Class</b>	<b>(Column 1)</b>	<b>(Column 2)</b>	<b>(Column 3)</b>	<b>(Column 4)</b>	<b>(Column 5)</b>	<b>(Column 6)</b>	<b>(Column 7)</b>	<b>(Column 8)</b>	<b>(Column 9)</b>
	<b>Crew</b>	<b>Fuel &amp; Oil</b>	<b>Maintenance</b>	<b>Variable Operating Costs (Including Crew)</b>	<b>Variable Operating Costs (Excluding Crew)</b>	<b>Annual Fixed Cost Other</b>	<b>Fixed Cost Per Hour</b>	<b>Flight Hours</b>	<b>Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	4,888,517	156
2 Piston 4-9 Seats 1 Eng	72	24	34	130	58	22,698	57	11,716,993	187
3 Piston 4-9 Seats 2 Eng	72	68	93	233	160	60,310	151	2,651,296	383
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	49	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	144,430	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	33,856	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	3,034	NA
8 Turboprop 1-9 Seats 1 Eng	114	103	110	327	213	178,776	447	299,391	774
9 Turboprop 1-9 Seats 2 Eng	193	147	257	597	404	474,539	1,186	269,755	1,783
10 Turboprop 10-19 Seats 1 Eng	117	109	140	366	249	223,170	558	3,868	924
11 Turboprop 10-19 Seats 2 Eng	201	181	303	685	484	308,172	770	765,381	1,455
12 Turboprop 20+ Seats 2 Eng	205	270	344	819	614	320,856	802	98,662	1,621
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	244	361	430	1,035	792	623,719	1,559	931,072	2,595
15 Turbojet/fan 2 Eng >=20,000	322	645	642	1,609	1,287	2,137,499	5,344	368,562	6,953
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	953	NA
17 Turbojet/fan 3+ Eng >=20,000	309	609	674	1,592	1,283	2,078,749	5,197	51,447	6,789
18 Turbojet/fan >=65,000	237	544	420	1,201	964	1,776,491	4,441	42,836	5,642
19 Rotor Piston <7,000	89	24	78	191	101	50,214	126	355,599	316
20 Rotor Turbine <7,000	134	60	196	390	256	129,300	323	1,002,095	713
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	4,854	NA
22 Rotor Turbine >=7,000	186	113	363	662	476	220,774	552	854,615	1,214
23 Other	NA	NA	NA	NA	NA	NA	NA	960,699	NA
All Piston	72	33	45	150	78	30,041	75	19,438,175	226
All Turboprop	181	156	250	587	406	337,326	843	1,437,057	1,431
All Turbojet	266	445	494	1,205	939	1,078,200	2,696	1,394,870	3,900
All Rotor	147	75	242	465	318	152,599	381	2,217,163	846
All Other	NA	NA	NA	NA	NA	NA	NA	960,699	NA
All Aircraft--GA and Air Taxi	102	78	114	294	192	146,519	366	25,447,963	660

**Table 4-6 (Continued)**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**All Hours**

<b>Group B: Aircraft Built Before 1982</b>									
	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)
<b>Economic Values Category</b>	<b>Crew</b>	<b>Fuel &amp; Oil</b>	<b>Maintenance</b>	<b>Variable Operating Costs (Including Crew)</b>	<b>Variable Operating Costs (Excluding Crew)</b>	<b>Annual Fixed Cost Other</b>	<b>Fixed Cost Per Hour</b>	<b>Flight Hours</b>	<b>Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	4,411,991	156
2 Piston 4-9 Seats 1 Eng	72	24	33	129	57	21,300	53	10,496,635	182
3 Piston 4-9 Seats 2 Eng	72	68	92	233	161	58,051	145	2,384,478	378
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	49	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	92,872	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	33,856	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	3,034	NA
8 Turboprop 1-9 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	18,248	NA
9 Turboprop 1-9 Seats 2 Eng	193	150	269	612	419	527,726	1,319	196,026	1,931
10 Turboprop 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
11 Turboprop 10-19 Seats 2 Eng	193	159	306	659	466	189,155	473	484,066	1,132
12 Turboprop 20+ Seats 2 Eng	203	271	346	821	618	239,771	599	18,251	1,420
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	237	371	483	1,092	855	366,466	916	328,802	2,008
15 Turbojet/fan 2 Eng >=20,000	281	461	599	1,340	1,060	720,102	1,800	178,561	3,141
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	280	692	768	1,740	1,460	1,273,514	3,184	14,150	4,924
18 Turbojet/fan >=65,000	NA	NA	NA	NA	NA	NA	NA	27,684	NA
19 Rotor Piston <7,000	89	40	151	280	191	74,936	187	139,352	467
20 Rotor Turbine <7,000	138	58	192	389	251	128,412	321	454,741	710
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	4,854	NA
22 Rotor Turbine >=7,000	298	205	664	1,166	869	420,965	1,052	195,172	2,219
23 Other	NA	NA	NA	NA	NA	NA	NA	316,395	NA
All Piston	72	32	45	149	77	28,408	71	17,422,915	220
All Turboprop	193	159	290	643	449	347,550	869	716,591	1,512
All Turbojet	251	413	530	1,194	943	511,235	1,278	549,196	2,472
All Rotor	147	69	227	444	296	148,325	371	794,120	815
All Other	NA	NA	NA	NA	NA	NA	NA	316,395	NA
All Aircraft—GA and Air Taxi	84	49	74	206	122	57,386	143	19,799,218	350

**Table 4-6 (Continued)**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**All Hours**

Group C: Aircraft Built in 1982 and Beyond									
Economic Values Category	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Variable Operating Costs (Including Crew)	(Column 5) Variable Operating Costs (Excluding Crew)	(Column 6) Annual Fixed Cost Other	(Column 7) Fixed Cost Per Hour	(Column 8) Flight Hours	(Column 9) Total Cost Per Hour (Including Crew)
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	476,526	156
2 Piston 4-9 Seats 1 Eng	72	30	40	142	70	36,085	90	1,220,358	232
3 Piston 4-9 Seats 2 Eng	72	65	94	232	160	83,548	209	266,818	441
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	51,558	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 Turboprop 1-9 Seats 1 Eng	114	103	110	327	213	178,776	447	281,143	774
9 Turboprop 1-9 Seats 2 Eng	193	141	234	568	375	372,634	932	73,729	1,499
10 Turboprop 10-19 Seats 1 Eng	117	109	140	366	249	223,170	558	3,868	924
11 Turboprop 10-19 Seats 2 Eng	209	205	299	712	504	433,927	1,085	281,315	1,797
12 Turboprop 20+ Seats 2 Eng	223	255	317	795	572	1,158,423	2,896	80,411	3,691
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	246	358	413	1,017	771	706,411	1,766	602,270	2,783
15 Turbojet/fan 2 Eng >=20,000	338	718	659	1,715	1,377	2,695,104	6,738	190,001	8,452
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	953	NA
17 Turbojet/fan 3+ Eng >=20,000	319	582	643	1,543	1,224	2,347,437	5,869	37,296	7,412
18 Turbojet/fan >=65,000	237	544	420	1,201	964	1,776,491	4,441	15,153	5,642
19 Rotor Piston <7,000	89	22	67	177	88	46,517	116	216,247	293
20 Rotor Turbine <7,000	129	63	199	392	262	130,318	326	547,354	717
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
22 Rotor Turbine >=7,000	178	107	344	629	451	207,835	520	659,443	1,149
23 Other	NA	NA	NA	NA	NA	NA	NA	644,304	NA
All Piston	72	38	52	162	90	45,023	113	2,015,259	275
All Turboprop	170	154	215	539	369	328,435	821	720,465	1,360
All Turbojet	271	455	482	1,208	938	1,267,351	3,168	845,674	4,377
All Rotor	147	78	249	473	326	154,352	386	1,423,043	859
All Other	NA	NA	NA	NA	NA	NA	NA	644,304	NA
All Aircraft--GA and Air Taxi	159	173	243	575	417	432,182	1,080	5,648,745	1,656

Source: Conklin and deDecker, *Aircraft Cost Evaluator*, Spring, 1997;

Category 1 aircraft costs are based on known fuel burn of 9.4 gallons per hour for this type (GAMA DATABOOK, 1998), and maintenance costs analogous to the 1989 relationship between category 1 and category 2 pistons, and an assumption that crew cost would be the same as for category 2 aircraft.

Note: NA indicates that the population for which costs were available was insufficient to provide reliable results.

Col 1: Crew cost includes salaries and benefits, and assumes 492 hours per year crew use. The crew salaries and benefits are from Conklin and deDecker, and the 492 hours is based on a survey done for FAA in 1991 that shows that non-airline professional pilots with a Class 1 medical certificate flew an average of 492 hours per year. Most piston operators do not employ crew.

Col 2: Fuel, oil and additives used per hour, with fuel at \$2.02 per gallon.

Col 3: Total maintenance cost, including labor, parts, engine allowances, propeller/thrust reverser overhaul, and APU overhaul if applicable.

Col 4: Variable operating cost total. Addition of columns 1, 2 and 3.

Col 5: Maintenance and Fuel only (Col. 2 plus Col. 3)

Col 6: Annual fixed cost including hanger cost, insurance costs, training cost, services typically used by air taxi and commercial operators (e.g., Weather service, maintenance programs) and book depreciation (using a formula of 8 year life to 20 percent residual).

Col 7: Fixed cost per hour, assuming utilization of 400 hours per year.

Col 8: Total Annual Flight Hours (See Section 3).

Col 9: Col. 4 plus Col. 7.

**Table 4-7**  
**Estimated GA Operating and Fixed Costs - Weighted by Hours**  
**GA Hours**

<b>Group A: All Aircraft Types</b>									
<b>Economic Values Category</b>	<b>(Column 1)</b> <b>Crew</b>	<b>(Column 2)</b> <b>Fuel &amp; Oil</b>	<b>(Column 3)</b> <b>Maintenance</b>	<b>(Column 4)</b> <b>Variable Operating Costs (Including Crew)</b>	<b>(Column 5)</b> <b>Variable Operating Costs (Excluding Crew)</b>	<b>(Column 6)</b> <b>Annual Fixed Cost Other</b>	<b>(Column 7)</b> <b>Fixed Cost Per Hour</b>	<b>(Column 8)</b> <b>Flight Hours</b>	<b>(Column 9)</b> <b>Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	4,881,821	156
2 Piston 4-9 Seats 1 Eng	72	24	34	130	58	22,623	57	11,463,869	187
3 Piston 4-9 Seats 2 Eng	72	68	94	233	161	59,359	148	2,156,015	382
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	49	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	70,374	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	16,700	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	3,034	NA
8 Turboprop 1-9 Seats 1 Eng	104	87	111	302	198	183,749	459	200,546	761
9 Turboprop 1-9 Seats 2 Eng	193	147	257	596	403	470,790	1,177	255,899	1,773
10 Turboprop 10-19 Seats 1 Eng	117	110	157	384	267	248,150	620	2,501	1,004
11 Turboprop 10-19 Seats 2 Eng	202	186	295	683	481	336,584	841	612,865	1,525
12 Turboprop 20+ Seats 2 Eng	205	270	344	819	614	320,856	802	93,078	1,621
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	246	360	430	1,036	790	645,249	1,613	825,623	2,649
15 Turbojet/fan 2 Eng >=20,000	323	654	645	1,622	1,298	2,189,042	5,473	341,263	7,094
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	953	NA
17 Turbojet/fan 3+ Eng >=20,000	309	609	676	1,594	1,284	2,083,796	5,209	50,652	6,803
18 Turbojet/fan >=65,000	237	544	420	1,201	964	1,776,491	4,441	42,836	5,642
19 Rotor Piston <7,000	89	24	78	191	101	50,214	126	355,599	316
20 Rotor Turbine <7,000	134	60	193	387	253	128,038	320	908,807	707
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	4,854	NA
22 Rotor Turbine >=7,000	158	99	308	565	407	217,711	544	685,320	1,110
23 Other	NA	NA	NA	NA	NA	NA	NA	960,683	NA
All Piston	72	31	43	146	74	28,203	71	18,591,861	216
All Turboprop	193	165	269	627	435	384,204	961	1,164,888	1,588
All Turbojet	269	451	498	1,218	949	1,132,518	2,831	1,261,328	4,050
All Rotor	134	67	212	413	279	144,875	362	1,954,579	775
All Other	NA	NA	NA	NA	NA	NA	NA	960,683	NA
All Aircraft--GA Fleet	100	75	107	283	183	147,191	368	23,933,340	651

**Table 4-7 (Continued)**  
**Estimated GA Operating and Fixed Costs - Weighted by Hours**  
**GA Hours**

<b>Group B: Aircraft Built Before 1982</b>									
	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)
<b>Economic Values Category</b>	<b>Crew</b>	<b>Fuel &amp; Oil</b>	<b>Maintenance</b>	<b>Variable Operating Costs (Including Crew)</b>	<b>Variable Operating Costs (Excluding Crew)</b>	<b>Annual Fixed Cost Other</b>	<b>Fixed Cost Per Hour</b>	<b>Flight Hours</b>	<b>Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	4,405,295	156
2 Piston 4-9 Seats 1 Eng	72	24	33	129	57	21,251	53	10,263,904	182
3 Piston 4-9 Seats 2 Eng	72	68	93	233	161	56,203	141	1,908,359	373
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	49	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	20,543	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	16,700	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	3,034	NA
8 Turboprop 1-9 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	18,248	NA
9 Turboprop 1-9 Seats 2 Eng	193	150	269	612	419	523,895	1,310	182,170	1,921
10 Turboprop 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
11 Turboprop 10-19 Seats 2 Eng	193	159	292	643	450	195,731	489	367,019	1,133
12 Turboprop 20+ Seats 2 Eng	203	271	346	821	618	239,771	599	12,667	1,420
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	239	354	467	1,061	822	385,061	963	277,958	2,023
15 Turbojet/fan 2 Eng >=20,000	281	469	603	1,352	1,071	725,289	1,813	156,514	3,165
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	280	692	768	1,740	1,460	1,273,514	3,184	14,150	4,924
18 Turbojet/fan >=65,000	NA	NA	NA	NA	NA	NA	NA	27,684	NA
19 Rotor Piston <7,000	89	40	151	280	191	74,936	187	139,352	467
20 Rotor Turbine <7,000	138	58	192	389	251	128,398	321	431,275	710
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	4,854	NA
22 Rotor Turbine >=7,000	274	160	536	970	696	470,450	1,176	186,356	2,146
23 Other	NA	NA	NA	NA	NA	NA	NA	316,394	NA
All Piston	72	30	42	144	72	26,359	66	16,617,882	210
All Turboprop	193	159	282	634	440	374,082	935	580,104	1,569
All Turbojet	253	408	524	1,185	932	535,987	1,340	476,307	2,525
All Rotor	143	63	210	415	273	144,881	362	761,838	778
All Other	NA	NA	NA	NA	NA	NA	NA	316,394	NA
All Aircraft--GA Fleet	83	45	68	196	113	54,749	137	18,752,525	333

**Table 4-7 (Continued)**  
**Estimated GA Operating and Fixed Costs - Weighted by Hours**  
**GA Hours**

<b>Group C: Aircraft Built in 1982 and Beyond</b>										
<b>Economic Values Category</b>	<b>(Column 1)</b> <b>Crew</b>	<b>(Column 2)</b> <b>Fuel &amp; Oil</b>	<b>(Column 3)</b> <b>Maintenance</b>	<b>(Column 4)</b> <b>Variable Operating Costs (Including Crew)</b>	<b>(Column 5)</b> <b>Variable Operating Costs (Excluding Crew)</b>	<b>(Column 6)</b> <b>Annual Fixed Cost Other</b>	<b>(Column 7)</b> <b>Fixed Cost Per Hour</b>	<b>(Column 8)</b> <b>Flight Hours</b>	<b>(Column 9)</b>	<b>Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	476,526		156
2 Piston 4-9 Seats 1 Eng	72	30	40	142	70	35,806	90	1,199,965		231
3 Piston 4-9 Seats 2 Eng	72	66	99	238	166	86,232	216	247,656		454
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA		NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	49,831		360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	NA		NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA		NA
8 Turboprop 1-9 Seats 1 Eng	104	87	111	302	198	183,749	459	182,298		761
9 Turboprop 1-9 Seats 2 Eng	193	141	234	568	375	372,634	932	73,729		1,499
10 Turboprop 10-19 Seats 1 Eng	117	110	157	384	267	248,150	620	2,501		1,004
11 Turboprop 10-19 Seats 2 Eng	209	207	298	714	505	445,323	1,113	245,846		1,828
12 Turboprop 20+ Seats 2 Eng	223	255	317	795	572	1,158,423	2,896	80,411		3,691
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA		NA
14 Turbojet/fan 2 Eng <20,000	248	362	419	1,029	781	721,657	1,804	547,665		2,833
15 Turbojet/fan 2 Eng >=20,000	338	717	659	1,714	1,376	2,690,960	6,727	184,749		8,442
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	953		NA
17 Turbojet/fan 3+ Eng >=20,000	320	581	644	1,544	1,224	2,360,056	5,900	36,501		7,444
18 Turbojet/fan >=65,000	237	544	420	1,201	964	1,776,491	4,441	15,153		5,642
19 Rotor Piston <7,000	89	22	67	177	88	46,517	116	216,247		293
20 Rotor Turbine <7,000	128	61	194	384	256	127,598	319	477,531		703
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	NA		NA
22 Rotor Turbine >=7,000	152	96	295	542	390	203,077	508	498,964		1,050
23 Other	NA	NA	NA	NA	NA	NA	NA	644,290		NA
All Piston	72	38	52	162	89	44,516	111	1,973,979		273
All Turboprop	192	173	256	620	429	394,774	987	584,784		1,607
All Turbojet	274	464	491	1,229	955	1,313,574	3,284	785,021		4,513
All Rotor	131	69	213	412	281	144,872	362	1,192,741		774
All Other	NA	NA	NA	NA	NA	NA	NA	644,290		NA
All Aircraft—GA Fleet	156	177	238	571	415	455,480	1,139	5,180,815		1,710

Source: Conklin and deDecker, *Aircraft Cost Evaluator*, Spring, 1997;

Category 1 aircraft costs are based on known fuel burn of 9.4 gallons per hour for this type (GAMA DATABOOK, 1998), and maintenance costs analogous to the 1989 relationship between category 1 and category 2 pistons, and an assumption that crew cost would be the same as for category 2 aircraft.

Note: NA indicates that the population for which costs were available was insufficient to provide reliable results.

Col 1: Crew cost includes salaries and benefits, and assumes 492 hours per year crew use. The crew salaries and benefits are from Conklin and deDecker, and the 492 hours is based on a survey done for FAA in 1991 that shows that non-airline professional pilots with a Class 1 medical certificate flew an average of 492 hours per year. Most piston operators do not employ crew.

Col 2: Fuel, oil and additives used per hour, with fuel at \$2.02 per gallon.

Col 3: Total maintenance cost, including labor, parts, engine allowances, propeller/thrust reverser overhaul, and APU overhaul if applicable.

Col 4: Variable operating cost total. Addition of columns 1, 2 and 3.

Col 5: Maintenance and Fuel only (Col. 2 plus Col. 3)

Col 6: Annual fixed cost including hanger cost, insurance costs, training cost, services typically used by air taxi and commercial operators (e.g., weather service, maintenance programs) and book depreciation (using a formula of 8 year life to 20 percent residual).

Col 7: Fixed cost per hour, assuming utilization of 400 hours per year.

Col 8: Total Annual Flight Hours (See Section 3).

Col 9: Col. 4 plus Col. 7.

