4. AIRCRAFT OPERATING COSTS

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 concern 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 or lower fares or taxes. Fixed aircraft costs may also be important in evaluating the effects of FAA investment and regulatory programs that affect fleet size, cause aircraft to be more productive, or cause aircraft to be out of service for extended periods of time.

To put airline costs in perspective, this section first shows the relationship of aircraft operating costs to total airline operating costs and then presents another disaggregation of total airline costs. After this, aircraft operating costs are presented in more detail. Costs in this section are shown for air carrier, general aviation and military equipment types. Data are presented for aircraft categories identical to those in Section 3 above.

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.[1] Fixed costs show little or no change in proportion to changes in activity. For example, in the short-term, a change in activity may not affect an operator's decision about a specific aircraft or fleet of aircraft. In the longer-term, the operator could change its fleet and ownership costs.

There are two estimates of fixed costs provided. The first is fixed accounting charges including depreciation, insurance, and rental charges reported by carriers in Form 41, or which have been estimated for GA aircraft. The second 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 removed 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.

4.1.1. Average versus Incremental Cost

By necessity, the operating cost data presented in this chapter represent average costs. Cost categories such as ownership costs are reported separately so they can be included or excluded in a specific analysis. However, economists typically look at the concept of incremental costs (i.e., the changes in costs from small changes in levels of activity). Incremental costs may

[1] Some analysts assume that crew costs are fixed in the short run; this is especially the case for entities that operate one or a small number of aircraft.

differ from the average costs used in this chapter, but the data from Form 41 and other sources using average costs are well-accepted industry standards. Analysts are cautioned, however, that average costs may not always be the most appropriate measure.

4.1.2. Change in Industry Structure and Implications for Airline Operating Cost Trends

The U.S. airline industry has undergone considerable restructuring since the previous Economic Values update was published in 2015. The demand for air travel grew rapidly between 2014 and 2018. The price of jet fuel fell from 2014 to 2015, and then started to increase around 2016. Furthermore, U.S. airlines made record profits, paid down debts, accomplished some large-scale mergers—American/US Airways, Alaska/Virgin America—and made significant changes in operating practices. The merged airlines provided their customers with a broader network and better services while Alaska and Virgin America swapped their aircraft to optimize usage by their route structure.

U.S. airlines increased capacity, retired fuel-inefficient aircraft types and have maintained a sharp focus on profitability. A small number of major carriers now provide the majority of airline service in the country, although a number of ultra-low-cost carriers have developed that focus on point-to-point service with fares and costs substantially less than the major carriers. Because the Form 41 data represent aggregations across the industry, reported costs may not accurately depict actual costs for individual carriers.

4.1.3. Direct and Indirect Costs

Table 4-1 shows direct and indirect operating expenses for Group III air carriers.[2] As can be seen, direct costs are about 48 percent of total costs for major passenger air carriers and about 35 percent of total costs for all-cargo air carriers. The direct costs will be examined in more detail later in this chapter. However, this table provides a perspective on overall carrier costs and the relative magnitudes of each category of costs. Industry costs for carriers filing Schedule P-7 of Form 41 totaled $166.4 billion for passenger air carriers and $44.7 billion for all-cargo air carriers in 2018. Overall, the average total operating cost per block hour for passenger air carriers was $8,916 and the average cost for all-cargo air carriers was $28,744 in 2018.

[2] Group III air carriers are those with annual revenues of more than $1 billion; direct and indirect costs are categories used on Schedule P.7 of Form 41.