**Table 4-8**  
**Estimated Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**Air Taxi Hours**

<b>Group A: All Aircraft Types</b>									
<b>Economic Values Category</b>	<b>(Column 1) Crew</b>	<b>(Column 2) Fuel &amp; Oil</b>	<b>(Column 3) Maintenance</b>	<b>(Column 4) Variable Operating Costs (Including Crew)</b>	<b>(Column 5) Variable Operating Costs (Excluding Crew)</b>	<b>(Column 6) Annual Fixed Cost Other</b>	<b>(Column 7) Fixed Cost Per Hour</b>	<b>(Column 8) Flight Hours</b>	<b>(Column 9) Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	6,696	156
2 Piston 4-9 Seats 1 Eng	72	28	37	136	64	26,647	67	253,124	203
3 Piston 4-9 Seats 2 Eng	72	68	90	230	158	62,978	157	495,281	388
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	74,056	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	17,156	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 Turboprop 1-9 Seats 1 Eng	117	108	110	334	217	177,419	444	98,845	778
9 Turboprop 1-9 Seats 2 Eng	193	153	273	619	426	632,464	1,581	13,856	2,200
10 Turboprop 10-19 Seats 1 Eng	117	108	110	334	217	177,419	444	1,367	778
11 Turboprop 10-19 Seats 2 Eng	193	161	337	692	498	180,047	450	152,516	1,142
12 Turboprop 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	5,584	NA
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	225	369	434	1,029	803	457,676	1,144	105,448	2,173
15 Turbojet/fan 2 Eng >=20,000	290	465	583	1,338	1,048	1,034,807	2,587	27,299	3,925
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	280	626	596	1,501	1,222	1,767,962	4,420	795	5,921
18 Turbojet/fan >=65,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
19 Rotor Piston <7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
20 Rotor Turbine <7,000	138	71	225	433	296	144,934	362	93,288	796
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
22 Rotor Turbine >=7,000	275	158	546	979	704	230,844	577	169,295	1,557
23 Other	NA	NA	NA	NA	NA	NA	NA	15	NA
All Piston	72	59	78	210	138	54,234	136	846,314	346
All Turboprop	145	127	192	464	319	192,445	481	272,169	945
All Turbojet	234	383	453	1,069	836	537,646	1,344	133,542	2,413
All Rotor	237	134	457	827	590	206,929	517	262,584	1,345
All Other	NA	NA	NA	NA	NA	NA	NA	15	NA
All Aircraft--Air Taxi Fleet	121	109	182	411	290	139,538	349	1,514,623	760

**Table 4-8 (Continued)**  
**Estimated Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**Air Taxi Hours**

<b>Group B: Aircraft Built Before 1982</b>									
<b>Economic Values Category</b>	<b>(Column 1) Crew</b>	<b>(Column 2) Fuel &amp; Oil</b>	<b>(Column 3) Maintenance</b>	<b>(Column 4) Variable Operating Costs (Including Crew)</b>	<b>(Column 5) Variable Operating Costs (Excluding Crew)</b>	<b>(Column 6) Annual Fixed Cost Other</b>	<b>(Column 7) Fixed Cost Per Hour</b>	<b>(Column 8) Flight Hours</b>	<b>(Column 9) Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	6,696	156
2 Piston 4-9 Seats 1 Eng	72	27	35	134	62	23,929	60	232,732	194
3 Piston 4-9 Seats 2 Eng	72	69	91	232	160	62,901	157	476,119	389
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	72,329	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	17,156	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 Turboprop 1-9 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
9 Turboprop 1-9 Seats 2 Eng	193	153	273	619	426	632,464	1,581	13,856	2,200
10 Turboprop 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
11 Turboprop 10-19 Seats 2 Eng	193	161	340	694	501	174,234	436	117,047	1,130
12 Turboprop 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	5,584	NA
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	226	452	560	1,238	1,012	278,138	695	50,843	1,933
15 Turbojet/fan 2 Eng >=20,000	280	412	574	1,266	985	687,150	1,718	22,046	2,984
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
18 Turbojet/fan >=65,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
19 Rotor Piston <7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
20 Rotor Turbine <7,000	138	59	193	390	252	128,697	322	23,466	712
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
22 Rotor Turbine >=7,000	351	305	951	1,607	1,256	310,114	775	8,816	2,382
23 Other	NA	NA	NA	NA	NA	NA	NA	1	NA
All Piston	72	60	80	212	140	54,056	135	805,033	347
All Turboprop	193	160	334	687	494	218,197	545	136,487	1,232
All Turbojet	239	442	564	1,245	1,006	375,486	939	72,890	2,183
All Rotor	219	152	481	852	633	197,543	494	32,282	1,346
All Other	NA	NA	NA	NA	NA	NA	NA	1	NA
All Aircraft—Air Taxi Fleet	95	91	137	323	228	88,014	220	1,046,693	543

**Table 4-8 (Continued)**  
**Estimated Air Taxi Operating and Fixed Costs - Weighted by Hours**  
**Air Taxi Hours**

<b>Group C: Aircraft Built in 1982 and Beyond</b>									
<b>Economic Values Category</b>	<b>(Column 1) Crew</b>	<b>(Column 2) Fuel &amp; Oil</b>	<b>(Column 3) Maintenance</b>	<b>(Column 4) Variable Operating Costs (Including Crew)</b>	<b>(Column 5) Variable Operating Costs (Excluding Crew)</b>	<b>(Column 6) Annual Fixed Cost Other</b>	<b>(Column 7) Fixed Cost Per Hour</b>	<b>(Column 8) Flight Hours</b>	<b>(Column 9) Total Cost Per Hour (Including Crew)</b>
1 Piston 1-3 Seats	72	19	20	111	39	18,238	46	NA	156
2 Piston 4-9 Seats 1 Eng	72	36	46	154	82	48,609	122	20,393	276
3 Piston 4-9 Seats 2 Eng	72	56	60	188	116	64,733	162	19,162	350
4 Piston 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Piston 10-19 Seats 2 Eng	72	66	89	227	155	52,880	132	1,726	360
6 Piston 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Piston 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
8 Turboprop 1-9 Seats 1 Eng	117	108	110	334	217	177,419	444	98,845	778
9 Turboprop 1-9 Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 Turboprop 10-19 Seats 1 Eng	117	108	110	334	217	177,419	444	1,367	778
11 Turboprop 10-19 Seats 2 Eng	195	166	317	678	483	217,595	544	35,469	1,222
12 Turboprop 20+ Seats 2 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
13 Turboprop 20+ Seats 4 Eng	NA	NA	NA	NA	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	225	321	360	906	681	562,468	1,406	54,605	2,312
15 Turbojet/fan 2 Eng >=20,000	352	792	640	1,784	1,432	3,165,755	7,914	5,253	9,699
16 Turbojet/fan 3+ Eng <20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Turbojet/fan 3+ Eng >=20,000	280	626	596	1,501	1,222	1,767,962	4,420	795	5,921
18 Turbojet/fan >=65,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
19 Rotor Piston <7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
20 Rotor Turbine <7,000	138	77	241	456	318	153,320	383	69,823	839
21 Rotor Piston >=7,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
22 Rotor Turbine >=7,000	269	145	511	925	656	223,918	560	160,479	1,484
23 Other	NA	NA	NA	NA	NA	NA	NA	14	NA
All Piston	72	48	56	176	104	57,275	143	41,281	319
All Turboprop	122	112	123	357	235	180,112	450	135,681	808
All Turbojet	230	339	372	941	711	656,283	1,641	60,652	2,582
All Rotor	240	130	452	823	583	208,622	522	230,302	1,345
All Other	NA	NA	NA	NA	NA	NA	NA	14	NA
All Aircraft--Air Taxi Fleet	179	148	280	607	428	253,207	633	467,930	1,240

Source: Conklin and deDecker, *Aircraft Cost Evaluator*, Spring, 1997;

Category 1 aircraft costs are based on known fuel burn of 9.4 gallons per hour for this type (GAMA DATABOOK, 1998), and maintenance costs analogous to the 1989 relationship between category 1 and category 2 pistons, and an assumption that crew cost would be the same as for category 2 aircraft.

Note: NA indicates that the population for which costs were available was insufficient to provide reliable results.

Col 1: Crew cost includes salaries and benefits, and assumes 492 hours per year crew use. The crew salaries and benefits are from Conklin and deDecker, and the 492 hours is based on a survey done for FAA in 1991 that shows that non-airline professional pilots with a Class 1 medical certificate flew an average of 492 hours per year.

Col 2: Fuel, oil and additives used per hour, with fuel at \$2.02 per gallon.

Col 3: Total maintenance cost, including labor, parts, engine allowances, propeller/thrust reverser overhaul, and APU overhaul if applicable.

Col 4: Variable operating cost total. Addition of columns 1, 2 and 3.

Col 5: Maintenance and Fuel only (Col. 2 plus Col. 3)

Col 6: Annual fixed cost including hanger cost, insurance costs, training cost, services typically used by air taxi and commercial operators (e.g., Weather service, maintenance programs) and book depreciation (using a formula of 8 year life to 20 percent residual).

Col 7: Fixed cost per hour, assuming utilization of 400 hours per year.

Col 8: Total Annual Flight Hours (See Section 3).

Col 9: Col. 4 plus Col. 7.

Variable operating costs for military aircraft were obtained from the military services. Military data include maintenance, fuel and oil, and other variable costs. No fixed costs or cost of ownership are included. Air Force data were obtained from Air Force Financial Management sources.<sup>6</sup> Army data were obtained from Department of the Army, Cost and Economic Analysis Center.<sup>7</sup> The Department of the Navy, Office of the Budget provided Navy data.

Military fixed costs and cost of ownership are not available, and in any case are generally not relevant for purposes of analyzing FAA regulatory or system changes. Most military fixed costs are sunk, and military requirements and resources, not differences in fixed cost of operation, dominate decisions on equipment purpose and use.

Military operating costs are summarized in Table 4-9 and shown in detail in Table 4-21.

**Table 4-9**  
**Summary of Military Direct Operating Cost**  
**Fleet as of December 1996**

<b>Economic Values Class</b>	<b>Number in Fleet</b>	<b>Average Cost Per Hour</b>
Turbojet/fan 3+ engines	1,250	\$3,918
Turbojet/fan attack/fighter	4,663	\$2,981
Turbojet/fan other	1,674	\$796
Turboprop	2,371	\$1,408
Piston engine	91	\$45
Fixed wing total	10,049	\$2,336
Rotary aircraft total	10,354	\$883
Total military fleet	20,403	\$1,599
Source: Military service data cited in text.		

## 4.5 PROFILES

Table 4-10 summarizes operating and fixed cost data for profiles of scheduled, non-scheduled commercial and non-commercial user groups. Because of variations in reporting, the profiles are presented on a per airborne hour basis only.

<sup>6</sup> Air Force data were available through an Internet web site, <http://www.saffm.hq.af.mil/saffm>. Reference AFI 65-503, Table A3-1.

<sup>7</sup> Army data were available on a web site, <http://www.asafm.army.mil/pubs/cdfs>.

**Table 4-10  
Operating and Fixed Cost Profiles Per Airborne Hour**

	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)	(Column 9)	(Column 10)
	Crew	Fuel and Oil	Maintenance	Total Variable Costs	Rentals and Depreciation	Insurance	Total Fixed Costs	Total Costs	Airborne Hours	Block Hours
<b>Scheduled commercial service</b>										
Passengers	933	743	577	2,253	548	15	563	2,816	14,269,090	17,120,549
Freight only	1,213	1,304	1,877	4,394	1,377	53	1,430	5,824	1,177,482	1,350,920
All combined	950	776	653	2,379	597	18	615	2,994	15,446,572	18,471,469
<b>Air Carrier without Commuters</b>										
Passengers	1,117	890	662	2,669	624	14	638	3,307	11,476,924	13,577,584
Freight only	1,238	1,334	1,917	4,489	1,408	51	1,459	5,948	947,672	1,086,752
All combined	1,125	921	749	2,795	678	16	694	3,489	12,424,596	14,664,336
<b>Commuter only</b>										
Passengers	178	139	231	548	238	23	261	809	2,792,166	3,542,965
Freight only	406	361	603	1,370	392	113	505	1,875	229,810	264,168
All combined	180	142	234	556	240	23	263	819	3,021,976	3,807,133
<b>Non-scheduled commercial (air taxi)</b>										
	121	109	182	411	NR	NR	349	760	1,514,623	NA
<b>Non-commercial (GA and military)</b>										
GA and air taxi	102	78	114	294	NR	NR	366	660	25,447,963	NA
GA only	NA	75	107	183	NR	NR	368	551	23,933,340	NA
Military	NR	NR	NR	1,599	NR	NR	NR	NR	NR	NR

NA: Not applicable; NR: No data reported.

Note: Numbers may not add due to rounding.

Col 1: For scheduled services: flight deck and cabin crew reported on Form 41 and Form 298-C; for GA, crew costs are excluded; for air taxi, crew cost includes salaries and benefits for flight crew assuming 492 hours per year as reported by Conklin and deDecker.

Col 2: For scheduled services, fuel and oil consumed as reported on Form 41 and Form 298-C; for GA and air taxi, fuel, oil and additives used per hour assuming \$2.02 per gallon as reported by Conklin and deDecker.

Col 3: For scheduled services, maintenance and maintenance burden as reported on Form 41 and Form 298-C; for GA and air taxi, maintenance costs reported by Conklin and deDecker.

Col 4: Columns 1+2+3; for military aircraft, the direct operating cost per hour as reported by the individual services.

Col 5: For scheduled services, amortization (for capital leases), rental charges (for operating leases) and depreciation as reported on Forms 41 and 298-C.

Col 6: For scheduled services, insurance as reported in Form 41 and other costs as reported on Form 298-C.

Col 7: For scheduled services, columns 5+6; for GA and air taxi, hangar, insurance, training, outside services (e.g., weather) and book depreciation as reported by Conklin and deDecker.

Col 8: Columns 4+7.

Col 9: Airborne (flight) hours reported on Form 41 and Form 298-C for scheduled service; General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995 for GA and air taxi. Note: Airborne hours are estimated for 298-C carriers based on the ratio of airborne hours to block hours for commuter carriers reporting on Form 41.

Col 10: Block hours reported on Form 41 and Form 298-C for scheduled service.

**SUPPORTING TABLES**  
**OPERATING AND FIXED COSTS**

**Table 4-11**  
**Detail Supporting Table 4-1A**  
**Large (Form 41) Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Two-engine narrow body jet	777	554	429	1,760	320	133	11	464	2,224	9,622,195
A320-1/2	866	530	339	1,736	537	81	13	632	2,368	442,582
B-737-1/2	703	527	539	1,769	106	109	5	220	1,989	954,174
B-737-2C	574	525	748	1,846	110	119	7	236	2,082	98,762
B-737-3	691	505	431	1,628	417	93	11	520	2,148	1,858,836
B-737-4	845	531	261	1,637	586	74	22	683	2,319	310,134
B-737-5	552	471	386	1,409	319	115	10	445	1,854	448,452
B-757	1,069	675	422	2,166	460	210	14	684	2,850	1,548,322
DC-9-10	520	474	564	1,558	33	50	3	85	1,643	100,289
DC-9-15	NR	NR	NR	NR	NR	NR	NR	NR	NR	9,285
DC-9-30	619	534	496	1,649	82	102	5	189	1,838	808,628
DC-9-40	608	534	442	1,585	183	114	3	299	1,884	45,592
DC-9-50	659	582	563	1,804	108	65	5	178	1,982	188,154
F-28	795	450	655	1,899	349	56	30	434	2,333	61,244
FOKR-100	778	401	370	1,549	56	337	17	410	1,959	400,855
FOKR-70	514	615	298	1,427	612	177	27	815	2,243	7,387
MD-80	782	584	396	1,762	323	127	12	462	2,224	2,279,138
MD-87	351	363	68	783	305	0	15	320	1,103	8,010
MD-90	845	536	88	1,470	83	431	6	520	1,989	52,351
Two-engine wide body jet	1,348	1,041	705	3,094	548	302	13	863	3,957	1,080,550
A300-600	1,238	1,126	1,169	3,533	983	354	11	1,348	4,881	110,112
A300-X4	990	1,022	1,531	3,543	610	116	62	788	4,332	18,382
B-767-2/ER	1,201	941	712	2,854	170	400	18	588	3,443	368,093
B-767-3/ER	1,427	1,057	590	3,074	725	240	7	972	4,046	525,665
B-777	1,862	1,381	595	3,838	497	193	20	710	4,548	58,298
Three-engine narrow body jet	982	842	585	2,410	92	85	7	184	2,594	1,478,241
B-727-1	NR	NR	NR	NR	NR	NR	NR	NR	NR	895
B-727-2	982	842	585	2,409	92	85	7	184	2,594	1,474,680
B-727-QC	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,666
Three-engine wide body jet	1,778	1,639	1,310	4,727	337	821	15	1,173	5,900	879,513
DC-10-1	1,521	1,478	1,616	4,615	170	381	14	565	5,179	195,771
DC-10-3	1,631	1,748	1,302	4,680	648	258	27	933	5,613	166,122
DC-10-4	1,667	1,730	1,661	5,057	37	89	3	129	5,186	81,057
L-1011	1,720	1,597	1,239	4,557	75	944	12	1,031	5,588	211,053
L-1011-5	2,439	1,715	958	5,112	0	3,822	2	3,824	8,936	80,966
MD-11	2,072	1,702	1,005	4,780	945	614	23	1,582	6,361	144,544

**Table 4-11 (Continued)**  
**Detail Supporting Table 4-1A**  
**Large (Form 41) Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Four-engine narrow body jet	473	673	803	1,949	659	48	52	759	2,708	68,930
BAE-146-1	487	555	181	1,224	227	16	81	324	1,548	1,174
BAE-146-2	278	374	487	1,139	453	3	29	485	1,625	12,547
BAE-146-3	410	508	636	1,553	812	0	42	853	2,406	37,210
DC-8-62	695	1,208	1,377	3,281	526	145	89	760	4,041	16,446
DC-8-63	1,240	1,570	1,863	4,673	387	564	78	1,029	5,702	1,553
Four-engine wide body jet	2,349	2,551	1,604	6,504	971	453	26	1,450	7,955	448,155
B-747-1	2,213	2,580	1,877	6,670	399	568	21	988	7,658	216,962
B-747-2/3	2,224	2,700	1,973	6,896	1,021	700	17	1,739	8,635	55,707
B-747-4	2,556	2,469	1,150	6,176	1,663	232	35	1,930	8,106	175,486
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	114	89	110	314	75	43	7	124	438	491,669
B-1900	103	93	87	284	72	52	7	131	415	373,433
JETST-31	121	79	172	371	72	1	6	80	451	79,253
METRO-III	208	72	203	483	109	36	13	158	641	38,983
Turboprops with 20 or more seats	181	114	250	545	215	46	8	268	813	1,081,703
ATR-42	184	111	303	598	303	24	5	332	930	238,969
ATR-72	207	119	230	557	260	60	4	324	881	154,978
BAE-ATP	NR	NR	NR	NR	NR	NR	NR	NR	NR	21,466
DHC8-100	253	121	374	748	254	35	25	314	1,062	66,395
DHC8-300	137	149	67	352	82	47	5	134	487	17,669
DO-328	240	111	218	569	239	5	33	277	846	29,983
EMB-120	152	114	235	501	106	77	8	191	692	345,838
JETST-41	139	100	86	324	203	2	9	214	538	58,612
L-188A	NR	NR	NR	NR	NR	NR	NR	NR	NR	3,743
SF-340	194	106	213	513	305	19	3	326	839	114,491
SHORT360	141	148	427	716	175	35	0	210	926	29,559
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	879	695	530	2,104	321	181	11	513	2,618	15,150,956

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total block hours.

Col 6: Total depreciation charges divided by block hours.

Col 7: Total insurance costs divided by total block hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Block hours reported in Form 41.