Table 4-1: 2018 Group III Part 121 Air Carrier Costs – Direct and Indirect Costs

Cost Group	Cost Type	Passenger			All-Cargo		
		Cost (millions)	Share of Cost	Cost per Block Hour	Cost (millions)	Share of Cost	Cost per Block Hour
Direct	Aircraft Operating Expense	$79,305.1	48%	$4,250	$15,802.1	35%	$10,155
	Subtotal Direct Expenses	**$79,305.1**	**48%**	**$4,250**	**$15,802.1**	**35%**	**$10,155**
Indirect	Advertising and Promotion Expenses	$1,454.5	1%	$78	$109.9	0%	$71
	Aircraft Servicing Expenses	$9,713.5	6%	$521	$1,797.8	4%	$1,155
	Amortization (non-flight equipment)	$486.2	0%	$26	$14.6	0%	$9
	Depreciation Expense - Maintenance Equipment	$53.2	0%	$3	$169.9	0%	$109
	General and Administrative Expense	$15,055.7	9%	$807	$3,121.5	7%	$2,006
	Maintenance and Depreciation (ground equipment)	$3,128.0	2%	$168	$625.0	1%	$402
	Passenger Service Expenses	$13,743.0	8%	$736	$60.5	0%	$39
	Reservations and Sales Expenses	$7,913.8	5%	$424	$336.0	1%	$216
	Traffic Servicing Expenses	$14,035.2	8%	$752	$2,833.7	6%	$1,821
	Subtotal Service, Sales, and General Operating Expenses	**$65,583.1**	**39%**	**$3,515**	**$9,068.9**	**20%**	**$5,828**
	Transport Related Expenses	$21,492.6	13%	$1,152	$19,855.3	44%	$12,760
	Subtotal Indirect Expenses	**$87,075.7**	**52%**	**$4,666**	**$28,924.2**	**65%**	**$18,588**
Total Operating Expenses		**$166,380.8**	**100%**	**$8,916**	**$44,726.3**	**100%**	**$28,744**

Source: 2018 Form 41, Schedules P-7 and T-100

Table 4-2 shows air carrier costs per block hour by operating expense grouping.[3] These data are divided into passenger and all-cargo carriers and then into air carrier groups, as defined by DOT based on total annual operating revenue.[4] In general, all-cargo carriers have higher total block hour costs than passenger carriers. As can be seen, transport-related expenses are a large proportion of total costs for Group III carriers.

[3] The block hour data in Tables 4-1 and 4-2 are not directly comparable because Table 4-1 contains only Group III carriers, while Table 4-2 contains Group I, II and III carriers.

[4] Group III carriers have annual revenues of more than $1 billion; Group II carriers have annual revenues of more than $100 million; Group I carriers have annual revenues of less than $100 million.

Table 4-2: 2018 Part 121 Air Carrier Operating and Other Expenses per Block Hour by Expense Category and Carrier Group

Expense Category	Passenger			All-Cargo			Total Carriers
	Group III	Group II	Group I	Group III	Group II	Group I	
Aircraft and Traffic Handling Personnel	$405	$67	$206	$819	$104	$320	$402
Flight Personnel	$1,090	$394	$1,049	$1,340	$963	$868	$1,066
General Management Personnel	$28	$23	$260	$240	$71	$188	$36
Maintenance Labor	$177	$95	$383	$607	$589	$391	$193
Other Personnel	$390	$55	$92	$614	$200	$291	$381
Total Salaries	**$2,089**	**$634**	**$1,990**	**$3,618**	**$1,928**	**$2,058**	**$2,078**
Total Fringe Benefits	$836	$103	$159	$1,336	$738	$831	$826
Total Salaries and Benefits	**$2,926**	**$738**	**$2,149**	**$4,954**	**$2,666**	**$2,889**	**$2,904**
Amortization	$50	$10	$149	$2	$45	$2	$46
Depreciation	$449	$104	$633	$1,161	$431	$393	$459
Landing Fees	$171	$14	$285	$331	$75	$122	$170
Materials	$2,168	$236	$3,466	$4,905	$1,812	$2,982	$2,182
Other	$170	$201	$2,595	$1,313	$91	$368	$218
Rentals	$459	$305	$666	$1,333	$560	$1,085	$487
Services	$1,371	$331	$1,029	$1,985	$1,591	$1,146	$1,346
Transport Related Expenses	$1,152	$0	$0	$12,760	$3,361	$527	$1,546
Total Operating Expenses	**$8,916**	**$1,939**	**$10,972**	**$28,744**	**$10,632**	**$9,514**	**$9,359**
Total Other Expenses (Income)	($128)	($51)	($309)	$41	($76)	$4	($117)
Total Expenses	**$8,789**	**$1,887**	**$10,663**	**$28,785**	**$10,556**	**$9,517**	**$9,242**

Source: 2018 Form 41, Schedules P-6, P-5.1 and T-100

4.2 CARRIER AIRCRAFT OPERATING COST DATA

Cost data for air carriers were derived from Bureau of Transportation Statistics (BTS) Form 41 data. The air carrier sub-groupings are based on the reporting requirements of 14 CFR Part 241, which prescribe reporting requirements for large certificated air carriers.[5] In some years, there could be additional air carrier groups for Part 135 carriers that are required to report financial and traffic data per 14 CFR Part 241.

Air carriers with total annual operating revenues of $100 million or more report aircraft operating costs on Schedule P-5.2 and air carriers with total annual operating revenue of less than $100 million report aircraft operating costs on Schedule P-5.1. The air carrier aircraft operating cost data are presented in four groups:

- Part 121 air carrier operations of passenger aircraft
  - Air carriers filing Schedule P-5.2[6]
  - Air carriers filing Schedule P-5.1[7]
- Part 121 air carrier operations of all-cargo aircraft
  - Air carriers filing Schedule P-5.2
  - Air carriers filing Schedule P-5.1

[5] Large certificated air carriers hold Certificates of Public Convenience and Necessity issued by the U.S. Department of Transportation authorizing the performance of air transportation with annual operating revenues of $20 million or more.

[6] Carrier groups II and III; large certificated air carriers with total annual operating revenues of $100 million or more.

[7] Carrier Group I: Total annual operating revenues of less than $100 million.

For air carriers filing Schedule P-5.2, variable costs are categorized as fuel and oil, maintenance, and crew. Fixed costs are categorized as depreciation, rentals, insurance, and other. Most of the cost categories are comprised of multiple items from Form 41 Schedule P-5.2. The composition of the cost categories is shown in Table 4-3.

Table 4-3: Air Carriers Filing Schedule P-5.2 Aircraft Operating Cost Categories

Variable Costs	
Economic Values Cost Category	**Form 41, Schedule P-5.2 Cost Item**
Fuel and Oil	Aircraft Fuel
	Aircraft Oil
	Taxes-Other than Payroll[1]
Maintenance	Labor - Airframes
	Labor - Aircraft Engines
	Airframe Repairs - Outside
	Aircraft Engine Repairs - Outside
	Aircraft Interchange Charges
	Maintenance Materials - Airframes
	Maintenance Materials - Aircraft Engines
	Airworthiness Allowance Provision - Airframes
	Airframe Overhauls Deferred (credit)
	Airworthiness Allowance Provision - Aircraft Engines
	Aircraft Engine Overhauls Deferred (credit)
	Applied Maintenance Burden-Flight Equipment
	Net Obsolescence & Deterioration - Expendable Parts
Crew	Pilots and Copilots Salaries
	Other Flight Personnel
	Trainees and Instructors
	Personnel Expenses
	Employee Benefits and Pensions
	Taxes - Payroll

Fixed Costs	
Economic Values Cost Category	**Form 41, Schedule P-5.2 Cost Item**
Depreciation	Depreciation - Airframes
	Depreciation - Aircraft Engines
	Depreciation - Aircraft Parts
	Depreciation - Aircraft Engine Parts
	Depreciation - Other Flight Equipment
Rentals	Aircraft Interchange Charges
	Rentals
	Amortization Expense - Capital Leases - Flight Equip.
Insurance	Insurance Purchased
Other	Injuries, Loss and Damage[2]
	Other Expenses
	Other Supplies
	Professional and Technical Fees and Expenses

[1] Non-refundable fuel taxes

[2] Excess of losses over insurance recoveries

Air carriers filing Schedule P-5.1 are not required to report aircraft operating costs in as much detail as air carriers filing Schedule P-5.2. Variable costs are categorized as fuel and oil, maintenance, and crew. The only fixed cost category is depreciation, which includes rentals. The other category includes all other costs associated with flying operations and may contain both variable and fixed costs. Table 4-4 shows the relationship of Schedule P-5.1 cost items to the cost categories used in this report.

Table 4-4: Air Carriers Filing Schedule P-5.1 Aircraft Operating Cost Categories

Variable Costs	
Economic Values Cost Category	**Form 41, Schedule P-5.1 Cost Item**
Fuel and Oil	Aircraft Fuel and Oil
Maintenance	Maintenance - Flight Equipment
Crew	Pilots and Copilot

Fixed Costs	
Economic Values Cost Category	**Form 41, Schedule P-5.1 Cost Item**
Depreciation	Depreciation and Rental - Flight Equipment

Other Costs	
Economic Values Cost Category	**Form 41, Schedule P-5.1 Cost Item**
Other	Flying Operations - Other

Table 4-5 shows aggregate average aircraft operating cost per block hour and activity data for air carriers filing Schedules P-5.2 and P-5.1 in 2018. Carriers that filed Schedule P-5.1 represented a very small proportion of the air carrier industry.