**Table 4-12**  
**Detail Supporting Table 4-1B**  
**Large (Form 41) Carriers Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Two-engine narrow body jet	928	665	515	2,108	384	159	13	557	2,122	8,015,424
A320-1/2	994	613	392	1,998	621	94	15	730	2,014	383,236
B-737-1/2	855	650	665	2,169	131	135	6	272	2,175	775,127
B-737-2C	731	669	954	2,355	140	152	9	301	2,363	77,435
B-737-3	817	598	511	1,926	493	110	13	616	1,939	1,570,316
B-737-4	999	629	309	1,936	694	88	26	809	1,963	261,865
B-737-5	663	566	464	1,693	384	139	13	535	1,706	372,952
B-757	1,232	779	487	2,498	531	243	16	789	2,513	1,341,922
DC-9-10	668	609	726	2,003	42	64	3	110	2,007	77,990
DC-9-15	NR	NR	NR	NR	NR	NR	NR	NR	NR	7,662
DC-9-30	772	673	625	2,071	103	129	6	239	2,077	642,432
DC-9-40	778	683	566	2,028	234	145	3	383	2,031	35,637
DC-9-50	858	770	745	2,372	143	86	6	235	2,378	142,913
F-28	1,011	572	833	2,416	443	71	38	552	2,454	48,152
FOKR-100	953	505	466	1,923	70	424	21	515	1,944	320,360
FOKR-70	571	683	331	1,584	679	196	30	905	1,614	6,655
MD-80	934	700	475	2,110	388	153	14	555	2,124	1,900,678
MD-87	418	432	81	931	362	0	18	381	949	6,738
MD-90	1,021	648	106	1,775	100	520	7	628	1,782	43,354
Two-engine wide body jet	1,489	1,152	780	3,420	606	334	14	954	3,434	977,047
A300-600	1,467	1,334	1,385	4,186	1,164	419	13	1,597	4,199	92,943
A300-X4	1,073	1,211	1,816	4,100	723	138	74	935	4,174	15,562
B-767-2/ER	1,324	1,037	785	3,146	188	441	20	648	3,165	333,977
B-767-3/ER	1,559	1,155	645	3,359	793	262	7	1,062	3,367	480,968
B-777	2,026	1,502	647	4,175	541	210	21	772	4,196	53,597
Three-engine narrow body jet	1,188	1,025	712	2,925	112	104	9	224	2,934	1,216,170
B-727-1	NR	NR	NR	NR	NR	NR	NR	NR	NR	772
B-727-2	1,188	1,025	712	2,925	112	104	9	224	2,934	1,213,062
B-727-QC	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,336
Three-engine wide body jet	1,981	1,827	1,459	5,268	375	915	17	1,307	5,285	789,247
DC-10-1	1,721	1,672	1,829	5,222	192	431	15	639	5,237	173,020
DC-10-3	1,765	1,891	1,409	5,066	701	279	30	1,009	5,095	153,489
DC-10-4	1,884	1,954	1,877	5,715	42	100	4	146	5,719	71,728
L-1011	2,007	1,863	1,445	5,315	87	1,101	14	1,202	5,329	180,958
L-1011-5	2,666	1,875	1,048	5,589	0	4,179	2	4,181	5,591	74,061
MD-11	2,202	1,809	1,069	5,080	1,004	652	25	1,681	5,105	135,991

**Table 4-12 (Continued)**  
**Detail Supporting Table 4-1B**  
**Large (Form 41) Carriers Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Four-engine narrow body jet	582	829	990	2,401	813	59	64	935	2,465	55,950
BAE-146-1	583	665	217	1,464	272	20	97	388	1,561	981
BAE-146-2	382	514	670	1,566	622	5	40	667	1,606	9,131
BAE-146-3	514	637	798	1,949	1,019	0	52	1,071	2,001	29,649
DC-8-62	769	1,342	1,529	3,640	584	161	99	844	3,739	14,799
DC-8-63	1,386	1,754	2,082	5,221	433	630	87	1,150	5,309	1,390
Four-engine wide body jet	2,488	2,703	1,699	6,890	1,029	479	28	1,536	6,918	423,086
B-747-1	2,360	2,750	2,001	7,110	425	605	23	1,053	7,133	203,531
B-747-2/3	2,372	2,880	2,104	7,356	1,089	747	18	1,855	7,374	52,226
B-747-4	2,680	2,590	1,207	6,477	1,744	243	37	2,025	6,514	167,329
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	149	116	143	408	97	55	9	162	417	378,221
B-1900	135	121	114	370	93	68	9	170	378	287,113
JETST-31	159	104	226	488	95	1	8	104	496	60,323
METRO-III	263	92	257	612	138	46	16	199	628	30,785
Turboprops with 20 or more seats	228	145	318	692	273	58	10	341	702	850,086
ATR-42	234	141	385	760	386	30	6	422	766	187,998
ATR-72	272	157	302	731	341	79	6	426	736	118,076
BAE-ATP	NR	NR	NR	NR	NR	NR	NR	NR	NR	16,416
DHC8-100	320	153	474	947	321	44	32	398	979	52,427
DHC8-300	161	176	79	416	97	56	6	159	422	14,974
DO-328	304	140	276	720	303	7	42	351	762	23,682
EMB-120	188	141	292	620	131	96	10	236	630	279,330
JETST-41	178	128	110	415	261	2	12	274	427	45,726
L-188A	NR	NR	NR	NR	NR	NR	NR	NR	NR	3,373
SF-340	257	140	283	680	404	25	4	433	684	86,351
SHORT360	191	201	581	973	238	48	0	286	973	21,733
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft	1,044	829	632	2,506	383	216	14	612	2,519	12,705,231

Source: BTS Form 41 for year-end 1996.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total airborne hours.

Col 6: Total depreciation charges divided by airborne hours.

Col 7: Total insurance costs divided by total airborne hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Airborne hours reported in Form 41.

**Table 4-13**  
**Detail Supporting Table 4-2A**  
**Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Two-engine narrow body jet	1,012	829	799	2,640	647	602	45	1,294	3,934	117,509
B-757	1,069	841	821	2,731	668	639	46	1,352	4,084	99,783
DC-9-15	357	630	548	1,536	410	188	36	634	2,170	9,865
DC-9-30	353	701	541	1,594	405	185	35	625	2,220	6,431
FALCON	NR	NR	NR	NR	NR	NR	NR	NR	NR	350
HS-125	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,080
Two-engine wide body jet	926	991	1,505	3,422	1,953	392	53	2,398	5,820	84,089
A300-600	1,178	1,039	1,267	3,484	3,181	157	72	3,410	6,894	32,634
A310-2CF	1,118	998	2,485	4,602	1,643	441	44	2,128	6,730	32,074
B-767-3/ER	184	897	286	1,367	398	708	35	1,141	2,508	19,381
Three-engine narrow body jet	1,229	789	1,535	3,553	232	870	28	1,129	4,683	298,091
B-727-1	1,431	811	2,099	4,341	250	1,029	23	1,302	5,643	107,345
B-727-2	1,228	912	1,308	3,447	254	893	31	1,178	4,626	165,462
B-727-QC	426	8	542	976	31	98	29	158	1,133	25,284
Three-engine wide body jet	1,292	1,636	2,313	5,241	1,607	273	45	1,925	7,166	167,381
DC-10-1	1,365	1,412	3,494	6,271	526	754	31	1,312	7,583	24,116
DC-10-3	1,453	1,677	2,606	5,736	1,511	256	37	1,805	7,541	61,449
DC-10-F	NR	NR	NR	NR	NR	NR	NR	NR	NR	7,248
L-1011	746	1,739	2,042	4,528	331	430	134	895	5,423	7,550
MD-11	1,182	1,669	1,655	4,506	2,224	96	48	2,368	6,875	67,018
Four-engine narrow body jet	692	764	1,174	2,631	213	303	48	564	3,195	274,755
B-707-3C	NR	NR	NR	NR	NR	NR	NR	NR	NR	9,315
DC-8-50	NR	NR	NR	NR	NR	NR	NR	NR	NR	6
DC-8-50F	757	1,589	1,821	4,167	143	452	104	699	4,867	30,686
DC-8-61	762	1,509	1,829	4,099	136	472	110	718	4,817	9,086
DC-8-62	328	380	1,000	1,708	429	54	68	551	2,259	16,863
DC-8-63	486	564	963	2,013	599	4	66	670	2,684	8,325
DC-8-63F	476	617	1,072	2,165	247	170	64	481	2,646	31,761
DC-8-71	784	636	1,142	2,562	59	344	27	429	2,991	73,343
DC-8-73	880	1,125	1,283	3,289	157	462	32	651	3,940	64,565
DC-8-73F	513	202	851	1,567	490	122	63	675	2,242	30,805
Four-engine wide body jet	1,371	2,296	2,736	6,403	798	473	62	1,333	7,737	144,927
B-747-1	887	2,382	2,214	5,483	423	369	73	865	6,348	84,435
B-747-2/3	1,833	1,468	2,815	6,116	1,535	461	88	2,084	8,200	24,322
B-747-F	2,191	2,653	3,901	8,745	1,180	723	20	1,922	10,667	36,170
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	35
LEAR-24	NR	NR	NR	NR	NR	NR	NR	NR	NR	1
LEAR-25	NR	NR	NR	NR	NR	NR	NR	NR	NR	22
LEAR-35	NR	NR	NR	NR	NR	NR	NR	NR	NR	12
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

**Table 4-13 (Continued)**  
**Detail Supporting Table 4-2A**  
**Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Block Hours
Turboprops under 20 seats	0	35	0	35	317	0	0	317	352	147,200
BECH-99	NR	NR	NR	NR	NR	NR	NR	NR	NR	16
BECH-C99	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,339
B-1900	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,076
C-208	0	35	0	35	317	0	0	317	352	127,347
METRO-II	NR	NR	NR	NR	NR	NR	NR	NR	NR	272
METRO-III	NR	NR	NR	NR	NR	NR	NR	NR	NR	15,897
MU-2/B	NR	NR	NR	NR	NR	NR	NR	NR	NR	253
Turboprops with 20 or more seats	607	516	902	2,025	0	365	170	534	2,560	41,926
CV-580	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,459
CV-600	NR	NR	NR	NR	NR	NR	NR	NR	NR	8,034
CV-640	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,356
L-188A	NR	NR	NR	NR	NR	NR	NR	NR	NR	7,995
L-382E	607	516	902	2,025	0	365	170	534	2,560	17,857
SD3-30	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,004
SHORT360	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,221
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	75,007
B-55	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,168
BECH-18	NR	NR	NR	NR	NR	NR	NR	NR	NR	456
C-185	NR	NR	NR	NR	NR	NR	NR	NR	NR	51,554
C-310	NR	NR	NR	NR	NR	NR	NR	NR	NR	418
C-401	NR	NR	NR	NR	NR	NR	NR	NR	NR	138
C-402	NR	NR	NR	NR	NR	NR	NR	NR	NR	754
C-404	NR	NR	NR	NR	NR	NR	NR	NR	NR	8
CES-206/7	NR	NR	NR	NR	NR	NR	NR	NR	NR	730
CV-240	NR	NR	NR	NR	NR	NR	NR	NR	NR	13
D-35	NR	NR	NR	NR	NR	NR	NR	NR	NR	34
DC-6	NR	NR	NR	NR	NR	NR	NR	NR	NR	13,788
DO-28	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,262
PA-30'S	NR	NR	NR	NR	NR	NR	NR	NR	NR	3,263
PA-32	NR	NR	NR	NR	NR	NR	NR	NR	NR	421
All Aircraft	1,057	1,137	1,637	3,831	703	497	46	1,247	5,077	1,350,920

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total block hours.

Col 6: Total depreciation charges divided by block hours.

Col 7: Total insurance costs divided by total block hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Block hours reported in Form 41.

**Table 4-14**  
**Detail Supporting Table 4-2B**  
**Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Two-engine narrow body jet	1,179	966	931	3,076	754	702	53	1,508	4,584	100,981
B-757	1,242	977	954	3,173	775	742	53	1,571	4,743	85,989
DC-9-15	427	754	656	1,837	491	225	42	758	2,595	8,454
DC-9-30	428	850	656	1,934	491	225	42	759	2,692	5,302
FALCON	NR	NR	NR	NR	NR	NR	NR	NR	NR	301
HS-125	NR	NR	NR	NR	NR	NR	NR	NR	NR	935
Two-engine wide body jet	1,071	1,145	1,740	3,955	2,257	453	61	2,771	6,727	72,758
A300-600	1,365	1,203	1,467	4,035	3,685	181	84	3,950	7,985	28,174
A310-2CF	1,328	1,186	2,952	5,465	1,952	523	52	2,527	7,993	27,005
B-767-3/ER	203	989	315	1,507	439	781	38	1,258	2,765	17,579
Three-engine narrow body jet	1,483	952	1,852	4,288	279	1,050	34	1,363	5,651	249,253
B-727-1	1,737	985	2,548	5,270	303	1,249	28	1,581	6,850	89,028
B-727-2	1,481	1,100	1,578	4,158	307	1,078	37	1,421	5,580	138,764
B-727-QC	503	9	640	1,152	36	116	34	186	1,338	21,461
Three-engine wide body jet	1,409	1,785	2,523	5,718	1,753	297	49	2,100	7,818	153,648
DC-10-1	1,596	1,650	4,083	7,329	615	881	37	1,533	8,862	20,635
DC-10-3	1,614	1,864	2,896	6,374	1,679	285	41	2,006	8,380	55,319
DC-10-F	NR	NR	NR	NR	NR	NR	NR	NR	NR	6,864
L-1011	624	1,455	1,708	3,787	277	360	112	749	4,536	9,018
MD-11	1,282	1,809	1,795	4,886	2,412	104	52	2,568	7,454	61,812
Four-engine narrow body jet	797	879	1,352	3,028	245	348	56	649	3,677	238,710
B-707-3C	NR	NR	NR	NR	NR	NR	NR	NR	NR	7,961
DC-8-50	NR	NR	NR	NR	NR	NR	NR	NR	NR	5
DC-8-50F	913	1,917	2,196	5,026	172	546	126	843	5,870	26,256
DC-8-61	876	1,735	2,104	4,716	156	543	127	826	5,542	7,896
DC-8-62	389	450	1,186	2,025	509	64	81	653	2,678	14,224
DC-8-63	564	655	1,118	2,337	696	5	77	778	3,115	7,171
DC-8-63F	552	717	1,244	2,514	287	198	74	559	3,073	27,355
DC-8-71	918	745	1,338	3,001	69	402	31	502	3,503	62,617
DC-8-73	982	1,256	1,432	3,670	175	515	36	727	4,397	57,848
DC-8-73F	578	227	958	1,763	552	137	70	760	2,522	27,377
Four-engine wide body jet	1,502	2,515	2,996	7,013	874	518	68	1,460	8,474	132,322
B-747-1	972	2,609	2,424	6,004	463	404	80	947	6,951	77,109
B-747-2/3	1,995	1,599	3,064	6,658	1,671	502	95	2,269	8,927	22,340
B-747-F	2,411	2,919	4,292	9,622	1,298	796	22	2,115	11,737	32,873
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	50
LEAR-24	NR	NR	NR	NR	NR	NR	NR	NR	NR	5
LEAR-25	NR	NR	NR	NR	NR	NR	NR	NR	NR	27
LEAR-35	NR	NR	NR	NR	NR	NR	NR	NR	NR	18
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

**Table 4-14 (Continued)**  
**Detail Supporting Table 4-2B**  
**Large (Form 41) Air Freight Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour									
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Depreciation	(Column 7) Insurance	(Column 8) Total Fixed Costs	(Column 9) Total Costs	(Column 10) Airborne Hours
Turboprops under 20 seats	0	41	0	41	375	0	0	375	416	129,217
BECH-99	NR	NR	NR	NR	NR	NR	NR	NR	NR	14
BECH-C99	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,284
B-1900	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,807
C-208	0	41	0	41	375	0	0	375	416	111,567
METRO-II	NR	NR	NR	NR	NR	NR	NR	NR	NR	232
METRO-III	NR	NR	NR	NR	NR	NR	NR	NR	NR	14,109
MU-2/B	NR	NR	NR	NR	NR	NR	NR	NR	NR	204
Turboprops with 20 or more seats	672	571	998	2,241	0	404	188	591	2,832	36,175
CV-580	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,104
CV-600	NR	NR	NR	NR	NR	NR	NR	NR	NR	6,746
CV-640	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,000
L-188A	NR	NR	NR	NR	NR	NR	NR	NR	NR	6,491
L-382E	672	571	998	2,241	0	404	188	591	2,832	16,141
SD3-30	NR	NR	NR	NR	NR	NR	NR	NR	NR	787
SHORT360	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,906
Piston	NR	NR	NR	NR	NR	NR	NR	NR	NR	64,368
B-55	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,058
BECH-18	NR	NR	NR	NR	NR	NR	NR	NR	NR	389
C-185	NR	NR	NR	NR	NR	NR	NR	NR	NR	44,794
C-310	NR	NR	NR	NR	NR	NR	NR	NR	NR	362
C-401	NR	NR	NR	NR	NR	NR	NR	NR	NR	116
C-402	NR	NR	NR	NR	NR	NR	NR	NR	NR	653
C-404	NR	NR	NR	NR	NR	NR	NR	NR	NR	6
CES-206/7	NR	NR	NR	NR	NR	NR	NR	NR	NR	653
CV-240	NR	NR	NR	NR	NR	NR	NR	NR	NR	12
D-35	NR	NR	NR	NR	NR	NR	NR	NR	NR	31
DC-6	NR	NR	NR	NR	NR	NR	NR	NR	NR	11,291
DO-28	NR	NR	NR	NR	NR	NR	NR	NR	NR	1,811
PA-30'S	NR	NR	NR	NR	NR	NR	NR	NR	NR	2,825
PA-32	NR	NR	NR	NR	NR	NR	NR	NR	NR	367
All Aircraft	1,213	1,304	1,877	4,395	806	571	53	1,430	5,825	1,177,482

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases) and rental charges (for operating leases) divided by total airborne hours.

Col 6: Total depreciation charges divided by airborne hours.

Col 7: Total insurance costs divided by total airborne hours.

Col 8: Columns 5+6+7.

Col 9: Columns 4+8.

Col 10: Airborne hours reported in Form 41.

**Table 4-15**  
**Detail Supporting Table 4-3A**  
**Alaskan Form 298-C Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour								Block Hours
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Depreciation and Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	
Two-engine narrow body jet	68	50	226	344	259	250	509	853	111
OTHER 2-ENGINE TURBO-FAN JET	68	50	226	344	259	250	509	853	111
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	57	22	55	135	23	25	49	183	878
BOEING 727-200/231A	NR	NR	NR	NR	NR	NR	NR	NR	NR
OTHER 3-ENGINE TURBO-FAN JET	57	22	52	131	23	23	47	178	878
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	231	181	719	1,132	129	326	455	1,587	580
OTHER 4-ENGINE TURBO-FAN JET	231	181	719	1,132	129	326	455	1,587	580
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	416	282	442	1,140	291	53	344	1,484	1,557
GATES LEARJET LEAR-35	416	282	442	1,140	291	53	344	1,484	1,557
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	98	108	165	371	94	31	125	496	70,463
BEECH 1900 A/B/C	71	147	127	346	32	37	69	415	3,493
BEECH 200 SUPER KINGAIR	93	130	155	378	69	20	89	467	4,191
BEECH 99 AIRLINER	83	113	139	336	53	23	77	412	2,960
BEECH C99	126	183	248	557	155	22	177	734	3,157
BEECH KING AIR C-90	288	84	255	627	193	69	262	889	631
CESSNA 208 CARAVAN	69	84	111	264	112	28	140	405	12,911
CESSNA C-441	312	90	282	684	80	64	144	828	880
FAIRCHILD-HILLER FH-227	74	183	173	431	301	66	367	798	178
FLOAT/AMPHIB TURBINE	74	64	132	269	62	77	140	409	1,110
GRUMMAN G-21G (TURBO-GOOSE)	223	91	384	699	342	127	469	1,167	263
LAND-TURBINE	66	65	109	240	85	16	101	341	515
PIPER T-1040	86	101	121	308	30	7	36	344	7,675
SHORTS HARLAND SC-7 SKYVAN	63	139	175	377	132	35	168	545	2,307
SWEARINGEN METRO II	84	153	226	463	116	34	150	613	614
SWEARINGEN METRO III	116	116	185	417	146	36	183	599	14,539
SWEARINGEN METRO MERLIN	79	119	101	299	162	49	210	510	139
VOLPAR TURBO 18	80	129	99	307	180	30	209	516	1,753
DEHAVILLAND TWIN OTTER DHC-6	106	86	214	406	46	37	83	489	13,147
Turboprops with 20 or more seats	215	268	461	944	91	66	157	1,101	11,991
CASA 235	74	184	199	458	101	32	134	591	371
CASA/NURTANIO C212 AVIOCAR	77	154	168	399	171	50	221	620	658
CONVAIR CV-580	225	363	566	1,154	28	77	105	1,259	5,918
DEHAVILLAND DHC4 CARIBOU	41	168	183	393	168	23	192	585	334
DEHAVILLAND DHC8-100 DASH-8	244	178	411	834	153	60	213	1,047	4,710

**Table 4-15 (Continued)**  
**Detail Supporting Table 4-3A**  
**Alaskan Form 298-C Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Depreciation and Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Block Hours
Piston	54	51	69	174	22	12	34	208	294,247
BEECH 18 C-185	100	130	144	375	54	22	76	451	2,910
BEECH BARON (55 SERIES)	89	85	100	273	35	17	53	326	503
CESSNA 172 SKYHAWK	49	21	52	122	15	7	22	143	5,412
CESSNA 180	53	42	37	132	30	7	37	169	1,271
CESSNA 185A/B/C SKYWAGON	63	29	59	152	27	13	40	192	6,606
CESSNA C206/207/209/210 STATIONAIR	53	38	60	151	20	13	33	184	93,260
CESSNA C-401	41	30	33	104	68	25	93	197	931
CESSNA C-402/402A	59	93	104	256	56	47	103	359	11,279
DEHAVILLAND DHC2 BEAVER	63	47	53	163	25	10	36	199	27,128
DEHAVILLAND DHC3 OTTER	64	65	132	260	39	37	76	336	6,928
GRUMMAN G-21A (GOOSE)	155	116	238	510	44	29	73	583	1,245
GRUMMAN G-44/44A (WIDGEON)	46	24	98	168	243	5	248	416	908
HELIO H-250	19	25	35	78	11	8	19	97	277
LAND-PISTON-LT 450 HP	43	35	51	130	18	5	22	152	19,734
MCDONNELL DOUGLAS DC-3/A/C,C-47/B	114	223	178	515	87	21	108	623	609
PILATUS BRITTEN-NORMAN BN2/A ISLANDER	50	56	81	187	11	12	23	211	3,159
PIPER PA-18 (SUPER-CUB)	23	17	28	68	17	9	26	94	1,481
PIPER PA-22 (TRI-PACER)	NR	NR	NR	NR	NR	NR	NR	NR	0
PIPER PA-24 (COMANCHE)	29	24	46	99	183	33	217	316	15
PIPER PA-28 (CHEROKEE)	21	21	24	66	6	5	12	78	5,598
PIPER PA-31 (NAVAJO)	55	79	100	234	19	7	26	261	54,449
PIPER PA-32 (CHEROKEE 6)	46	35	45	125	13	5	18	143	41,340
PIPER PA-34/39 (TWIN COMMANCHE)	49	61	75	186	22	7	29	214	5,321
PIPER T-1020	88	116	89	293	34	9	43	336	3,883
All Aircraft	69	69	102	240	39	18	57	297	379,827

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total block hours.

Col 6: Total other (primarily insurance) costs divided by total block hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Block hours reported in 298-C.

**Table 4-16**  
**Detail Supporting Table 4-3B**  
**Alaskan Form 298-C Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Airborne Hours
Two-engine narrow body jet	85	63	285	433	326	315	641	1,074	88
OTHER 2-ENGINE TURBO-FAN JET	85	63	285	433	326	315	641	1,074	88
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	72	28	70	169	30	32	61	231	697
BOEING 727-200/231A	NR	NR	NR	NR	NR	NR	NR	NR	NR
OTHER 3-ENGINE TURBO-FAN JET	72	28	66	165	30	30	59	224	697
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	292	228	906	1,425	162	411	573	1,999	461
OTHER 4-ENGINE TURBO-FAN JET	292	228	906	1,425	162	411	573	1,999	461
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	524	355	557	1,435	366	67	434	1,869	1,236
GATES LEARJET LEAR-35	524	355	557	1,435	366	67	434	1,869	1,236
Regional jet with 40-59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	124	136	208	468	118	39	157	625	55,948
BEECH 1900 A/B/C	90	186	160	436	40	47	87	523	2,773
BEECH 200 SUPER KINGAIR	118	164	195	476	87	25	112	588	3,328
BEECH 99 AIRLINER	105	142	175	423	67	30	96	519	2,350
BEECH C99	159	231	312	701	195	28	223	924	2,507
BEECH KING AIR C-90	363	105	322	790	243	87	330	1,120	501
CESSNA 208 CARAVAN	87	105	140	333	142	35	177	510	10,251
CESSNA C-441	393	114	355	861	101	81	182	1,043	699
FAIRCHILD-HILLER FH-227	94	231	218	543	379	84	463	1,005	141
FLOAT/AMPHIB TURBINE	93	80	166	339	78	97	176	515	881
GRUMMAN G-21G (TURBO-GOOSE)	281	115	484	880	430	160	590	1,470	209
LAND-TURBINE	83	82	137	302	107	21	127	430	409
PIPER T-1040	108	127	152	387	38	8	46	433	6,094
SHORTS HARLAND SC-7 SKYVAN	80	175	221	475	167	45	211	687	1,832
SWEARINGEN METRO II	106	193	285	583	146	43	189	772	488
SWEARINGEN METRO III	146	146	233	525	184	46	230	755	11,544
SWEARINGEN METRO MERLIN	100	150	127	377	204	61	265	642	110
VOLPAR TURBO 18	101	162	124	387	226	38	264	650	1,392
DEHAVILLAND TWIN OTTER DHC-6	133	108	270	511	58	46	105	616	10,439
Turboprops with 20 or more seats	270	338	581	1,189	115	83	198	1,387	9,521
CASA 235	94	232	251	577	127	41	168	745	295
CASA/NURTANIO C212 AVIOCAR	97	194	211	503	215	63	279	781	522
CONVAIR CV-580	283	458	713	1,454	36	96	132	1,586	4,699
DEHAVILLAND DHC4 CARIBOU	52	212	231	495	212	30	242	737	265
DEHAVILLAND DHC8-100 DASH-8	308	224	518	1,050	193	76	269	1,318	3,740

**Table 4-16 (Continued)**  
**Detail Supporting Table 4-3B**  
**Alaskan Form 298-C Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Airborne Hours
Piston	68	64	87	219	28	15	43	262	233,632
BEECH 18 C-185	126	164	182	472	68	27	96	568	2,311
BEECH BARON (55 SERIES)	112	107	126	344	44	22	66	410	399
CESSNA 172 SKYHAWK	61	26	65	153	18	9	27	180	4,297
CESSNA 180	67	53	47	166	38	8	46	213	1,009
CESSNA 185A/B/C SKYWAGON	80	37	75	191	34	17	51	242	5,245
CESSNA C206/207/209/210 STATIONAIR	67	47	75	190	25	16	41	231	74,048
CESSNA C-401	52	38	41	131	86	32	117	248	739
CESSNA C-402/402A	75	117	131	323	71	59	130	452	8,956
DEHAVILLAND DHC2 BEAVER	79	59	67	205	32	13	45	250	21,540
DEHAVILLAND DHC3 OTTER	80	82	166	328	49	47	96	424	5,501
GRUMMAN G-21A (GOOSE)	196	146	300	642	55	37	92	734	989
GRUMMAN G-44/44A (WIDGEON)	58	30	123	212	306	7	312	524	721
HELIO H-250	23	32	44	99	13	10	24	122	220
LAND-PISTON-LT 450 HP	55	45	64	164	22	6	28	192	15,669
MCDONNELL DOUGLAS DC-3A/C, C-47/B	143	280	225	648	110	26	136	785	484
PILATUS BRITTEN-NORMAN BN2/A ISLANDER	63	71	102	236	14	15	29	265	2,508
PIPER PA-18 (SUPER-CUB)	29	22	35	86	22	11	33	119	1,176
PIPER PA-22 (TRI-PACER)	NR	NR	NR	NR	NR	NR	NR	NR	0
PIPER PA-24 (COMANCHE)	37	30	58	125	231	42	273	398	12
PIPER PA-28 (CHEROKEE)	27	26	30	83	8	7	15	98	4,445
PIPER PA-31 (NAVAJO)	70	99	127	295	24	9	33	328	43,233
PIPER PA-32 (CHEROKEE 6)	57	44	57	157	16	6	22	180	32,824
PIPER PA-34/39 (TWIN COMMANCHE)	62	77	94	234	28	9	36	270	4,225
PIPER T-1020	111	146	112	369	42	12	54	423	3,083
All Aircraft	87	87	128	302	49	22	72	374	301,583

Source: BTS Form 41 for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total airborne hours.

Col 6: Total other (primarily insurance) costs divided by total airborne hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Airborne hours estimated as block hours reported in Form 298-C multiplied by the ratio of (airborne hrs/block hrs) reported for commuter operations in Form 41.

**Table 4-17**  
**Detail Supporting Table 4-4A**  
**Non-Alaskan Form 298-C Carrier Operating and Fixed Costs Per Block Hour**

Economic Values Class	Per Block Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Block Hours
Two-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	310	474	554	1,338	486	137	623	1,961	535
ROCKWELL SABRELINER	310	474	554	1,338	486	137	623	1,961	535
Regional jet with 40-59 seats	190	287	127	604	405	46	451	1,055	147,443
CANADAIR RJ-100/RJ-100ER	190	287	127	604	405	46	451	1,055	147,443
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	108	80	139	327	124	24	148	475	370,813
BEECH 1900 A/B/C	94	101	76	271	135	7	142	413	49,673
BRITISH AEROSPACE JETSTREAM 31	110	77	124	311	119	11	130	441	186,933
DEHAVILLAND TWIN OTTER DHC-6	181	142	200	523	361	43	404	927	3,343
SWEARINGEN METRO II	94	94	205	394	71	39	110	504	5,315
SWEARINGEN METRO III	109	74	182	364	124	49	173	537	125,549
Turboprops with 20 or more seats	157	123	214	494	211	28	239	733	973,201
AEROSPATIALE/AERITALIA ATR-42	154	138	311	602	283	24	307	909	42,601
BRITISH AEROSPACE JETSTREAM 41	146	103	139	388	188	17	205	593	87,791
DEHAVILLAND DHC8-100 DASH-8	150	133	218	501	247	46	293	794	203,498
DORNIER 328	110	147	154	411	320	20	340	751	9,688
EMBRAER EMB-120 BRASILIA	148	121	165	435	180	34	214	649	296,977
FOKKER FRIENDSHIP F-27/FAIRCHILD F-27A/B/F/J	182	143	233	557	625	129	754	1,311	4,835
SAAB-FAIRCHILD 340/B	172	121	265	558	203	15	217	776	327,811
SHORTS 360	NR	NR	NR	NR	NR	NR	NR	NR	0
Piston	42	66	80	188	69	13	83	271	97,774
CESSNA C206/207/209/210 STATIONAIR	29	53	52	133	32	14	45	179	3,584
CESSNA C-402/402A	19	36	36	91	17	12	29	119	50,974
CONVAIR CV-340/440	151	310	170	631	1	80	81	712	498
LOCKHEED L-049	70	101	134	304	136	14	150	454	42,686
MCDONNELL DOUGLAS DC-3/A/C,C-47/B	305	186	235	726	11	492	503	1,229	32
All Aircraft	141	125	180	447	200	28	228	675	1,589,766

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total block hours.

Col 2: Cost of total fuel and oil consumed divided by total block hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total block hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total block hours.

Col 6: Total other (primarily insurance) costs divided by total block hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Block hours reported in 298-C.

**Table 4-18**  
**Detail Supporting Table 4-4B**  
**Non-Alaskan Form 298-C Carrier Operating and Fixed Costs Per Airborne Hour**

Economic Values Class	Per Airborne Hour								
	(Column 1) Crew	(Column 2) Fuel & Oil	(Column 3) Maintenance	(Column 4) Total Variable Costs	(Column 5) Rentals	(Column 6) Other	(Column 7) Total Fixed Costs	(Column 8) Total Costs	(Column 9) Airborne Hours
Two-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Two-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Three-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine narrow body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Four-engine wide body jet	NR	NR	NR	NR	NR	NR	NR	NR	NR
Regional jet under 40 seats	390	597	698	1,685	612	173	785	2,470	425
ROCKWELL SABRELINER	390	597	698	1,685	612	173	785	2,470	425
Regional jet with 40-59 seats	240	362	160	761	510	58	568	1,329	117,070
CANADAIR RJ-100/RJ-100ER	240	362	160	761	510	58	568	1,329	117,070
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	136	101	175	412	156	30	187	599	294,426
BEECH 1900 A/B/C	119	127	96	342	170	9	179	520	39,440
BRITISH AEROSPACE JETSTREAM 31	139	97	156	392	150	13	163	556	148,425
DEHAVILLAND TWIN OTTER DHC-6	227	179	252	659	455	54	509	1,167	2,654
SWEARINGEN METRO II	119	118	259	496	89	50	139	634	4,220
SWEARINGEN METRO III	137	93	229	459	156	62	218	677	99,686
Turboprops with 20 or more seats	197	155	270	622	265	36	301	923	772,722
AEROSPATIALE/AERITALIA ATR-42	194	173	391	758	356	30	387	1,145	33,825
BRITISH AEROSPACE JETSTREAM 41	183	130	175	488	237	21	258	747	69,706
DEHAVILLAND DHC8-100 DASH-8	190	167	275	631	311	58	369	1,000	161,577
DORNIER 328	139	185	195	518	403	25	428	946	7,692
EMBRAER EMB-120 BRASILIA	187	153	208	548	227	43	270	818	235,800
FOKKER FRIENDSHIP F-27/FAIRCHILD F-27(A/B/F/J)	229	180	293	701	787	163	950	1,651	3,839
SAAB-FAIRCHILD 340/B	217	153	334	703	255	18	274	977	260,282
SHORTS 360	NR	NR	NR	NR	NR	NR	NR	NR	0
Piston	53	83	101	237	87	17	104	342	77,633
CESSNA C206/207/209/210 STATIONAIR	36	67	65	168	40	17	57	225	2,846
CESSNA C-402/402A	24	45	45	114	22	14	36	150	40,473
CONVAIR CV-340/440	190	390	215	795	2	101	102	897	395
LOCKHEED L-049	88	127	168	383	171	18	189	572	33,893
MCDONNELL DOUGLAS DC-3/A/C,C-47/B	384	234	297	914	14	620	634	1,548	25
All Aircraft	178	157	227	563	252	35	287	850	1,262,276

Source: BTS Form 298-C for year-end 1996.

NR = No data reported.

Col 1: Total flight deck and flight attendant costs divided by total airborne hours.

Col 2: Cost of total fuel and oil consumed divided by total airborne hours.

Col 3: Maintenance and maintenance overhead (burden) costs divided by total airborne hours.

Col 4: Columns 1+2+3.

Col 5: Total amortization (for capital leases), rental charges (for operating leases) and depreciation divided by total airborne hours.

Col 6: Total other (primarily insurance) costs divided by total airborne hours.

Col 7: Columns 5+6.

Col 8: Columns 4+7.

Col 9: Airborne hours estimated as block hours reported in Form 298-C multiplied by the ratio of (airborne hrs/block hrs) reported for commuter operations in Form 41.

**Table 4-19**  
**Detail Supporting Table 4-5**  
**Detail CY 1996 Average Monthly Lease Rate**  
**(\$000/Month, Averages Weighted by Fleet)**

Equipment Type	Lease Rate	Equipment Type	Lease Rate	Equipment Type	Lease Rate
1900C	22	777-200A	937	DC-9-50	88
1900D	35	A300-600F	657	DHC63	15
340A	32	A300-600R	507	DHC71	21
340B	60	A300B2-100	111	DHC81	61
707-100B JT3	5	A300B4-100	121	DHC82	84
707-100B JT3 SII	5	A300B4-200	125	DHC83	72
707-300C	14	A300C4-203	120	DO2282	16
707-300C SII	23	A310-200	239	DO3281	77
707-300pax	13	A310-200f	320	EMB110	9
707-300pax SII	16	A310-300	352	EMB120	47
720s	2	A320-200	306	EMB145ER	131
727-100 -217	151	A330-300	820	F274	14
727-100 -7	12	ATP	58	F28-1000	35
727-100 -9	18	ATR423	64	F28-4000	44
727-100 TAY	224	ATR425	98	Fokker F100	141
727-100C/F -7	60	ATR72	108	Fokker F70	150
727-100C/F -7F	62	BAC1-11	5	HS748	17
727-200 -15V	63	BAE146100	84	J31	11
727-200 -217V	252	BAE146200	115	J32	21
727-200A-15	66	BAE146300	142	J41	44
727-200A-17	73	C2121	7	L1011-1	69
727-200A-9	41	C2122	9	L1011-100	96
727-200F	61	C99	9	L1011-1F	34
727-200F -217	179	CN235	50	L1011-200	129
737-100 -7	11	Convair 580/600	11	L1011-200F	242
737-100 -9	11	CRJ100ER	150	L1011-250	205
737-200 -17Q	122	DC-10-10	107	L1011-50	89
737-200A-15	117	DC-10-10F	181	L1011-500	153
737-200A-17	123	DC-10-30	305	L188A	8
737-200A-9	90	DC-10-30F	398	L188AF	18
737-200AC	95	DC-10-40	162	L188C	16
737-300	235	DC-8-50 Fs	40	L188CF	21
737-400	275	DC-8-50 pax	28	MD-11	789
737-500	224	DC8-61	50	MD-11F	804
747-100	88	DC8-61Fs	55	MD-81	147
747-100F	300	DC8-62	64	MD-82 217A	180
747-200	346	DC8-62Fs	69	MD-82 -217C	220
747-200F	644	DC8-63	109	MD-83	251
747-200M	470	DC-8-63F	171	MD-87	154
747-300	698	DC8-71	286	MD-88	235
747-400	1,115	DC-8-71F	378	MD-90-30	271
747-SP	114	DC8-72	229	MET2	6
757-200	383	DC8-73	321	MET23	28
757-200ER	381	DC-8-73F	414	MET3A	13
767-200	339	DC9-10	25	RJ-85	227
767-200ER	475	DC9-21	25	S2000	111
767-300	555	DC-9-30	79	SH33	7
767-300ER	694	DC-9-30Fs	93	SH362	15
767-300ERF	739	DC-9-40	75	SH363	21

Source: GRA Aviation Specialists. "The Guide" (Herndon, VA, 1996).

**Table 4-20**  
**Detail Supporting Table 4-6**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Detail by Equipment Type**  
**(Costs are Hourly Unless Indicated in Column Description)**

FAA Category	Name	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
		Crew	Fuel & Oil	Maintenance	Variable Operating Costs (Including Crew)	Variable Operating Costs (Excluding Crew)	Annual Fixed Cost Other	Fixed Cost Per Hour	Total Cost Per Hour (Including Crew)
2	Arrow	72	25	31	128	56	28,200	71	199
2	Beech A36	72	37	48	157	85	54,658	137	294
2	Beech B36 TC	72	39	57	168	96	59,586	149	317
2	Beech F33A	72	31	43	146	74	46,322	116	262
2	Beech V35B	72	31	57	160	88	24,775	62	222
2	Cessna 172P	72	16	27	115	43	13,916	35	150
2	Cessna 172R	72	16	23	112	40	19,673	49	161
2	Cessna 182R	72	27	35	134	62	19,160	48	182
2	Cessna 206	72	31	40	143	71	25,592	64	207
2	Cessna 210	72	39	48	159	87	32,845	82	241
2	Cherokee	72	19	22	113	40	19,605	49	162
2	Malibu Mirage	72	37	52	161	89	93,788	234	396
2	Rockwell International 114A	72	37	36	145	73	57,245	143	288
2	Saratoga SP	72	33	35	141	68	44,739	112	252
2	Socata TB-20 Trinidad	72	31	35	138	66	46,891	117	255
3	Aero Commander 500 S	72	70	113	255	183	34,845	87	342
3	Aztec F	72	56	76	203	131	26,008	65	268
3	Baron 58	72	60	91	223	151	99,417	249	472
3	Baron 58P	72	74	139	285	213	67,215	168	453
3	Cessna 310R	72	62	83	217	145	31,700	79	296
3	Cessna 340A	72	68	89	229	157	49,295	123	353
3	Cessna 414A	72	72	101	245	173	65,325	163	408
3	Cessna 421C	72	87	115	274	202	72,255	181	454
3	Duke B60	72	95	171	338	265	48,145	120	458
3	Navajo Chft	72	76	90	238	166	54,090	135	373
3	Seneca IV	72	56	59	187	115	64,924	162	349
5	Cessna 402C	72	66	89	227	155	52,880	132	360
8	Cessna 208	117	108	110	334	217	177,419	444	778
8	Socata TB21TC	72	35	48	155	83	57,784	144	300
8	Socata TBM 700	117	108	174	399	282	316,154	790	1,189
9	Beech C90A	193	139	228	560	367	334,138	835	1,395
9	Piper PA-31T	193	166	317	676	483	923,525	2,309	2,985
9	Piper PA-31T1	193	149	306	649	456	145,545	364	1,013
10	Pilatus PC XII	117	111	182	411	294	285,993	715	1,126
11	Beech 1900D	225	240	306	771	546	628,701	1,572	2,343
11	Beech 2000	193	265	298	756	563	425,950	1,065	1,821
11	Beech A100	193	160	284	636	443	135,048	338	974
11	Beech B100	193	162	307	661	468	156,400	391	1,052
11	Beech B200	193	174	250	616	423	467,934	1,170	1,786
11	Beech B300	193	206	278	677	484	305,450	764	1,441