Table 4-5: 2018 Summary Air Carrier Average Aircraft Operating Costs and Block Hours

	1	2	3	4	5	6	7	8	9
Aircraft Category	**Carriers Filing Schedule P-5.2**			**Carriers Filing Schedule P-5.1**			**Total Carriers**		
	Average Variable Costs per Block Hour	**Average Total Costs per Block Hour**	**Total Block Hours**	**Average Variable Costs per Block Hour**	**Average Total Costs per Block Hour**	**Total Block Hours**	**Average Variable Costs per Block Hour**	**Average Total Costs per Block Hour**	**Total Block Hours**
Wide-body more than 300 seats	$9,097	$10,351	220,210	NR	NR	NR	$9,097	$10,351	220,210
Wide-body 300 seats and below	$7,227	$8,285	2,091,230	NR	NR	NR	$7,221	$8,279	2,095,069
Four-engine wide-body	$10,007	$14,162	289,242	$6,440	$8,201	14,569	$9,836	$13,876	303,811
Three-engine wide-body	$11,938	$13,556	285,182	$4,304	$5,638	22,778	$11,373	$12,971	307,960
Two-engine wide-body	$7,125	$8,581	770,899	$1,822	$6,572	2,269	$7,110	$8,575	773,168
Narrow-body more than 160 seats	$4,096	$4,733	4,197,734	$6,746	$9,634	5,463	$4,100	$4,740	4,203,197
Narrow-body 160 seats and below	$3,512	$4,045	9,281,531	$3,781	$5,352	66,795	$3,514	$4,054	9,348,326
RJ more than 60 seats	$991	$1,388	3,565,900	$9,644	$14,758	1,240	$994	$1,392	3,567,140
RJ 60 seats and below	$1,044	$1,338	1,328,393	$1,792	$3,144	1,076	$1,045	$1,340	1,329,469
Turboprop more than 60 seats	$1,241	$1,785	116,701	$8,819	$10,864	7,099	$1,675	$2,306	123,800
Turboprop 20-60 seats	NR	NR	NR	$1,848	$3,282	4,700	$1,848	$3,282	4,700
Turboprop under 20 seats (Part 23)	$44	$796	93,751	$529	$909	1,762	$53	$798	95,513
Piston engine (Part 25)	NR	NR	NR	$2,199	$2,608	11	$2,199	$2,608	11
Piston engine (Part 23)	NR	$3,889	51,686	NR	NR	NR	NR	$3,889	51,686
Total	**$3,766**	**$4,432**	**22,292,459**	**$4,473**	**$6,174**	**127,762**	**$3,770**	**$4,442**	**22,420,221**

Source: 2018 Form 41, Schedules P-5.1, P-5.2 and T-100;
NR = Not Reported
Col 1: Average variable cost (weighted by block hours) for passenger and all-cargo carriers filing Schedule P-5.2
Col 2: Average total cost (weighted by block hours) for passenger and all-cargo carriers filing Schedule P-5.2
Col 3: Total block hours from Schedule T-100 for passenger and all-cargo carriers filing Schedule P-5.2
Col 4: Average variable cost (weighted by block hours) for passenger and all-cargo carriers filing Schedule P-5.1
Col 5: Average total cost (weighted by block hours) for passenger and all-cargo carriers filing Schedule P-5.1
Col 6: Total block hours from Schedule T-100 for passenger and all-cargo carriers filing Schedule P-5.1
Col 7: Average variable cost (weighted by block hours) for passenger and all-cargo carriers filing Schedules P-5.1 and P-5.2
Col 8: Average total cost (weighted by block hours) for passenger and all-cargo carriers filing Schedules P-5.1 and P-5.2
Col 9: Total block hours from Schedule T-100 for passenger and all-cargo carriers filing Schedules P-5.1 and P-5.2

Block hours are the common industry measure for presenting operating cost data and are used in this report. Tables are also provided on the APO website for costs broken down by airborne hours. Analysts using the data need to identify the appropriate value, block or airborne hours. (Section 6 discusses cost by phase of flight, which divides elapsed block times into component flight segments.) Variable costs include all aircraft operating cost elements, except rentals, depreciation and insurance. This provides an industry-wide perspective for passenger and all-cargo operators combined.

4.2.1. Part 121 Passenger and All-Cargo Air Carriers Filing Schedule P-5.2 Cost per Block Hour

Table 4-6 summarizes variable and fixed costs per block hour for Part 121 passenger air carriers that filed Schedule P-5.2. Total operating costs averaged $3,985 per block hour while variable costs averaged $3,420 per block hour. Variable costs accounted for an average of 86 percent of total costs. Narrow-body aircraft with 160 seats and below accounted for nearly one-half of activity, measured in block hours.

Table 4-6: 2018 Part 121 Passenger Air Carriers Filing Schedule P-5.2 Operating and Fixed Costs per Block Hours

	1	2	3	4	5	6	7	8	9	10	11
Aircraft Category	Cost per Block Hour										Block Hours
	Fuel and Oil	Maintenance	Crew	Total Variable	Depreciation	Rentals	Insurance	Other	Total Fixed	Total	
Wide-body more than 300 seats	$5,411	$1,331	$2,356	$9,097	$845	$406	$4	$1	$1,254	$10,351	220,210
Wide-body 300 seats and below	$4,080	$1,289	$1,857	$7,227	$685	$366	$4	$4	$1,058	$8,285	2,091,230
Narrow-body more than 160 seats	$2,054	$718	$1,152	$3,925	$355	$217	$3	$7	$582	$4,506	3,991,243
Narrow-body 160 seats and below	$1,741	$737	$1,034	$3,512	$306	$215	$5	$7	$533	$4,045	9,267,585
RJ more than 60 seats	$115	$431	$444	$991	$131	$252	$1	$13	$397	$1,388	3,565,900
RJ 60 seats and below	$92	$479	$470	$1,041	$58	$227	$1	$7	$293	$1,334	1,326,851
Turboprop more than 60 seats	$0	$880	$360	$1,241	$439	$103	$0	$2	$544	$1,785	116,701
All Aircraft	**$1,681**	**$727**	**$1,012**	**$3,420**	**$314**	**$239**	**$4**	**$7**	**$564**	**$3,985**	**20,579,720**

Source: 2018 Form 41 Schedule P-5.2 financial data and Schedule T-100 traffic data
Col 1: Fuel and Oil Costs (see Table 4-3) divided by total block hours
Col 2: Maintenance Costs (see Table 4-3) divided by total block hours
Col 3: Crew Costs (see Table 4-3) divided by total block hours
Col 4: Columns 1 + 2 + 3
Col 5: Depreciation Costs (see Table 4-3) divided by total block hours
Col 6: Rental Costs (see Table 4-3) divided by total block hours
Col 7: Insurance Costs (see Table 4-3) divided by total block hours
Col 8: Other Costs (see Table 4-3) divided by total block hours
Col 9: Columns 5 + 6 + 7 + 8
Col 10: Columns 4 + 9
Col 11: Total block hours reported on Schedule T-100

Table 4-7 reports operating cost data for Part 121 all-cargo air carriers filing Schedule P-5.2. Total operating costs averaged $10,051 per block hour while variable costs averaged $8,095 per block hour. Variable costs accounted for an average of 80 percent of total costs. Wide-body aircraft accounted for nearly 79 percent of activity, measured in block hours.

Table 4-7: 2018 Part 121 All-Cargo Air Carriers Filing Schedule P-5.2 Operating and Fixed Costs per Block Hours

	1	2	3	4	5	6	7	8	9	10	11
Aircraft Category	**Cost per Block Hour**										**Block Hours**
	Fuel and Oil	**Maintenance**	**Crew**	**Total Variable**	**Depreciation**	**Rentals**	**Insurance**	**Other**	**Total Fixed**	**Total**	
Four-engine wide-body	$5,654	$2,347	$2,007	$10,007	$679	$3,428	$24	$23	$4,154	$14,162	289,242
Three-engine wide-body	$4,882	$4,754	$2,302	$11,938	$1,138	$255	$21	$205	$1,619	$13,556	285,182
Two-engine wide-body	$3,035	$1,986	$2,104	$7,125	$849	$448	$28	$131	$1,456	$8,581	770,899
Narrow-body more than 160 seats	$2,340	$2,848	$2,219	$7,407	$1,397	$177	$31	$110	$1,714	$9,121	206,491
Narrow-body 160 seats and below	$1,322	$566	$1,567	$3,455	$288	$0	$46	$174	$508	$3,963	13,946
RJ 60 seats and below	$1,188	$1,747	$1,003	$3,938	$635	$0	$85	$37	$758	$4,696	1,542
Turboprop under 20 seats (Part 23)	$0	$44	$0	$44	$56	$696	$0	$0	$752	$796	93,751
Piston engine (Part 23)	NR	NR	NR	$0	$383	$3,336	$170	$0	$3,889	$3,889	51,686
All Aircraft	**$3,535**	**$2,509**	**$2,011**	**$8,055**	**$872**	**$983**	**$30**	**$112**	**$1,996**	**$10,051**	**1,712,739**