**Table 4-20 (Continued)**  
**Detail Supporting Table 4-6**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Detail by Equipment Type**  
**(Costs are Hourly Unless Indicated in Column Description)**

FAA Category	Name	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
		Crew	Fuel & Oil	Maintenance	Variable Operating Costs (Including Crew)	Variable Operating Costs (Excluding Crew)	Annual Fixed Cost Other	Fixed Cost Per Hour	Total Cost Per Hour (Including Crew)
11	Cessna 425	193	147	244	584	391	183,870	460	1,044
11	Cessna 441	193	143	305	642	449	231,343	578	1,220
11	Commander 690B	193	168	314	675	482	126,320	316	990
11	Gulfstream AM Corp Comm Div 690C	193	168	311	671	478	167,930	420	1,091
11	Gulfstream AM Corp Comm Div 690D	193	149	310	653	460	178,880	447	1,100
11	Gulfstream AM Corp Comm Div 695	193	170	290	653	460	214,468	536	1,189
11	King Air F-90-1	193	166	285	644	451	217,668	544	1,188
11	Mitsubishi MU-2B-60	193	166	368	726	533	154,645	387	1,113
11	Mitsubishi MU-300	225	318	418	961	736	257,364	643	1,604
11	Piaggio P180	193	204	309	706	513	426,950	1,067	1,773
11	Piper PA-42-1000	193	190	353	736	543	209,990	525	1,261
11	Piper PA-42-720R	193	198	302	693	500	306,200	766	1,458
11	Swearingen SA-226AT	225	178	280	682	458	492,596	1,231	1,914
11	Swearingen SA227-TT	193	170	312	675	482	264,500	661	1,336
12	de Havilland DHC-6-300	193	178	209	580	387	235,438	589	1,168
12	Grumman G-159	225	465	630	1,319	1,094	248,721	622	1,941
12	SAAB 340B	225	259	323	806	581	1,205,708	3,014	3,820
14	Beechjet 400A	225	345	396	965	740	711,840	1,780	2,745
14	Cessna 500	225	273	440	939	714	267,514	669	1,607
14	Cessna 525	225	224	281	730	505	429,955	1,075	1,805
14	Cessna 550	225	312	338	875	651	484,504	1,211	2,087
14	Cessna 560	225	339	375	939	714	612,929	1,532	2,471
14	Cessna 650	280	414	479	1,174	893	925,076	2,313	3,486
14	Cessna S550	225	337	361	922	698	382,854	957	1,880
14	Dassault-Breguet Falcon 10	225	372	503	1,099	874	452,804	1,132	2,231
14	Gates LearJet 25D	225	500	630	1,355	1,130	208,582	521	1,876
14	Israel Aircraft Industries 112- 4	280	380	577	1,237	956	360,034	900	2,137
14	Israel Aircraft Industries 112- 4A	280	380	577	1,237	956	392,584	981	2,218
14	Israel Aircraft Industries 112- 5 Westwind Astra	280	402	423	1,105	825	1,043,250	2,608	3,713
14	Learjet 24E	225	500	640	1,365	1,140	164,822	412	1,777
14	LearJet 31	225	291	390	906	681	676,732	1,692	2,598
14	Learjet 35A	225	351	411	987	762	561,172	1,403	2,389
14	Learjet 55C	280	402	506	1,188	908	705,514	1,764	2,952
14	LearJet Inc. 60	280	356	491	1,127	846	1,198,204	2,996	4,122
14	Raytheon Corporate Jets Inc- Hawker 800	280	420	486	1,186	906	1,150,388	2,876	4,062

**Table 4-20 (Continued)**  
**Detail Supporting Table 4-6**  
**Estimated GA and Air Taxi Operating and Fixed Costs - Detail by Equipment Type**  
**(Costs are Hourly Unless Indicated in Column Description)**

FAA Category	Name	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)	(Column 8)
		Crew	Fuel & Oil	Maintenance	Variable Operating Costs (Including Crew)	Variable Operating Costs (Excluding Crew)	Annual Fixed Cost Other	Fixed Cost Per Hour	Total Cost Per Hour (Including Crew)
15	British Aerospace A/C Group	280	418	540	1,238	958	519,088	1,298	2,536
15	Challenger 600 S	352	596	1,400	2,348	1,996	875,520	2,189	4,537
15	Corporate Jets Ltd. BAE 125-1000A	280	434	498	1,212	932	1,504,348	3,761	4,973
15	Corporate Jets Ltd. BAE 125-800A	280	420	486	1,186	906	1,150,388	2,876	4,062
15	Dassault-Breguit Mystere Falco	280	402	622	1,304	1,024	896,864	2,242	3,546
15	Falcon 200	280	513	802	1,595	1,315	728,886	1,822	3,417
15	Gulfstream Aerospace G-IV	352	794	631	1,777	1,425	3,193,183	7,983	9,760
15	HS 125-600A	280	701	849	1,831	1,550	230,188	575	2,406
15	North American NA-265-60	280	622	553	1,456	1,176	210,378	526	1,982
17	Falcon 50	280	626	596	1,501	1,222	1,767,962	4,420	5,921
17	Falcon 900B	352	543	683	1,579	1,227	2,843,989	7,110	8,689
17	Lockheed 1329-25 Jetstar II	280	808	1,075	2,163	1,883	397,360	993	3,156
18	Dassault Aviation	352	450	554	1,357	1,005	2,104,937	5,262	6,620
18	Saab-Scania	225	553	406	1,185	960	1,742,668	4,357	5,541
19	Hiller-Rodgers Helicopter UH12	89	41	153	283	194	75,795	189	473
19	Robinson Helicopter R22 Beta	89	21	66	177	88	46,235	116	292
20	Aerospatiale AS 355 F Ecureuil	272	121	330	722	450	310,443	776	1,498
20	Aerospatiale AS350BA	138	94	286	517	380	176,084	440	957
20	Bell 206B3	138	58	192	388	250	127,972	320	708
20	Enstrom 280FX	89	32	95	217	128	69,860	175	391
20	MDHC 500E	138	58	220	416	278	127,838	320	736
20	MDHC 520N	138	62	218	418	280	141,908	355	772
22	Agusta S.P.A. A109K2	272	158	528	958	687	478,150	1,195	2,154
22	Bell 206L3	138	75	233	445	308	125,300	313	759
22	Bell 206L4	138	79	247	464	327	184,260	461	925
22	Bell 222B	321	175	525	1,020	700	167,365	418	1,439
22	Bell 230	321	173	465	959	638	546,300	1,366	2,325
22	Bell 412EP	321	235	604	1,159	839	675,260	1,688	2,848
22	Eurocopter AS 350 B2 Ecureuil	138	100	287	525	387	198,998	497	1,022
22	Eurocopter DthInd GMBH BK117C	321	160	465	946	625	558,218	1,396	2,341
22	Eurocopter/France AS355N Ecureuil	272	123	382	776	504	336,085	840	1,616
22	Sikorsky S61N	365	364	1,090	1,819	1,454	351,920	880	2,699
22	Sikorsky S76A	321	169	630	1,120	799	213,860	535	1,654
22	Sikorsky S76B	321	221	723	1,265	944	897,835	2,245	3,509
22	Sikorsky S76C/C+	321	175	701	1,196	875	851,898	2,130	3,326

Source: Conklin and deDecker, *The Aircraft Cost Evaluator*, Spring, 1997.

- Col 1: Crew cost per hour, reported by Conklin and deDecker.
- Col 2: Fuel and Oil per Hour, assuming \$2.02 per gallon for fuel.
- Col 3: Maintenance cost per hour.
- Col 4: Variable Operating Cost including crew. Sum of Columns 1, 2 and 3.
- Col 5: Variable Operating Cost excluding crew. Sum of Column 2 and Column 3.
- Col 6: Total fixed cost including depreciation.
- Col 7: Fixed cost per hour, assuming 400 hours per year utilization.
- Col 8: Sum of Column 4 and Column 7.

Table 4-21  
Detail Supporting Table 4-9  
**Detail of Military Aircraft Cost by Equipment Type**  
(Averages Weighted By Fleet)

Type	Operating Cost Per Hour	Fleet Size
Boeing B-52H	\$6,950	94
Northrop Grumman B-2A	\$13,528	15
Rockwell B-1B	\$11,550	95
Lockheed C-141B	\$2,850	144
Lockheed C-5A	\$6,545	84
Lockheed C-5B	\$6,087	50
McDonnell Douglas C-17A	\$5,075	22
McDonnell Douglas KC-10A	\$2,094	59
Boeing C-135A/B/C/E	\$320	15
Boeing EC-135	\$3,305	15
Boeing KC-135E/R	\$1,946	551
Boeing RC-135	\$1,474	19
Boeing E-3B/C	\$4,586	34
Boeing E-6A	\$2,509	16
OTHER	\$2,543	37
Turbojet/fan 3+ engines	\$3,918	1,250
McDD/BA AV-8B Harrier 2	\$2,634	201
McDonnell Douglas F/A-18	\$3,023	1,039
Fairchild A-10A	\$1,637	380
Lock Martin F-16A/B	\$1,850	225
Lock Martin F-16C/D	\$2,201	1,039
Lockheed F-117A	\$1,360	52
McDonnell Douglas F-15A/B/C/D	\$4,332	726
McDonnell Douglas F-15E	\$4,747	204
Gen Dyn F-111	\$4,433	135
Grumman F-14	\$3,988	361
McDonnell Douglas F-4	\$2,275	196
McDonnell Douglas T-45A	NR	44
Northrop F-5	\$1,809	45
OTHER	\$1,641	16
Turbojet/fan Attack/Fighter	\$2,981	4,663
Gulfstream C-20	\$674	20
Learjet C-21	\$159	83
McDonnell Douglas C-9A/C	\$925	52
Rockwell CT-39E/G Sabreliner	\$1,125	12
Rockwell T-39	NR	23
Grumman A-6	\$2,913	185
Lockheed U-2R/RT	NR	37
Boeing T-43A	\$865	14
McDonnell Douglas TAV-8B	\$2,059	17
Raytheon T-1A	\$155	132
Rockwell T-2B/C	NR	111
Cessna T-37B	\$255	488
Northrop T-38	\$754	497
Other	NR	3
Turbojet/fan Other	\$796	1,674

**Table 4-21 (Continued)**  
**Detail Supporting Table 4-9**  
**Detail of Military Aircraft Cost by Equipment Type**  
(Averages Weighted By Fleet)

Type	Operating Cost Per Hour	Fleet Size
Alenia c-27A	\$244	10
Beech T-34C	\$173	272
Beech T-42A	NR	14
Beech U-8F	NR	48
Grumman C-2A	\$1,889	38
Grumman E-2C	\$2,563	91
Grumman OV-1D	\$1,128	59
Lock Martin C-130 A-E	\$1,722	622
Lock Martin C-130-OTHER	\$3,123	91
Lockheed ES-3A	\$1,988	16
Lockheed Martin KC-130F/R/T	\$1,477	183
Lockheed Martin P-3C	\$2,009	263
Lockheed S-3B	\$2,925	119
Raytheon C-12	\$319	199
Raytheon RC-12	\$491	134
Raytheon RU-21	\$277	107
Raytheon T-44A	NR	57
Other	\$1,169	48
Turboprop	\$1,408	2,371
Slingsby T-3A/Piston	n.a	91
Bell AH-1E/F/F/P/S	\$688	929
Bell AH-1W	\$688	140
Bell HH-1H	\$663	58
Bell OH-58A-C	\$108	1,517
Bell OH-58D	\$875	289
Bell TH-57	NR	129
Bell TH-67A	NR	82
Bell UH-1B/H/V	\$134	2,872
Bell UH-1N	\$835	159
Boeing CH-46	\$1,852	499
Boeing CH-47C/D	\$1,384	430
Hughes OH-6A	\$81	229
Kaman SH-2F/G	\$1,193	26
McDonnell Douglas AH-64A	\$2,819	755
McDonnell Douglas AH-6C/G	NR	60
Sikorsky CH-53D	\$2,728	496
Sikorsky SH-3H	\$1,464	40
Sikorsky SH-60B	\$1,287	1,617
Sikorsky VH-3D11	\$220	11
Other	\$1,128	16
Rotary Aircraft Total	\$883	10,354
Source: Military service data cited in the text.		
NR = No data reported.		



## **SECTION 5: UNIT REPLACEMENT AND RESTORATION COSTS OF DAMAGED AIRCRAFT**

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### **5.1 INTRODUCTION**

The cost of damage to aircraft in aviation accidents is borne directly by operators and indirectly by users and society in the form of higher fares and taxes. Determining these costs provides a measure for evaluation of FAA investment and regulatory programs that affect the likelihood of aircraft being damaged or destroyed.

#### **5.1.1 Replacement**

For the purpose of evaluating the cost of aircraft replacement, a destroyed aircraft is assigned the value of an identical or nearly identical aircraft. This valuation assumption is consistent with the opportunity cost of the loss of the use of a typical aircraft; the value of a new aircraft would overstate the typical loss. The aircraft values reported below are based on transactions in the well-defined market for used aircraft, except for military aircraft which will be discussed later in this section.

#### **5.1.2 Restoration**

The NTSB classifies aircraft involved in accidents as "destroyed," having "substantial damage," having "minor damage," or having "no damage."

The cost incurred as a result of "minor damage" to aircraft is generally a negligible percentage of the market value and is not evaluated in this report. An aircraft with "substantial damage" is one that is damaged but repairable; industry data discussed below provide a means of estimating the relative relationship between the cost of damage and the total value of the aircraft.

### **5.2 AIR CARRIER AIRCRAFT**

#### **5.2.1 Replacement**

Replacement values were derived from a proprietary database developed by GRA Aviation Specialists (GRAS).<sup>1</sup> The first step in establishing average fleet valuation is to develop an industry database covering each aircraft and aircraft type in the U.S. fleet. The average value was developed using an estimated value for each aircraft delivered in a given year, and then aggregating these values into the economic classifications.

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<sup>1</sup> GRA Aviation Specialists, 690 Center Street, Suite 203, Herndon, VA 20170.

The valuation database uses industry data on recent sales and asking prices of airplanes on the used market. There is an active market in used commercial aircraft, and thus it is possible to obtain reliable estimates of the opportunity cost of destroyed aircraft.

The summary of values for commercial aircraft is shown in Table 5-1, and detail by equipment type is shown in Table 5-9. The first column shows an average value by aircraft type. As a measure of value dispersion, the second column provides the standard deviation of aircraft values within the groups. The last row provides an estimate of average value for the fleet estimated using the values in Column 1 and weighting them by annual hours; this value pertains to the average value of commercial aircraft observed in the air traffic system.

**Table 5-1  
Average Commercial Aircraft Values  
(Averages Weighted by Fleet)**

Economic Values Class	(Column 1) Average Value (\$000,000)	(Column 2) SD A/C Value (\$000,000)	(Column 3) Fleet Size	(Column 4) Average Restoration Value (\$000,000)
Two-engine narrow body passenger	\$17.87	\$12.28	3,049	\$2.41
Two-engine narrow body freight	4.83	1.47	28	\$0.65
Two-engine wide body passenger	46.45	26.96	322	\$6.27
Two-engine wide body freight	51.15	26.54	66	\$6.91
Three-engine narrow body passenger	3.31	2.22	689	\$0.45
Three-engine narrow body freight	3.17	2.15	285	\$0.43
Three-engine wide body passenger	14.83	23.22	346	\$2.00
Three-engine wide body freight	40.75	32.38	73	\$5.50
Four-engine narrow body passenger	4.50	2.8	108	\$0.61
Four-engine narrow body freight	9.92	7.27	195	\$1.34
Four-engine wide body passenger	36.11	43.86	155	\$4.87
Four-engine wide body freight	23.23	12.33	70	\$3.14
Regional jet under 40 seats	NR	NR	NR	NR
Regional jet with 40-59 seats	15.98	1.35	72	\$2.16
Regional jet over 59 seats	NR	NR	NR	NR
Turboprops under 20 seats	1.75	1.27	929	\$0.24
Turboprops under 20 seats freight	0.88	0.07	242	\$0.12
Turboprops with 20 or more seats	3.84	2.89	1,540	\$0.52
Piston	NR	NR	NR	NR
All Aircraft (weighted by fleet)	\$12.58	17.14	8,169	\$1.70
All Aircraft (weighted by hours)	\$15.93	NA	NA	\$2.15
NR = No data reported.				
NA = Not applicable.				
Source: GRA Aviation Specialists (GRAS) 690 Center Street, Suite 203, Herndon, VA 20170				
Col 1: Total value of aircraft in class, divided by fleet (Col 3).				
Col 2: Standard deviation value of the average in Col 1.				
Col 3: Total fleet in the class.				
Col 4: Average restoration percentage (13.5%) multiplied by Col. 1.				

## 5.2.2 Restoration

Restoration costs were estimated for commercial air carriers by analysis of the CASE database developed by Airclaims, Inc.<sup>2</sup> The database covers all commercial accidents throughout the world, and includes the insured hull value of the aircraft and the value of the claim. Aircraft that were destroyed were excluded from the analysis, as the replacement cost is clear in that case. Minor losses, where the loss percentage was under two percent, were also excluded. This level of loss is assumed to place the loss as an incident rather than an accident. Analysis of the data indicated that the average cost of repair was 13.5 percent of the insured value. This percentage is used for all commercial aircraft.<sup>3</sup> The estimated average restoration cost by aircraft type is shown in Column 4 of Table 5-1.

## 5.3 GENERAL AVIATION AIRCRAFT

### 5.3.1 Replacement

Replacement values for general aviation aircraft were based on a methodology similar to that used for commercial air carriers. The primary source of data was the *Aircraft Bluebook -Price Digest (Spring 1997)*.<sup>4</sup> Aircraft in the fleet were assigned to one of the 23 economic value classifications. The average age of all aircraft of a particular type was calculated based on detailed data from the *General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995*.<sup>5</sup> The value for the average aircraft for each type was identified from the "Bluebook;" these averages were used together with the relative numbers of aircraft of each type in a particular Economic Value Class to obtain a weighted average value for that class.

The summary of valuation for general aviation classes is shown in Table 5-2. This valuation is provided in terms of an average value per aircraft, a minimum and maximum value per aircraft, and a statistical standard derivation that applies to the average value. Table 5-2 is shown in three parts for aircraft built before 1982, for aircraft built in 1982 and beyond, and for all aircraft. Detail by major aircraft type is shown in Table 5-10. No data were available in certain aircraft categories.

There have been significant changes in the composition of the general aviation fleet since the early 1980's which makes it desirable to have additional information on aircraft values. There was a major decline in GA aircraft production—primarily smaller piston aircraft—after 1981. The fleet age profile for smaller piston aircraft is significantly different than that for larger turbine aircraft. Moreover, there is wide variation in the values of pre- and post-1982 aircraft. As was noted previously, no data were available in certain aircraft categories. As a result, average values are less relevant for at least some economic evaluations. For example, FAA may be faced with investment or regulatory decisions that disproportionately affect GA piston or GA turbine operators. In extreme

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<sup>2</sup> Airclaims Group, Ltd., London Heathrow Airport, England.

<sup>3</sup> Insufficient data were available to develop reliable samples for rates that would apply to detailed equipment types.

<sup>4</sup> *Aircraft Bluebook - Price Digest*, (Overland Park, KS: Intertec Publishing, Spring 1997).

<sup>5</sup> *General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995*, FAA-APO-97-4 (Washington, DC, 1997). The analysis here used the actual sample records and appropriate expansion factors.

cases, these decisions may affect only one group or the other. Or decisions may affect aircraft of only certain ages, such as a requirement to bring an old design up to a modern standard. The values relevant for use in such a benefit-cost study should reflect the aircraft actually affected. One way to reflect such value differences is to use either pre-1982 or post-1982 data depending upon which is most representative.

Table 5-3 shows the values of general aviation aircraft separated into air taxi and all other uses; air taxi aircraft are assumed to be those used primarily (50 percent or more of the hours) for hire service as reported in the detailed data used in the *General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995*.<sup>6</sup> Table 5-3 also shows all other aircraft and the total fleet. The aircraft used in air taxi (as a group) are of considerably higher value than the other aircraft in the general aviation fleet.

In both tables 5-2 and 5-3, the last row shows average values weighted by flight hours. These values correspond to the average aircraft flown in the air traffic system, and are based on numbers in Column 1 weighted by flight hours in each economic value class.

In some cases, aircraft value estimates were not available because of small numbers of aircraft in the fleet group. While it is a large group, no replacement costs could be developed for class 23 (experimental, home built, and other) aircraft. Aircraft in this group have a somewhat limited used aircraft market, and values for this class of aircraft are highly variable.

### 5.3.2 Restoration

Information is available from the CASE database<sup>7</sup> on the restoration costs for part of the general aviation fleet. Data are available on claimed damages and insured hull value for large air carrier aircraft and some corporate aircraft, especially business jets. Using this information and data from previous studies, estimates for restoration costs for each aircraft group were developed. The available Airclaims data are used to derive a value of 16.4 percent for the GA turbojet/ turboprop groups. The turbojet/fan value from Airclaims is also applied to turboprops and turboshaft helicopters. Second, the values from the 1989 study<sup>8</sup> for single engine piston (29%) and twin engine piston (24%) aircraft are applied in this study. As was the case in the 1989 study, piston rotorcraft are assigned the same restoration percentages as single engine piston fixed wing aircraft (29%). The restoration percentages are shown in Table 5-4. For estimates of restoration values by aircraft type, see Table 5-5.

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<sup>6</sup> *General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995, op.cit.*

<sup>7</sup> Airclaims Group, Ltd., *op. cit.*

<sup>8</sup> *Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs*, FAA-APO-89-10, (Washington, DC: October, 1989).

Table 5-2  
General Aviation Aircraft Values

Economic Values Class	Year Built ->					1982 and Beyond					All Years				
	(Column 1a) Fleet Size	(Column 2a) Average Value Per Aircraft (\$000)	(Column 3a) Minimum Value Per Aircraft (\$000)	(Column 4a) Maximum Value Per Aircraft (\$000)	(Column 5a) Standard Deviation (\$000)	(Column 1b) Fleet Size	(Column 2b) Average Value Per Aircraft (\$000)	(Column 3b) Minimum Value Per Aircraft (\$000)	(Column 4b) Maximum Value Per Aircraft (\$000)	(Column 5b) Standard Deviation (\$000)	(Column 1c) Fleet Size	(Column 2c) Average Value Per Aircraft (\$000)	(Column 3c) Minimum Value Per Aircraft (\$000)	(Column 4c) Maximum Value Per Aircraft (\$000)	(Column 5c) Standard Deviation (\$000)
1 Piston 1-3 Seats	41,135	23	11	188	11	2,425	139	21	755	127	43,560	27	11	755	34
2 Piston 4-9 Seats 1 Eng	83,224	52	11	450	31	5,697	158	44	495	94	88,921	58	11	495	46
3 Piston 4-9 Seats 2 Eng	15,285	140	23	464	112	1,093	239	19	440	131	16,378	147	19	464	116
4 Piston 10-19 Seats 1 Eng	1	18	18	18	0	0	0	0	0	0	1	18	18	18	0
5 Piston 10-19 Seats 2 Eng	392	136	59	440	85	77	NR	NR	NR	NR	469	136	59	440	85
6 Piston 20+ Seats 2 Eng	135	163	163	163	0	0	0	0	0	0	135	163	163	163	0
7 Piston 20+ Seats 4 Eng	51	NR	NR	NR	NR	0	0	0	0	0	51	NR	NR	NR	NR
8 Turboprop 1-9 Seats 1 Eng	109	227	175	245	31	663	720	175	1,450	365	772	679	175	1,450	375
9 Turboprop 1-9 Seats 2 Eng	992	493	260	618	102	1,711	1,047	618	1,285	224	1,163	572	260	1,285	231
10 Turboprop 10-19 Seats 1 Eng	NA	NA	NA	NA	NA	25	1,522	905	2,100	610	25	1,522	905	2,100	610
11 Turboprop 10-19 Seats 2 Eng	1,573	785	145	1,050	234	880	1,708	584	3,800	705	2,453	1,100	145	3,800	630
12 Turboprop 20+ Seats 2 Eng	64	736	460	885	163	104	2,808	1,055	4,690	1,769	168	2,487	460	4,690	1,792
13 Turboprop 20+ Seats 4 Eng	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0
14 Turbojet/fan 2 Eng <20,000	1,308	1,308	315	2,200	531	1,678	4,283	1,150	8,900	1,962	2,986	3,015	315	8,900	2,119
15 Turbojet/fan 2 Eng >=20,000	650	2,511	405	8,500	2,087	622	14,682	1,900	21,000	6,415	1,272	9,244	405	21,000	7,896
16 Turbojet/fan 3+ Eng <20,000	0	0	NA	NA	NA	2	NR	NR	NR	NR	2	NR	NR	NR	NR
17 Turbojet/fan 3+ Eng >=20,000	84	4,478	380	8,000	3,299	108	15,381	11,800	18,700	3,464	193	10,612	380	18,700	6,418
18 Turbojet/fan >=65,000	107	1,882	750	6,600	778	89	17,348	4,630	36,630	5,843	196	6,782	750	36,630	7,835
19 Rotor Piston <7,000	820	65	16	87	20	635	89	56	148	20	1,455	76	16	148	23
20 Rotor Turbine <7,000	1,302	376	77	700	110	955	548	129	3,150	319	2,257	448	77	3,150	239
21 Rotor Turbine >=7,000	42	70	70	70	0	0	0	0	0	0	42	70	70	70	0
22 Rotor Turbine >=7,000	554	1,001	144	1,600	383	973	1,794	620	4,800	1,374	1,527	1,651	144	4,800	1,292
23 Other	5,509	NA	NA	NA	NA	11,807	NA	NA	NA	NA	17,316	NA	NA	NA	NA
All Aircraft	153,339	97	11	8,500	300	28,002	1,603	19	36,630	3,863	181,341	250	11	36,630	1,308
All Aircraft (hours)	NA	148	NA	NA	NA	NA	2,071	NA	NA	NA	NA	520	NA	NA	NA

Source: FAA GA Survey and Aircraft Bluebook - Price Digest.

NR = No data reported.

NA = Not applicable.

Note: Zero indicates no sample aircraft in that class and use.

Col 1: Fleet size.

Col 2: Average value of aircraft in category.

Col 3: Minimum value of aircraft in category.

Col 4: Maximum value of aircraft in category.

Col 5: Statistical standard deviation for values in category.

Table 5-3  
General Aviation Aircraft Values

Economic Values Class	Air Taxi					General Aviation					Total Fleet				
	(Column 1a) Fleet Size	(Column 2a) Average Unit Value (\$000)	(Column 3a) Minimum Value Per Aircraft (\$000)	(Column 4a) Maximum Value Per Aircraft (\$000)	(Column 5a) Standard Deviation (\$000)	(Column 1b) Fleet Size	(Column 2b) Average Unit Value (\$000)	(Column 3b) Minimum Value Per Aircraft (\$000)	(Column 4b) Maximum Value Per Aircraft (\$000)	(Column 5b) Standard Deviation (\$000)	(Column 1c) Fleet Size	(Column 2c) Average Unit Value (\$000)	(Column 3c) Minimum Value Per Aircraft (\$000)	(Column 4c) Maximum Value Per Aircraft (\$000)	(Column 5c) Standard Deviation (\$000)
1 Piston 1-3 Seats	0	NA	NA	NA	NA	43,560	27	11	755	34	43,560	27	11	755	34
2 Piston 4-9 Seats 1 Eng	225	105	46	450	101	88,921	58	11	495	46	88,921	58	11	495	46
3 Piston 4-9 Seats 2 Eng	907	173	76	315	64	15,471	145	19	464	118	16,378	147	19	464	116
4 Piston 10-19 Seats 1 Eng	0	NA	NA	NA	NA	1	18	18	18	0	1	18	18	18	0
5 Piston 10-19 Seats 2 Eng	221	169	69	440	85	248	68	59	113	13	469	136	59	440	85
6 Piston 20+ Seats 2 Eng	64	163	163	163	0	71	163	163	163	0	135	163	163	163	0
7 Piston 20+ Seats 4 Eng	0	NA	NA	NA	NA	51	NR	NR	NR	NR	51	NR	NR	NR	NR
8 Turboprop 1-9 Seats 1 Eng	289	910	910	910	NR	484	430	175	1,450	416	772	679	175	1,450	375
9 Turboprop 1-9 Seats 2 Eng	0	NA	NA	NA	NA	1,163	572	260	1,285	231	1,163	572	260	1,285	231
10 Turboprop 10-19 Seats 1 Eng	13	905	905	905	0	12	2,100	2,100	2,100	0	25	1,522	905	2,100	610
11 Turboprop 10-19 Seats 2 Eng	183	678	275	1,300	152	2,270	1,136	145	3,800	642	2,453	1,100	145	3,800	630
12 Turboprop 20+ Seats 2 Eng	18	NR	NR	NR	NR	150	2,487	460	4,690	1,792	168	2,487	460	4,690	1,792
13 Turboprop 20+ Seats 4 Eng	0	NA	NA	NA	NA	0	NA	NA	NA	NA	0	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	110	1,129	575	2,200	434	2,877	3,091	315	8,900	2,125	2,986	3,015	315	8,900	2,119
15 Turbojet/fan 2 Eng >=20,000	7	505	505	505	NR	1,266	9,297	405	21,000	7,830	1,272	9,244	405	21,000	7,836
16 Turbojet/fan 3+ Eng <20,000	0	NA	NA	NA	NA	2	NR	NR	NR	NR	2	NR	NR	NR	NR
17 Turbojet/fan 3+ Eng >=20,000	0	NA	NA	NA	NA	193	10,612	360	18,700	6,418	193	10,612	360	18,700	6,418
18 Turbojet/fan >=65,000	0	NA	NA	NA	NA	196	6,782	750	36,630	7,835	196	6,782	750	36,630	7,835
19 Rotor Piston <7,000	0	NR	NR	NR	NR	1,455	76	16	148	23	1,455	76	16	148	23
20 Rotor Turbine <7,000	92	996	311	3,150	561	2,166	426	77	1,475	183	2,257	448	77	3,150	239
21 Rotor Turbine >=7,000	0	NA	NA	NA	NA	42	70	70	70	0	42	70	70	70	0
22 Rotor Turbine >=7,000	165	1,555	1,250	2,610	255	1,362	1,664	144	4,800	1,372	1,527	1,651	144	4,800	1,292
23 Other	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	17,316	NA	NA	NA	NA
All Aircraft	2,293	484	46	3,150	474	179,048	246	11	36,630	1,316	181,341	250	11	36,630	1,308
All Aircraft (hours)	NA	648	NA	NA	NA	NA	515	NA	NA	NA	NA	520	NA	NA	NA

Source: FAA GA Survey and Aircraft Bluebook - Price Digest. Air taxi defined as aircraft with dominant use in air taxi hours.

NR = No data reported.

NA = Not applicable.

Note: Zero indicates no sample aircraft in that class and use.

Col 1: Fleet size.

Col 2: Average value of aircraft in category.

Col 3: Minimum value of aircraft in category.

Col 4: Maximum value of aircraft in category.

Col 5: Statistical standard derivation for values in category.

**Table 5-4**  
**Restoration Cost of Damaged Aircraft as a Percent**  
**of Aircraft Replacement Cost**

Aircraft Type	Restoration Percentage
Fixed Wing:	
Air Carrier Aircraft	13.5%
General Aviation Aircraft	
Piston – Single Engine	29.0%
Piston – Twin Engine	24.0%
Turboprop	16.4%
Turbojet/fan	16.4%
Rotorcraft:	
Piston	29.0%
Turbine	16.4%

**Table 5-5**  
**General Aviation Aircraft Values and Restoration Costs**

Economic Values Class	Air Taxi			GA			Total Fleet		
	(Column 1a) Fleet Size	(Column 2a) Average Unit Value (\$000)	(Column 3a) Restoration Costs (\$000)	(Column 1b) Fleet Size	(Column 2b) Average Unit Value (\$000)	(Column 3b) Restoration Costs (\$000)	(Column 1c) Fleet Size	(Column 2c) Average Unit Value (\$000)	(Column 3c) Restoration Costs (\$000)
1 Piston 1-3 Seats	0	NA	NA	43,560	27	8	43,560	27	8
2 Piston 4-9 Seats 1 Eng	225	105	30	88,696	58	17	88,921	58	17
3 Piston 4-9 Seats 2 Eng	907	173	41	15,471	145	35	16,378	147	35
4 Piston 10-19 Seats 1 Eng	0	NA	NA	1	NR	NR	1	NR	NR
5 Piston 10-19 Seats 2 Eng	221	169	41	248	68	16	469	136	33
6 Piston 20+ Seats 2 Eng	64	163	39	71	163	39	135	163	39
7 Piston 20+ Seats 4 Eng	0	NA	NA	51	NR	NR	51	NR	NR
8 Turboprop 1-9 Seats 1 Eng	289	910	149	484	430	71	772	679	111
9 Turboprop 1-9 Seats 2 Eng	0	NA	NA	1,163	572	94	1,163	572	94
10 Turboprop 10-19 Seats 1 Eng	13	905	148	12	2,100	344	25	1,522	250
11 Turboprop 10-19 Seats 2 Eng	183	678	111	2,270	1,136	186	2,453	1,100	180
12 Turboprop 20+ Seats 2 Eng	18	NA	NA	150	2,487	408	168	2,487	408
13 Turboprop 20+ Seats 4 Eng	0	NA	NA	0	NA	NA	NA	NA	NA
14 Turbojet/fan 2 Eng <20,000	110	1,129	185	2,877	3,091	507	2,986	3,015	494
15 Turbojet/fan 2 Eng >=20,000	7	505	83	1,266	9,297	1,525	1,272	9,244	1,516
16 Turbojet/fan 3+ Eng <20,000	0	NA	NA	2	NR	NR	2	NR	NR
17 Turbojet/fan 3+ Eng >=20,000	0	NA	NA	193	10,612	1,740	193	10,612	1,740
18 Turbojet/fan >=65,000	0	NA	NA	196	6,782	1,112	196	6,782	1,112
19 Rotor Piston <7,000	0	NA	NA	1,455	76	22	1,455	76	22
20 Rotor Turbine <7,000	92	996	163	2,166	426	70	2,257	448	73
21 Rotor Piston >=7,000	0	NA	NA	42	70	20	42	70	20
22 Rotor Turbine >=7,000	165	1,555	255	1,362	1,664	273	1,527	1,651	271
23 Other	2	NA	NA	17,314	NA	NA	17,316	NA	NA
All Aircraft	2,293	484	88	179,048	246	46	181,341	250	47

Source: FAA GA Survey and *Aircraft Bluebook - Price Digest*. Air taxi defined as aircraft with dominant use in air taxi hours.

NA=Not Applicable.

NR = No data reported.

Notes: Zero indicates no sample aircraft in that class and use. Totals may not add due to rounding.

Col 1: Fleet size.

Col 2: Average value of aircraft in category.

Col 3: Values for restoration percentages from Table 5-4 applied to values in Column 2.

## 5.4 MILITARY AIRCRAFT

### 5.4.1 Replacement

Estimating replacement values for military aircraft is considerably more complex than it is for air carrier or general aviation aircraft. One problem is that used military aircraft do not sell in the large numbers that commercial equipment does. The second problem is that there is a complex procurement process for military aircraft, which often makes unit cost estimates for individual types inappropriate as measures of opportunity costs.

The example of the B-52 bomber illustrates the two problems discussed above. First, there is no used market for this aircraft. It is a venerable aircraft, for which there are few substitutes. Second, what would it cost to actually replace a plane that is lost in an accident? It is not possible to buy one B-52 or a newer plane that has similar characteristics. A new military procurement program would cost a substantial sum of money, which could not be counted as a cost against one plane lost in an accident.

The only practical solution is to count the value of military aircraft as the approximate cost of a new aircraft where that model is still being produced, or the cost of older aircraft, brought up to date for inflation. The general method used here is to assign the value of military aircraft as a result of the following steps:

1. If an aircraft type is still being produced, the latest price information is used.
2. If an aircraft is no longer in production, but there is a commercial aircraft that would serve the same general military purpose, the value of the comparable commercial aircraft is applied.
3. If an aircraft type is no longer in production, the latest price paid is determined and prices are brought up to current dollar values using the PPI inflation rate discussed below.
4. If none of the above valuations estimates were possible, the value shown in the 1989 study is used, updated to the current costs to account for inflation, using the PPI rate discussed below.

With respect to number 1 above, sources included recent budget data as summarized in the *Aviation and Aerospace Almanac*, 1996.<sup>9</sup> With respect to number 2, data from the GRAS<sup>10</sup> database were used. With respect to number 3, the primary source was *Jane's All the World's Aircraft*.<sup>11</sup> For the remainder of the aircraft, mostly older aircraft, the 1989 study values<sup>12</sup> were

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<sup>9</sup> *Aviation and Aerospace Almanac* (Washington, DC: Aviation Week Group Newsletters, 1996).

<sup>10</sup> GRA Aviation Specialists, *op. cit.*

<sup>11</sup> *Jane's All the World's Aircraft* (Surrey, U.K.: Jane's Information Group Limited, various years).

<sup>12</sup> The sources of these values are shown in the 1989 study at p. 84, and are virtually the same as the sources used in this update.

updated for inflation using the PPI Detailed Report for aircraft from the U.S. Department of Labor.<sup>13</sup>

The summary of valuation by general type is provided in Table 5-6. Fleet data are year-end 1996 data, as summarized in *The Aerospace Source Book*.<sup>14</sup> Detail data by aircraft type are shown in Supporting Table 5-11.

#### 5.4.2 Restoration

Data on military restoration costs were not available. The percentage from the Airclaims database for commercial air carriers is used by analogy for military aircraft. Restoration estimates for military aircraft are shown in Table 5-6 with detail provided in Table 5-11.

**Table 5-6**  
**Summary of Military Fleet—December 1996**  
**(Averages Weighted By Fleet Size)**

<b>Economic Values Class</b>	<b>(Column 1) Fleet Size</b>	<b>(Column 2) Avg. A/C Value (\$000,000)</b>	<b>(Column 3) Restoration (\$000,000)</b>
Turbojet/fan 3+engines	1,250	90.98	12.28
Turbojet/fan Attack/Fighter	4,663	31.86	4.30
Turbojet/fan Other	1,674	7.83	1.06
Turboprop	2,371	29.67	4.01
Piston Engine	91	0.12	0.02
Fixed Wing Total	10,049	34.26	4.62
Rotary Aircraft Total	10,354	8.36	1.13
<b>Total Military Fleet</b>	<b>20,403</b>	<b>21.11</b>	<b>2.85</b>

Source: See text at Section 5.4.1.  
 Col 1: Number of aircraft in total of military services.  
 Col 2: Estimated total value divided by fleet.  
 Col 3: Average restoration value, or Column 2 average value multiplied by 13.5 percent.

### 5.5 FLEET VALUATION RELATED TO STAGE 2 AND STAGE 3 REQUIREMENTS

Analysts who are using fleet average data over intermediate or long time periods should bear in mind the potential impacts of the Stage 3 noise rules. These rules require that large aircraft meet Stage 3 standards by the end of 1999. Airlines face important decisions whether to retrofit Stage 2 aircraft or acquire complying aircraft by the end of 1999. Their decisions will

<sup>13</sup> The PPI detailed report lists producer price indices for products by SIC code. The PPI for aircraft (SIC-3721) was used.

<sup>14</sup> *The Aerospace Source Book*, (Washington, DC: McGraw-Hill, January 13, 1997).

affect the average values of aircraft that should be used in FAA regulatory and investment analysis.

At the end of 1996, 2,034 of the 8,169 commercial aircraft in the U.S. air carrier fleet were narrow body and Stage 2. All of these aircraft are considered eligible for conversion to Stage 3 because a hushkit was available for converting them. In addition, many widebodies—e.g., early B-747's, L1011's and DC-10's—were Stage 2 aircraft but all of them can be brought into compliance by reducing gross weight of operations, by using different flap settings on takeoff, or through other operational changes.

In order to estimate the impact of the noise rule on the fleet, the following assumptions were made:

- All Category 2 wide body aircraft will remain in the fleet and adopt revised operational procedures to meet Stage 3
- Half of the narrow body fleet eligible for conversion will not be converted, and
- The oldest half of the fleet eligible for conversion will be dropped from the fleet.

The first assumption is based on the observation that few wide body aircraft have been retired to meet intermediate Stage 2 requirements because the operational penalties are not a large factor for most missions flown by these aircraft, and/or the cost of alternative Stage 3 versions is large relative to the modest cost of the operational penalty. The second assumption above is based on an analysis done by the Boeing Aircraft Company and incorporated in their annual forecast.<sup>15</sup> The third assumption is a practical one, based on the observation that the older an airplane, the lower its comparative value; all other things equal, newer aircraft with longer expected future lives will make the most economic sense to modify.