Source: 2018 Form 41 Schedule P-5.2 financial data and Schedule T-100 traffic data;
NR = None Reported
Col 1: Fuel and Oil Costs (see Table 4-3) divided by total block hours
Col 2: Maintenance Costs (see Table 4-3) divided by total block hours
Col 3: Crew Costs (see Table 4-3) divided by total block hours
Col 4: Columns 1 + 2 + 3
Col 5: Depreciation Costs (see Table 4-3) divided by total block hours
Col 6: Rental Costs (see Table 4-3) divided by total block hours
Col 7: Insurance Costs (see Table 4-3) divided by total block hours
Col 8: Other Costs (see Table 4-3) divided by total block hours
Col 9: Columns 5 + 6 + 7 + 8
Col 10: Columns 4 + 9
Col 11: Total block hours reported on Schedule T-100

4.2.2. Part 121 Passenger and All-Cargo Air Carriers Filing Schedule P-5.1 Cost Per Block Hour

Table 4-8 presents operating cost per block hour data for Part 121 passenger air carriers filing Schedule P-5.1. These carriers report in a different format than the carriers that file Schedule P-5.2. The composition of the "other" category is unknown, so it cannot be classified as either variable or fixed costs. The average total cost per block hour was $5,636, while the variable cost per block hour was $3,561.

Table 4-8: 2018 Part 121 Passenger Air Carriers Filing Schedule P-5.1 Operating and Fixed Costs per Block Hours

	1	2	3	4	5	6	7	8	9
Aircraft Category	Cost per Block Hour								Block Hours
	Fuel and Oil	Maintenance	Crew	Variable Costs	Depreciation and Rentals	Fixed Costs	Other Variable and/or Fixed Costs	Total	
Narrow-body more than 160 seats	$6,470	$2,105	$301	$8,876	$2,086	$2,086	$3,252	$14,215	2,313
Narrow-body 160 seats and below	$1,621	$873	$565	$3,059	$777	$777	$1,012	$4,849	39,553
RJ more than 60 seats	$4,649	$2,804	$2,191	$9,644	$2,932	$2,932	$2,182	$14,758	1,240
All Aircraft	**$1,969**	**$995**	**$597**	**$3,561**	**$910**	**$910**	**$1,166**	**$5,636**	**43,106**

Sources: 2018 Form 41 financial data and T-100 traffic data
Col 1: Fuel and Oil Costs (see Table 4-4) divided by total block hours
Col 2: Maintenance Costs (see Table 4-4) divided by total block hours
Col 3: Crew Costs (see Table 4-4) divided by total block hours
Col 4: Columns 1 + 2 + 3
Col 5: Depreciation and Rental Costs (see Table 4-4) divided by total block hours
Col 6: Same as Column 5
Col 7: Other Variable and/or Fixed Costs (see Table 4-4) divided by total block hours
Col 8: Columns 4 + 6 + 7
Col 9: Total block hours reported on Schedule T-100

Table 4-9 presents similar data for Part 121 all-cargo air carriers filing Schedule P-5.1. The average total aircraft cost per block hour was $6,448, while the average variable cost per block hour was $4,938. Narrow-body aircraft with the equivalent of 160 seats and below accounted for nearly 32 percent of the total block hours.

Table 4-9: 2018 Part 121 All-Cargo Air Carriers Filing Schedule P-5.1 Operating and Fixed Costs per Block Hours

	1	2	3	4	5	6	7	8	9
Aircraft Category	Cost per Block Hour								Block Hours
	Fuel and Oil	Maintenance	Crew	Variable Costs	Depreciation and Rentals	Fixed Costs	Other Variable and/or Fixed Costs	Total	
Four-engine wide-body	$2,437	$2,475	$1,528	$6,440	$1,183	$1,183	$578	$8,201	14,569
Two-engine wide-body	$17	$889	$916	$1,822	$4,181	$4,181	$569	$6,572	2,269
Narrow-body 160 seats and below	$1,984	$1,632	$1,212	$4,828	$861	$861	$395	$6,083	27,242
Turboprop more than 60 seats	$2,209	$3,850	$2,761	$8,819	$1,609	$1,609	$435	$10,864	7,099
Turboprop 20-60 seats	$669	$146	$1,033	$1,848	$1,295	$1,295	$140	$3,282	4,700
Turboprop under 20 seats (Part 23)	$188	$150	$191	$529	$326	$326	$54	$909	1,762
Piston engine (Part 25)	$302	$1,376	$521	$2,199	$0	$0	$407	$2,606	11
All Aircraft	**$1,944**	**$1,740**	**$1,255**	**$4,938**	**$1,098**	**$1,098**	**$412**	**$6,448**	**84,656**

Sources: 2018 Form 41 financial data and T-100 traffic data
Col 1: Fuel and Oil Costs (see Table 4-4) divided by total block hours
Col 2: Maintenance Costs (see Table 4-4) divided by total block hours
Col 3: Crew Costs (see Table 4-4) divided by total block hours
Col 4: Columns 1 + 2 + 3
Col 5: Depreciation and Rental Costs (see Table 4-4) divided by total block hours
Col 6: Same as Column 5
Col 7: Other Variable and/or Fixed Costs (see Table 4-4) divided by total block hours
Col 8: Columns 4 + 6 + 7
Col 9: Total block hours reported on Schedule T-100

4.3 GENERAL AVIATION OPERATING COSTS

4.3.1. Data Sources for Operating Costs

The source for the variable and fixed operating costs for general aviation aircraft was *The Aircraft Cost Evaluator*, published by Conklin & de Decker.[8] Costs assume an operator of one or two aircraft of a given model, and do not reflect lower prices which may be available through bulk purchases. The following variable cost categories were obtained from *The Aircraft Cost Evaluator* for use in this study:

- Fuel & Oil
  - Fuel (assuming fuel price of $5.13 per gallon for avgas and $4.73 for turbine fuel (Jet A)—costs based on a Conklin & de Decker survey of FBOs (Fixed Base Operators) at major general aviation airports in the United States
  - Fuel Additives
  - Lubricants
- Maintenance
  - Maintenance Labor
  - Parts Airframe/Engine/Avionics

[8] Conklin & de Decker, *The Aircraft Cost Evaluator* (Chicago, IL, 2018. Version 18.2.0).

    - Engine Restoration
    - Thrust Reverser Overhaul
    - Propeller Overhaul
    - APU Overhaul
    - Dynamic Components/Life Limited Parts
- Crew Salaries[9] (based on *NBAA Salary Survey* and other sources)
    - Captain
    - Co-pilot
    - Flight Engineer/Other
    - Benefits

Maintenance labor costs represent the average cost of routine, scheduled, and unscheduled maintenance labor. Labor hours are based on data from operator experience, manufacturer's data and surveys. Crew salaries are derived for each aircraft type from a recognized pilot salary survey, and benefits are typically an additional 30 percent of wages. Salaries are counted for the entire crew, which depending on the aircraft type can consist of a captain, copilot and flight engineer. Crew salaries and benefits are divided by Conklin & de Decker's estimated annual flight hours for that model in order to obtain hourly crew costs. *The Aircraft Cost Evaluator* also provided the following fixed costs:

- Hangar Rental
- Insurance
    - Hull
    - Single Limit Liability
- Miscellaneous Overhead
    - Recurrent Training
    - Aircraft Modernization
    - Navigation Chart Services
    - Refurbishing
    - Computerized Maintenance Management Program
    - Weather Service
    - Other Fixed Cost
    - Fractional Cost/Year + Tax

The Aircraft Cost Evaluator provides different cost categories based on the type of operation for which an aircraft is used. It was assumed that piston and turboprops (categories 1-4) are used in business operations; turbojets (category 5) are used in corporate operations; piston engine rotorcraft (category 6) are used in utility operations; and turbine rotorcraft engine (categories7 and 8) are used in commercial operations. Business operating costs from Conklin & de Decker assume that the aircraft is owner-flown and therefore no crew salaries are included as costs. However, for the purposes of economic analysis, the costs of a pilot's time should be considered.