Table 5-7 reports the average 1996 values for the projected Stage 3 fleet in the year 2000. For all aircraft assumed to meet Stage 3 requirements through the installation of a hushkit, the market value of the aircraft has been enhanced by the cost of the hushkit. This is the standard adopted by aircraft valuation firms.<sup>16</sup>

## 5.6 PROFILES

Table 5-8A and 5-8B summarize the replacement costs and restoration costs of scheduled commercial, non-scheduled commercial and non-commercial user groups. Table 5-8A expresses results weighted by aircraft units, while Table 5-8B presents results weighted by hours.

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<sup>15</sup> 1997 *Current Market Outlook*, (Seattle, WA: Boeing Commercial Airplane Company, 1997).

<sup>16</sup> GRA Aviation Specialists, Inc., *op. cit.*

**Table 5-7**  
**Values of Current Fleet Projected To Be Stage 3 Compliant in the Year 2000**  
**1996 Dollars**

Circa 1996 Fleet							
Economic Values Class	Hushkit Aircraft		Stage 3 Aircraft		Stage 3 Compliant Aircraft		
	(Column 1)	(Column 2)	(Column 3)	(Column 4)	(Column 5)	(Column 6)	(Column 7)
	Average Value	Fleet	Average Value	Fleet	Average Value	Fleet	Average Restoration Value
Two-engine narrow body passenger	\$7.93	395	\$23.58	2,198	\$21.20	2,593	\$2.86
Two-engine narrow body freight	\$7.24	13	NR	NR	\$7.24	13	\$0.98
Two-engine wide body passenger	NA	NA	\$46.45	322	\$46.45	322	\$6.27
Two-engine wide body freight	NA	NA	\$51.15	66	\$51.15	66	\$6.91
Three-engine narrow body passenger	\$4.89	491	NR	NR	\$4.89	491	\$0.66
Three-engine narrow body freight	\$6.75	112	NR	NR	\$6.75	112	\$0.91
Three-engine wide body passenger	NA	NA	\$14.83	346	\$14.83	346	\$2.00
Three-engine wide body freight	NA	NA	\$40.75	73	\$40.75	73	\$5.50
Four-engine narrow body passenger	\$3.65	2	\$10.55	30	\$10.12	32	\$1.37
Four-engine narrow body freight	\$5.85	4	\$17.34	92	\$16.86	96	\$2.28
Four-engine wide body passenger	NA	NA	\$36.11	155	\$36.11	155	\$4.87
Four-engine wide body freight	NA	NA	\$23.23	70	\$23.23	70	\$3.14
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	NA	NA	\$15.98	72	\$15.98	72	\$2.16
Regional jet over 59 seats	NR	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	NA	NA	\$1.75	929	\$1.75	929	\$0.24
Turboprops with 20 or more seats	NA	NA	\$3.84	1,540	\$3.84	1,540	\$0.52
Piston	NR	NR	NR	NR	NR	NR	NR
All Aircraft	\$6.31	1,017	\$16.31	5,893	\$14.83	6,910	\$2.00

NA = Not applicable.  
NR = No data reported.

Source: GRA Aviation Specialists, Herndon, VA

Col 1: Total value (including cost of hushkit) of Stage 2 aircraft whose vintage is in the upper half among all Stage 2 narrowbody aircraft divided by fleet (Col 2).

Col 2: Number of Stage 2 aircraft whose vintage is in the upper half among all Stage 2 narrow body aircraft.

Col 3: Total value of Stage 3 aircraft (including Stage 2 wide body aircraft that can be Stage 3 compliant by altering operational procedures) divided by fleet (Column 4).

Col 5: Total value of Column 1 and Column 3 aircraft divided by fleet numbers from Column 2 and Column 4.

Col 6: Column 2 plus Column 4.

Col 7: Values from Table 5-4 applied to economic value classes.

**Table 5-8A  
Unit Replacement Profiles  
(Weighted by Aircraft Units)**

<b>User Class</b>	<b>(Column 1) Average Unit Value (\$000,000)</b>	<b>(Column 2) Fleet Size</b>	<b>(Column 3) (11) Average Restoration Value (\$000,000)</b>
<b>Scheduled Commercial Services</b>			
Passenger (1)	\$12.71	7,210	\$1.72
Freight Only (2)	\$11.64	959	\$1.57
All Combined	\$12.58	8,169	\$1.70
<b>Air Carrier Without Commuters</b>			
Passenger (3)	\$17.76	4,669	\$2.40
Freight Only (4)	\$15.27	717	\$2.06
All Combined	\$17.43	5,386	\$2.35
<b>Commuter Only</b>			
Passenger (5)	\$3.42	2,541	\$0.46
Freight Only (6)	\$0.88	242	\$0.12
All Combined	\$3.20	2,783	\$0.43
<b>Non-Scheduled Commercial (Air Taxi) (7)</b>	\$0.48	2,293	\$0.09
<b>Non-Commercial (GA and Military)</b>			
GA and Air Taxi (8)	\$0.25	181,341	\$0.04
GA Only (9)	\$0.25	179,048	\$0.04
Military (10)	\$21.10	20,403	\$2.85
<p>(1) Total value of all aircraft classified as passenger aircraft divided by total number of passenger aircraft.</p> <p>(2) Total value of all aircraft classified as freight aircraft divided by total number of freight aircraft.</p> <p>(3) Total value of all aircraft classified as Air Carrier passenger aircraft divided by total number of Air Carrier passenger aircraft. Air Carrier aircraft are identified as jet powered aircraft that are not regional jets.</p> <p>(4) Total value of all aircraft classified as Air Carrier freight aircraft divided by total number of Air Carrier freight aircraft. Air Carrier aircraft are identified as jet powered aircraft that are not regional jets.</p> <p>(5) Total value of all aircraft classified as commuter passenger aircraft divided by total number of commuter passenger aircraft. Commuter aircraft are identified as regional jets and turboprop aircraft.</p> <p>(6) Total value of all aircraft classified as commuter freight aircraft divided by total number of commuter freight aircraft. Commuter aircraft are identified as regional jets and turboprop aircraft.</p> <p>(7) Air taxi aircraft are defined as those GA aircraft used at least 50 percent of the time in air taxi service (see Table 5-3).</p> <p>(8) Includes all GA aircraft (see Table 5-2).</p> <p>(9) Includes all GA aircraft except those qualifying as air taxi (see Note 7).</p> <p>(10) Includes all military aircraft (see Table 5-5).</p> <p>(11) Values for Table 5-4 applied to user class categories.</p>			

**Table 5-8B  
Unit Replacement Profiles  
(Weighted by Airborne Hours)**

<b>User Class</b>	<b>(Column 1) Average Unit Value (\$000,000)</b>	<b>(Column 2) Airborne/ Flight Hours</b>	<b>(Column 3) (11) Average Restoration Value (\$000,000)</b>
<b>Scheduled Commercial Services</b>			
Passenger (1)	\$16.07	14,269,090	\$2.17
Freight Only (2)	\$14.28	1,177,482	\$1.93
All Combined	\$15.93	15,446,572	\$2.15
<b>Air Carrier Without Commuters</b>			
Passenger (3)	\$19.15	11,476,924	\$2.59
Freight Only (4)	\$17.63	947,672	\$2.38
All Combined	\$19.04	12,424,596	\$2.57
<b>Commuter Only</b>			
Passenger (5)	\$3.81	2,792,166	\$0.51
Freight Only (6)	\$0.88	229,810	\$0.12
All Combined	\$3.66	3,021,976	\$0.49
Non-Scheduled Commercial (Air Taxi) (7)	\$0.65	1,514,623	\$0.14
<b>Non-Commercial (GA and Military)</b>			
GA and Air Taxi (8)	\$0.52	25,447,963	\$0.13
GA Only (9)	\$0.51	23,933,340	\$0.13
Military (10)	NR	NR	NR
NR = No data reported.			
<p>(1) Average value of aircraft classified as passenger aircraft weighted by passenger aircraft airborne hours.</p> <p>(2) Average value of aircraft classified as freight aircraft weighted by freight aircraft airborne hours.</p> <p>(3) Average value of aircraft classified as Air Carrier passenger aircraft weighted by Air Carrier passenger aircraft airborne hours. Air Carrier aircraft are identified as jet powered aircraft that are not regional jets.</p> <p>(4) Average value of aircraft classified as Air Carrier freight aircraft weighted by number of Air Carrier freight aircraft airborne hours. Air Carrier aircraft are identified as jet powered aircraft that are not regional jets.</p> <p>(5) Average value of aircraft classified as commuter passenger aircraft weighted by commuter passenger aircraft airborne hours. Commuter aircraft are identified as regional jets and turboprop aircraft.</p> <p>(6) Average value of all aircraft classified as commuter freight aircraft weighted by commuter freight aircraft airborne hours. Commuter aircraft are identified as regional jets and turboprop aircraft.</p> <p>(7) Air taxi aircraft are defined as those GA aircraft used at least 50 percent of the time in air taxi service (see Table 5-3).</p> <p>(8) Includes all GA aircraft (see Table 5-2).</p> <p>(9) Includes all GA aircraft except those qualifying as air taxi (see Note 7).</p> <p>(10) Includes all military aircraft (see Table 5-5).</p> <p>(11) Values for Table 5-4 applied to user class categories.</p>			



**SUPPORTING TABLES**  
**UNIT REPLACEMENT AND RESTORATION COSTS**  
**OF DAMAGED AIRCRAFT**

**Table 5-9**  
**Detail Supporting Table 5-1**  
**Detail Commercial Aircraft Values**  
**(Averages Weighted by Fleet)**

Economic Values Class	\$ Millions					
	(Column 1) Average Aircraft Value	(Column 2) Minimum Value	(Column 3) Maximum Value	(Column 4) Standard Deviation	(Column 5) Restoration Cost	(Column 6) Fleet Size
2 Engine Narrowbody Freight	4.83	1.31	8.04	1.47	0.65	28
737-200C	5.61	1.31	8.04	1.78	0.76	14
DC-9-30Fs	4.06	3.70	4.30	0.19	0.55	14
2 Engine Narrowbody Passenger	17.87	0.20	50.93	12.28	2.41	3,049
737-100 -7	0.50	0.50	0.50	0.00	0.07	14
737-100 -9	0.50	0.50	0.50	0.00	0.07	1
737-200 -17Q	5.80	5.80	5.80	0.00	0.78	1
737-200A-15	8.04	2.33	11.10	1.32	1.09	143
737-200A-17	7.61	5.60	11.20	1.43	1.03	25
737-200A-9	3.92	1.80	8.00	1.88	0.53	177
737-300	20.95	15.20	32.80	4.75	2.83	503
737-400	26.41	22.00	37.00	3.22	3.57	90
737-500	23.07	19.90	27.80	2.30	3.11	119
757-200	36.46	20.15	50.93	7.53	4.92	388
757-200EM	36.64	23.57	42.48	6.51	4.95	24
757-200PF	38.94	28.65	50.93	6.62	5.26	65
A320-200	31.53	25.50	40.48	4.04	4.26	121
BAC1-11s	0.20	0.20	0.20	0.00	0.03	24
DC-9-10s	1.10	1.10	1.10	0.00	0.15	71
DC-9-30 pax	3.46	2.80	6.00	0.84	0.47	358
DC9-21	1.10	1.10	1.10	0.00	0.15	5
DC9-41	3.27	2.10	5.07	0.90	0.44	42
DC9-51	4.69	4.01	5.85	0.49	0.63	62
F28-1000	1.53	1.02	1.96	0.37	0.21	10
F28-4000	3.15	2.35	3.84	0.61	0.43	23
Fokker F100	14.14	10.84	18.68	1.82	1.91	126
Fokker F70	16.17	15.02	16.56	0.77	2.18	4
MD-82 -217C	18.80	16.84	21.57	2.27	2.54	12
MD-82 217A	14.90	9.84	20.37	3.04	2.01	349
MD80-81	9.66	8.87	10.23	0.32	1.30	33
MD80-83	24.16	17.07	34.33	4.48	3.26	106
MD80-87	13.71	11.50	15.32	0.97	1.85	11
MD80-88	21.75	17.60	26.55	2.66	2.94	122
MD90-30	29.79	24.18	32.14	2.49	4.02	20
2 Engine Widebody Freight	51.15	6.00	83.50	26.54	6.91	66
767-300ERF	81.22	78.80	83.50	1.71	10.96	16
A300C4-203	6.00	6.00	6.00	0.00	0.81	1
A310-200f	24.28	21.50	27.02	1.79	3.28	30
A300-600 F4-605R	70.62	65.99	75.37	3.83	9.53	19
2 Engine Widebody Passenger	46.45	5.00	109.03	26.96	6.27	322
767-200/EM	23.40	20.59	25.65	1.06	3.16	55
767-200ER	40.64	31.19	68.66	8.93	5.49	37
767-300	49.56	40.70	63.09	7.53	6.69	26
767-300ER	69.40	57.10	85.50	7.60	9.37	92
777-200	102.95	98.44	109.03	4.37	13.90	21
A300-600R	46.93	42.38	58.27	4.96	6.34	38
A300B2-1C	6.59	6.59	6.59	0.00	0.89	1
A300B4-103	6.44	6.00	7.30	0.58	0.87	9
A300B4-200/2C	7.78	5.00	10.50	1.28	1.05	36
A310-200 pax	17.30	15.49	19.42	1.99	2.34	5
A310-300	30.10	30.10	30.10	0.00	4.06	1
A330-322	88.15	88.15	88.15	0.00	11.90	1
3 Engine Narrowbody Freight	3.17	1.05	12.00	2.15	0.43	285
727-100C/F -7	2.61	2.50	3.00	0.12	0.35	123
727-100C/F -7F	2.70	2.70	2.70	0.00	0.36	2
727-200F	2.91	1.05	5.34	1.18	0.39	149
727-200F -217	12.00	12.00	12.00	0.00	1.62	11

**Table 5-9 (Continued)**  
**Detail Supporting Table 5-1**  
**Detail Commercial Aircraft Values**  
**(Averages Weighted by Fleet)**

Economic Values Class	\$ Millions					(Column 6) Fleet Size
	(Column 1) Average Aircraft Value	(Column 2) Minimum Value	(Column 3) Maximum Value	(Column 4) Standard Deviation	(Column 5) Restoration Cost	
3 Engine Narrowbody Passenger	3.31	0.40	12.00	2.22	0.45	689
727-100 -217	6.60	6.60	6.60	0.00	0.89	3
727-100 -7	0.52	0.40	0.75	0.07	0.07	56
727-100 -9	0.70	0.55	0.85	0.15	0.09	3
727-100 TAY	9.80	9.80	9.80	0.00	1.32	44
727-200 -15V	3.00	3.00	3.00	0.00	0.41	1
727-200 -217V	12.00	12.00	12.00	0.00	1.62	2
727-200A-15	3.52	2.00	4.40	0.72	0.47	338
727-200A-17	4.52	2.00	5.50	0.51	0.61	66
727-200A-7	0.79	0.75	0.80	0.02	0.11	31
727-200A-9	1.79	0.81	2.94	0.60	0.24	145
3 Engine Widebody Freight	40.75	1.50	106.16	32.38	5.50	73
DC-10-10Fs	8.61	5.94	13.90	2.37	1.16	12
DC-10-30Fs	23.53	16.70	33.00	5.83	3.18	35
L1011-1F	1.50	1.50	1.50	0.00	0.20	1
L1011-200F	14.34	14.34	14.34	0.00	1.94	1
MD11-F	84.68	68.68	106.16	11.31	11.43	24
3 Engine Widebody Passenger	14.83	2.30	102.22	23.22	2.00	346
DC10-10	4.68	2.80	9.30	1.92	0.63	99
DC10-15	9.68	9.30	10.82	0.76	1.31	4
DC10-30	14.50	10.80	29.20	3.29	1.96	61
DC10-40	7.09	6.22	7.73	0.52	0.96	21
L1011-1/40s	3.26	2.30	5.20	0.83	0.44	57
L1011-100	4.81	3.80	6.50	1.12	0.65	11
L1011-200	7.19	5.62	8.37	1.19	0.97	11
L1011-250	14.13	13.82	14.76	0.48	1.91	6
L1011-50	4.06	3.59	5.77	0.49	0.55	21
L1011-500	9.51	8.50	9.80	0.44	1.28	19
MD11-P	81.32	67.74	102.22	7.17	10.98	36
4 Engine Narrowbody Freight	9.92	0.60	18.10	7.27	1.34	195
707-300C	0.60	0.60	0.60	0.00	0.08	10
707-300C SII	1.00	1.00	1.00	0.00	0.14	16
DC-8-50 Fs	1.75	1.75	1.75	0.00	0.24	12
DC-8-61Fs	2.40	2.40	2.40	0.00	0.32	15
DC-8-62Fs	3.00	3.00	3.00	0.00	0.41	25
DC-8-63Fs	7.46	6.19	9.04	0.65	1.01	25
DC-8-71Fs	16.50	16.50	16.50	0.00	2.23	44
DC-8-73Fs	18.10	18.10	18.10	0.00	2.44	48
4 Engine Narrowbody Passenger	4.50	0.10	25.23	2.80	0.61	108
707-100B JT3	0.20	0.20	0.20	0.00	0.03	1
707-100B JT3 SII	0.20	0.20	0.20	0.00	0.03	1
707-300pax	0.59	0.25	0.70	0.23	0.08	4
707-300pax SII	0.70	0.70	0.70	0.00	0.09	6
720s	0.10	0.10	0.10	0.00	0.01	5
Avro RJ85	25.23	25.23	25.23	0.00	3.41	1
BAe146-100	6.63	6.30	6.80	0.29	0.90	3
BAe146-200	9.50	8.40	12.10	1.08	1.28	17
BAe146-300	12.66	12.00	13.10	0.60	1.71	5
DC-8-50 pax	1.23	1.23	1.23	0.00	0.17	20
DC-8-63	4.75	4.75	4.75	0.00	0.64	15
DC8-61	2.20	2.20	2.20	0.00	0.30	11
DC8-62	2.80	2.80	2.80	0.00	0.38	15
DC8-71	12.50	12.50	12.50	0.00	1.69	1
DC8-72	10.00	10.00	10.00	0.00	1.35	2
DC8-73	14.00	14.00	14.00	0.00	1.89	1
4 Engine Widebody Freight	23.23	11.96	51.20	12.33	3.14	70
747-100F	13.09	11.96	16.73	1.00	1.77	39
747-200Fs	35.99	24.40	51.20	6.79	4.86	31

**Table 5-9 (Continued)**  
**Detail Supporting Table 5-1**  
**Detail Commercial Aircraft Values**  
**(Averages Weighted by Fleet)**

Economic Values Class	\$ Millions					
	(Column 1) Average Aircraft Value	(Column 2) Minimum Value	(Column 3) Maximum Value	(Column 4) Standard Deviation	(Column 5) Restoration Cost	(Column 6) Fleet Size
4 Engine Widebody Passenger	36.11	3.40	153.26	43.86	4.87	155
747-100pax	3.83	3.40	9.00	0.92	0.52	49
747-200B	18.42	8.40	32.70	7.68	2.49	58
747-200Combi	23.52	16.69	27.00	4.72	3.17	6
747-300	50.59	50.59	50.59	0.00	6.83	1
747-400	111.50	96.36	153.26	15.33	15.05	37
747-SP	6.07	5.33	6.52	0.57	0.82	4
Regional jet under 40 seats	NR	NR	NR	NR	NR	NR
Regional jet with 40-59 seats	15.98	14.06	18.14	1.35	2.16	72
Canadair CRJs	16.16	14.14	18.14	1.32	2.18	64
EMB-145	14.58	14.06	14.76	0.32	1.97	8
Regional Jet over 59 seats	NR	NR	NR	NR	NR	NR
Turboprops under 20 seats	1.75	0.20	4.53	1.27	0.24	929
1900C	1.94	1.28	2.51	0.44	0.26	160
1900D	3.80	2.89	4.53	0.42	0.51	202
Bandeirantes	0.58	0.47	0.78	0.08	0.08	44
Beech 99s	0.41	0.20	0.93	0.25	0.06	144
DHC6-100	0.44	0.37	0.48	0.04	0.06	22
DHC6-200	0.47	0.46	0.48	0.01	0.06	21
DHC6-300s	0.77	0.46	1.50	0.22	0.10	62
Do228	1.33	1.27	1.69	0.12	0.18	13
J31	0.92	0.52	1.40	0.16	0.12	131
J31/HP137 CENTURY3	0.20	0.20	0.20	0.00	0.03	2
J32	1.99	1.59	2.35	0.20	0.27	128
Turboprops under 20 seats Freight	0.88	0.75	1.07	0.07	0.12	242
CARAVAN	0.88	0.75	1.07	0.07	0.12	242
Turboprops with 20 or more seats	3.84	0.16	12.99	2.89	0.52	1,540
235-100	4.77	4.77	4.77	0.00	0.64	1
330-100	0.42	0.32	0.50	0.05	0.06	28
330-200	0.56	0.50	0.60	0.05	0.08	12
340A	2.63	2.09	3.50	0.35	0.36	91
340B	6.15	4.39	9.04	1.32	0.83	169
360-100	1.05	0.90	1.17	0.08	0.14	20
360-200	1.25	1.17	1.38	0.05	0.17	19
360-300	1.91	1.73	2.30	0.16	0.26	24
748-2B	0.78	0.78	0.78	0.00	0.11	2
ATP	5.57	4.16	7.30	0.85	0.75	14
ATR42-300s	5.94	4.48	7.84	0.86	0.80	96
ATR42-500	10.76	10.76	10.76	0.00	1.45	8
ATR72-200s	11.41	9.10	12.99	1.06	1.54	51
Brasllias	4.49	2.83	7.56	1.09	0.61	244
CASA 212s	0.57	0.28	0.85	0.15	0.08	38
Convair 580/600/640	0.50	0.50	0.50	0.00	0.07	89
DHC7	1.29	0.90	1.79	0.20	0.17	33
DHC8-100s	5.64	3.62	7.58	1.06	0.76	136
DHC8-200s	9.34	9.21	9.82	0.25	1.26	24
DHC8-300	8.90	6.58	7.21	0.45	0.93	2
Do328s	8.25	7.45	8.73	0.32	1.11	49
F27/FH227	0.60	0.20	2.39	0.71	0.08	78
J41	4.71	3.88	5.69	0.49	0.64	60
L188A	0.35	0.35	0.35	0.00	0.05	1
L188AF	0.80	0.80	0.80	0.00	0.11	7
L188C	0.70	0.70	0.70	0.00	0.09	6
L188CF	0.90	0.90	0.90	0.00	0.12	12
METRO 23	2.97	2.77	3.01	0.10	0.40	6
METRO 23 C26B	2.96	2.54	3.57	0.54	0.40	3
METRO II	0.31	0.16	0.50	0.08	0.04	68
METRO III	1.03	0.68	1.70	0.23	0.14	146
Saab 2000	11.95	11.95	11.95	0.00	1.61	3
Piston	NR	NR	NR	NR	NR	NR
<b>Total</b>	<b>12.58</b>	<b>0.10</b>	<b>153.26</b>	<b>17.14</b>	<b>1.70</b>	<b>8,169</b>

Source: GRA Aviation Specialists, Herndon, VA  
Column 1: Average aircraft value  
Column 2: Minimum value within the aircraft sample  
Column 3: Maximum value within the aircraft sample  
Column 4: Standard deviation of average aircraft value  
Column 5: Column 1 multiplied by 13.5%  
Column 6: Number of aircraft in fleet

**Table 5-10**  
**Detail Supporting Table 5-2**  
**Representative General Aviation Average Aircraft Values**  
**(Averages Weighted by Fleet)**

Aircraft	(Column 1) Economic Value Class	(Column 2) Average Aircraft Value (\$000)	(Column 3) Restoration Costs	(Column 4) Fleet Size
Piper Pa-28-140	1	25	7	4,540
Cessna 152	1	24	7	3,038
Cessna 150l	1	17	5	1,887
Cessna 150m	1	19	5	1,648
Piper Pa-18-150	1	44	13	1,432
Cessna 140	1	14	4	1,402
Aeronca 7ac	1	17	5	1,237
Cessna 150g	1	16	5	1,165
Cessna A188b	1	40	12	853
Cessna 172m	2	38	11	3,879
Cessna 172n	2	50	15	3,594
Piper Pa-28-180	2	35	10	3,320
Cessna 182p	2	62	18	2,007
Beech A36	2	172	50	1,913
Piper Pa-28-181	2	57	16	1,710
Mooney M20j	2	80	23	1,589
Cessna 172	2	25	7	1,561
Piper Pa-28r-200	2	46	13	1,559
Cessna 182q	2	78	23	1,508
Piper Pa-23-250	3	58	14	1,234
Beech 58	3	212	51	882
Piper Pa-30	3	50	12	853
Piper Pa-34-200t	3	91	22	735
Cessna 310r	3	131	31	600
Cessna 414a	3	320	77	594
Cessna 421c	3	335	80	529
Piper Pa-34-200	3	58	14	508
Antonov An-2	4	18	5	1
Cessna 402b	5	155	37	127
Cessna 402c	5	280	67	96
Beech D18s	5	59	14	61
Douglas Dc3c-R-1830-90c	6	163	39	23
Cessna 208b	8	910	149	242
Air Tractor Inc At-502	8	290	48	120
Ayres Corporation S2r-T34	8	225	37	106
Beech C90	9	635	104	404
Piper Pa-31t	9	560	92	234
Beech 65-90	9	325	53	115

Aircraft	(Column 1) Economic Value Class	(Column 2) Average Aircraft Value (\$000)	(Column 3) Restoration Costs	(Column 4) Fleet Size
Pilatus Aircraft Ltd Pc-12	10	2,100	344	13
Cessna 208	10	905	148	12
Beech 200	11	1,050	172	382
Beech B200	11	1,775	291	310
Beech E-90	11	705	116	162
Cessna 441	11	1,050	172	162
Cessna 425	11	925	152	141
Jetstream 4101	12	4,690	769	47
Embraer Emb-110p1	12	1,055	173	39
Cessna 550	14	1,900	312	302
Cessna 560	14	4,200	689	241
Gates Learjet Corp. 35a	14	2,600	426	240
Cessna 501	14	1,305	214	211
Cessna 650	14	5,300	869	208
Gulfstream Aerospace G-iv	15	21,000	3,444	268
Canadair Ltd Cl-600-2b16	15	14,150	2,321	160
Hawker Siddeley Hs.125 Series 700a	15	3,100	508	93
Dassault-Breguet Falcon 50	17	9,550	1,566	90
Dassault-Breguet Mystere Falcon N 900	17	18,700	3,067	56
Lockheed 1329-25 Jetstar II	17	2,200	361	29
Boeing 727-44	18	2,000	328	27
BAE/Bac 1-11 401/Ak	18	1,500	246	27
Dassault Aviation Falcon 2000	18	18,000	2,952	25
Robinson Helicopter R22 Beta	19	82	24	397
Hughes 269c	19	86	25	174
Hiller Uh-12e	19	50	15	82
Bell 206b	20	405	97	1,056
Hughes 369d	20	315	76	189
Bell Helicopter Textron 206l-1	20	495	119	152
McDonnell Douglas Helicopter 3 69e	20	500	120	122
Enstrom F-28c	21	70	20	14
Bell 206l-3	22	720	173	219
Bell 214st	22	4,760	1,142	132
Source: Aircraft Bluebook Price Digest (Spring 1997), op. cit. and detailed data from General Aviation and Air Taxi Activity and Avionics Survey, Calendar Year 1995, op. cit. Col 1: Economic Values Class aircraft is assigned based on characteristics published in GA Survey. Col 2: Value for average aircraft of this type as identified in the Bluebook. Col 3: Values from Table 5-4 multiplied by column 2 Col 4: Number of aircraft in active fleet as identified in the GA Survey.				

**Table 5-11**  
**Detail Supporting Table 5-6**  
**Average Military Aircraft Values By Type**  
**(Averages Weighted by Fleet)**

Type	(Column 1) Number in Fleet (12/96)	(Column 2) Estimated Aircraft Value (\$000,000)	(Column 3) Restoration Costs (\$000,000)	Type	(Column 1) Number in Fleet (12/96)	(Column 2) Estimated Aircraft Value (\$000,000)	(Column 3) Restoration Costs (\$000,000)
Boeing B-52H	94	\$21.2	\$2.86	Alenia c-27A	10	\$28.9	\$3.91
Northrop Grumman B-2A	15	\$939.4	\$126.82	Beech T-34C	272	\$1.6	\$0.22
Rockwell B-1B	95	\$178.6	\$24.11	Beech T-42A	14	\$28.9	\$3.91
Lockheed C-141B	144	\$66.5	\$8.98	Beech U-8F	48	\$28.9	\$3.91
Lockheed C-5A	84	\$53.7	\$7.25	Grumman C-2A	38	\$28.2	\$3.81
Lockheed C-5B	50	\$151.8	\$20.49	Grumman E-2C	91	\$70.9	\$9.57
McDonnell Douglas C-17A	22	\$135.8	\$18.33	Grumman OV-1D	59	\$0.7	\$0.09
McDonnell Douglas KC-10A	59	\$87.3	\$11.78	Lock Martin C-130 A-E	622	\$44.3	\$5.98
Boeing C-135A/B/C/E	15	\$66.5	\$8.98	Lock Martin C-130-OTHER	91	\$44.3	\$5.98
Boeing EC-135	15	\$66.5	\$8.98	Lockheed ES-3A	16	\$28.9	\$3.91
Boeing KC-135E/R	551	\$66.5	\$8.98	Lockheed Martin KC-130F/RT	183	\$42.3	\$5.71
Boeing RC-135	19	\$66.5	\$8.98	Lockheed Martin P-3C	263	\$51.2	\$6.91
Boeing E-3B/C	34	\$167.9	\$22.66	Lockheed S-3B	119	\$20.1	\$2.72
Boeing E-6A	16	\$174.6	\$23.57	Raytheon C-12	199	\$3.8	\$0.51
OTHER	37	\$66.5	\$8.98	Raytheon RC-12	134	\$3.8	\$0.51
Turbojet/fan 3+ engines	1250	\$91.0	\$12.28	Raytheon RU-21	107	\$3.8	\$0.51
McDD/BA AV-8B Harrier 2	201	\$40.9	\$5.52	Raytheon T-44A	57	\$2.2	\$0.29
McDonnell Douglas F/A-18	1039	\$57.8	\$7.80	OTHER	48	\$28.9	\$3.91
Fairchild A-10A	380	\$10.7	\$1.45	Turboprop	2371	\$29.7	\$4.00
Lock Martin F-16A/B	225	\$20.7	\$2.79	Slingsby T-3A/Piston	91	\$0.1	\$0.02
Lock Martin F-16C/D	1039	\$20.7	\$2.79	Bell AH-1E/F/H/P/S	929	\$12.3	\$1.66
Lockheed F-117A	52	\$54.7	\$7.38	Bell AH-1W	140	\$12.3	\$1.66
McDonnell Douglas F-15A/B/C/D	726	\$26.9	\$3.63	Bell HH-1H	58	\$2.7	\$0.36
McDonnell Douglas F-15E	204	\$39.3	\$5.31	Bell OH-58A-C	1517	\$8.6	\$1.16
Gen Dyn F-111	135	\$7.5	\$1.02	Bell OH-58D	289	\$8.6	\$1.16
Grumman F-14	361	\$43.9	\$5.93	Bell TH-57	129	\$8.4	\$1.13
McDonnell Douglas F-4	196	\$4.8	\$0.65	Bell TH-67A	82	\$8.4	\$1.13
McDonnell Douglas T-45A	44	\$26.4	\$3.56	Bell UH-1B/H/V	2872	\$0.6	\$0.08
Northrop F-5	45	\$6.7	\$0.91	Bell UH-1N	159	\$0.6	\$0.08
OTHER	16	\$25.2	\$3.40	Boeing CH-46	499	\$4.6	\$0.62
Turbojet/fan Attack/Fighter	4663	\$31.9	\$4.30	Boeing CH-47C/D	430	\$17.5	\$2.36
Gulfstream C-20	20	\$29.0	\$3.92	Hughes OH-6A	229	\$0.3	\$0.04
Learjet C-21	83	\$5.6	\$0.76	Kaman SH-2F/G	26	\$8.1	\$1.09
McDonnell Douglas C-9A/C	52	\$29.0	\$3.92	McDonnell Douglas AH-64A	755	\$11.0	\$1.49
Rockwell CT-39E/G Sabreliner	12	\$5.2	\$0.70	McDonnell Douglas AH-6C/G	60	\$0.3	\$0.04
Rockwell T-39	23	\$5.2	\$0.70	Sikorsky CH-53D	496	\$26.5	\$3.57
Grumman A-6	185	\$33.6	\$4.53	Sikorsky SH-3H	40	\$1.3	\$0.18
Lockheed U-2R/RT	37	\$32.2	\$4.35	Sikorsky SH-60B	1617	\$13.8	\$1.86
Boeing T-43A	14	\$10.1	\$1.36	Sikorsky VH-3D11	11	\$8.4	\$1.13
McDonnell Douglas TAV-8B	17	\$28.7	\$3.88	Other	16	\$8.4	\$1.13
Raytheon T-1A	132	\$5.4	\$0.73	Rotary Aircraft total	10354	\$8.4	\$1.13
Rockwell T-2B/C	111	\$0.7	\$0.09	Sources: See text at section 5.4.1			
Cessna T-37B	488	\$0.3	\$0.05	Column 1: Estimated number of each aircraft type in military service			
Northrop T-38	497	\$2.7	\$0.36	Column 2: Estimated value per aircraft			
OTHER	3	\$7.8	\$1.06	Column 3: Average restoration value- Column 2 value multiplied by 13.5 percent			
Turbojet/fan Other	1674	\$7.8	\$1.06				

## SECTION 6: INTERNET CATALOGUE OF MODELS AND DATABASES

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To supplement this and other publications devoted to the economic evaluation of FAA investment and regulatory programs, the FAA's Office of Aviation Policy and Plans (APO) maintains a catalogue of models and databases, and other analytical toolkits on the internet. The address of the homepage for this catalogue is [http://api.hq.faa.gov/apo\\_home.htm](http://api.hq.faa.gov/apo_home.htm). As of the date of this report, the catalogue, is organized under the following categories:

<u>Models</u>	<u>Databases</u>
Capacity/Delay	Capacity/Delay
Economic	Economic/Financial
Environment	Inventories
Productivity	Registries
Safety	Regulation
Security	Safety
Miscellaneous	Security
	Traffic Activity
	Miscellaneous

The FAA/APO hopes that this site will facilitate the interchange of models and databases within the civil aviation community. In addition to serving as a central location of aviation related models and databases, APO wants to work with developers and users of models and databases, at FAA and elsewhere, to produce standards for documentation that will facilitate their exchange and use. Developers and users are encouraged to submit models and databases to the webmaster.



## APPENDIX A: ADJUSTMENT METHODOLOGY TO UPDATE ECONOMIC VALUES

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### A.1 INTRODUCTION

The values developed in this report are expected to change with the passage of time because of price and income level movements, aviation industry changes, advances in theoretical and empirical research, and policy changes. This report will be revised periodically to account for such changes and advancements. Between revisions, interim updates for passenger related values will be provided by the Office of Aviation Policy and Plans based upon guidance furnished by the Office of the Secretary of Transportation. For aircraft related values, users may adjust the 1996 base year aircraft related values to future year values utilizing the recommendations outlined in this appendix.

### A.2 AIRCRAFT CAPACITY AND UTILIZATION FACTORS

These values, developed in Section 3, are based on the physical makeup and operation of the fleet. No economic index approach can be used to easily update these values, as there is no known correlation between the sundry values and general economic indexes.

We note that if revisions or projections of these values are required, the annual *FAA Aviation Forecasts* series provides many of the aggregate air carrier and general aviation values for capacity and utilization. The following are available for scheduled commercial air carriers (both Form 41 and Form 298C) directly from the annual Forecast:

- Passenger load factor (RPMs/ASMs)
- Passenger capacity
- Total flight hours
- Daily utilization (airborne hours/(aircraft x 365))

Flight hours are also available for GA and air taxi operations from this same source.

The analyst can also use the primary data sources to update capacity and utilization factors. Form 41 and Form 298C data are available from the Bureau of Transportation Statistics of the U.S. DOT and are also made available by various commercial services including Data Base Products (Dallas, TX) and Backe Associates (Stamford, CT). The best source of data for the GA and military fleets is the FAA's annual *General Aviation and Air Taxi Activity and Avionics Survey*.

### A.3 AIRCRAFT OPERATING COSTS

Aircraft operating costs, developed in Section 4, should be updated either by reference to the cited sources or by use of price indexes. Use of source data can be expected to be the most accurate approach, particularly when updating values for specific aircraft models. The price index approach has the advantage of being much less time and resource intensive.

The original data sources as cited in the text are:

- For commercial operations: Form 41 and Form 298C data from the sources cited above
- For GA and air taxi operations, *The Aircraft Cost Evaluator* published by Conklin and deDecker (Orleans, MA)
- For military operations, the various web sites indicated in the text.

The alternative approach is to adjust the 1996 data presented in the text for price and cost changes. This should be done separately for fuel costs and all other operating cost components.

For commercial operators, the *FAA Aviation Forecasts* has sufficient data to develop general updates to operating costs. The main body of the Forecast book documents annual changes in operating costs (except fuel) expressed in cents per available seat mile. These values can be used as an index of operating costs (excluding fuel) for the industry using the methodology described below.

Since fuel is such an important and variable part of commercial costs, these should be adjusted to future year dollar values by use of published fuel price indexes. The annual *FAA Aviation Forecasts* provides fuel indexes, including projections of these indexes into the future.

Data to update general aviation and military costs are much more sparse. The fuel indexes from *FAA Aviation Forecasts* should be used to update the fuel cost component of general aviation operating cost. In the absence of better data, it is recommended that other GA operating costs and all military costs be updated using the *Price Index for Gross Domestic Product Personal Consumption Expenditures*.<sup>1</sup>

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<sup>1</sup> *Business Statistics of the United States* (Annual: Berman Press; Lanham, MD) or for the latest update on the Worldwide Web, go to <http://www.bea.doc.gov> and select *GDP and Related Data*.

Regardless of the source of update information, the following equation may be used:

$$(P_f/P_b) \times C_b = \text{Adjusted Aircraft Operating Cost}$$

where:

$P_f$  and  $P_b$  are the prices in the future year and base year, and  
 $C_b$  is the cost per block or airborne hour of operation in the base year.

It is recommended that updated operating costs per hour be rounded to the nearest dollar.

#### **A.4 UNIT REPLACEMENT AND RESTORATION COSTS OF DAMAGED AIRCRAFT**

Unit replacement and restoration costs of damaged aircraft, developed in Section 5, should be updated by either specific reference to cited sources, or by applying a price index. As with aircraft operating costs, use of source data can be expected to be the most accurate approach, particularly with respect to specific aircraft models. The price index approach is much less time and resource intensive.

For commercial aircraft, there are a number of vendors that provide estimates of aircraft values, including:

GRA Aviation Specialists (Reston, VA)  
Avitas (Reston, VA)  
Avmark (Arlington, VA)

For general aviation and air taxi aircraft, the best source of updated price data is *Aircraft Bluebook – Price Digest* (Overland Park, KS: Intertec Publishing). Updates on military values can be found in *Aviation and Aerospace Almanac* (Washington, DC: Aviation Week Group Newsletters).

In the absence of a more specific index, it is suggested that the *Producer Price Index for Civilian Aircraft*<sup>2</sup> be used to adjust aircraft replacement and restoration costs to future year dollars. The adjustment method is illustrated below:

$$(PPI-CA_f/PPI-CA_b) \times (REP_b) = \text{Adjusted Unit Replacement Cost of a Damaged Aircraft}$$

where:

PPI-CA<sub>f</sub> and PPI-CA<sub>b</sub> are the Producer Price Index for Civilian Aircraft for the future year and base year, and

REP<sub>b</sub> is the unit replacement cost of a destroyed aircraft in the base year.

With regard to restoration costs, it is recommended that the restoration percentages of aircraft values shown in Table 5-4 be applied to updated aircraft values developed using the methods described immediately above.

It is recommended that adjusted aircraft replacement and restoration costs be rounded to the nearest \$1,000 for values less than \$1,000,000 and to the nearest \$10,000 for values greater than \$1,000,000.

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<sup>2</sup> *Business Statistics of the United States* (Annual: Berman Press; Lanham, MD) or for the latest update on the Worldwide Web, go to <http://stats.bls.gov>, and select *Producer Price Index—Commodities*.

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