[9] Conklin & de Decker (C&D) classify crew costs as fixed in *The Aircraft Cost Evaluator*. As noted earlier in this section, whether crew costs are best considered fixed or variable depends on the nature of the operation and the employment arrangements. GRA converted annual salary and benefit costs to an hourly rate by dividing them by C & D's utilization rate (annual hours flown), on a per-model basis.

For piston engine aircraft (both airplanes and rotorcraft), air taxi hours are a small percentage of total hours flown. Therefore, all piston engine airplanes and rotorcraft use an hourly crew cost equal to the value of Intercity Business air travel time, or $63.20[10] per hour.

4.3.2. Depreciation

In order to reflect general aviation aircraft ownership costs, estimates based on replacement costs were developed for this report. Depreciation is a significant component of the fixed costs for general aviation aircraft. In this report we use Conklin & de Decker's market-based depreciation values, which assume that aircraft lose a fixed percentage of their original purchase price each year, with no residual value. The percentage used varies by aircraft type, as follows:

- Jets: 4%
- Rotorcraft: 5%
- Turboprops and Pistons: 6%

Table 4-10 summarizes general aviation aircraft operating cost per flight hour by each of the economic values categories. While the average total cost per hour is about $1,600, it ranges from about $490 per hour to over $5,900 per hour, depending on the size, complexity and age of the aircraft within each group. Average variable costs per hour including flight crews are $930, while they are $708 per hour if crew costs are not counted.

[10] DOT, Office of Economic and Strategic Analysis, *Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis* (Washington, DC, September 27, 2016).

Operating costs in this report

In previous editions of this report, GRA was provided with the response records from the FAA's General Aviation and Air Taxi Survey, minus any Personally Identifiable Information (PII) such as name, address, etc. From these records, hours per use by model could be summed and combined with operating costs to produce Tables 4-10 and 4-11. For the 2017 Survey, GRA was not permitted to obtain detailed survey records, due to concerns about respondent privacy. GRA did receive summary information by model, but this was restricted to models with 40 or more survey responses (also due to privacy concerns). Since this excluded most models for which costs were available, it was decided that this data might not be representative of the GA fleet, nor comparable to previous editions of this report.

The following workarounds were used:
Table 4-10: Instead of weighting aircraft models by hours flown, they were weighted by counts of aircraft in the FAA's Aircraft Registry[11]

Table 4-11: Hours by use from the 2013 Survey response records were recombined into the Aircraft Categories used in this report, and costs were indexed from 2014 dollars to 2018 dollars using the Producer Price Index (PPI) for Nonscheduled Air Transportation.[12] The PPI exhibited a Compound Annual Growth Rate (CAGR) of 0.6% from 2014 to 2018.

[11] Aircraft Registration - Releasable Aircraft Database Download, 2017
[12] Bureau of Labor Statistics. PPI industry data for Nonscheduled air transportation, not seasonally adjusted. BLS Data Viewer

Table 4-10: GA and Air Taxi Operating and Fixed Costs ($2018) (Weighted by Population)

		1	2	3	4	5	6	7	8	9	10
Aircraft Category	**Certifi-cation**	**Crew**	**Fuel & Oil**	**Maintenance**	**Variable Operating Costs (Including Crew)**	**Variable Operating Costs (Excluding Crew)**	**Annual Fixed Cost Other (Without Depreciation)**	**Annual Depreciation**	**Fixed Cost Per Hour**	**Total Cost Per Hour (Including Crew)**	**Average Annual Hours**
Piston engine airplanes, one-engine	Part 23	$63	$84	$90	$237	$174	$19,788	$18,840	$248	$485	162
Piston engine airplanes, multi-engine	Part 23	$63	$200	$216	$479	$416	$27,867	$23,238	$411	$890	125
Turboprop airplanes, one-engine	Part 23	$132	$290	$333	$755	$623	$86,895	$153,303	$435	$1,190	631
Turboprop airplanes, multi-engine	Part 23/25	$268	$561	$731	$1,561	$1,292	$102,687	$155,238	$604	$2,164	456
Turbojet/turbofan airplanes	Part 23/25	$911	$1,297	$1,411	$3,619	$2,708	$237,395	$721,790	$2,256	$5,875	442
Rotorcraft piston	Part 27/29	$63	$76	$116	$256	$192	$32,271	$28,366	$126	$381	496
Rotorcraft turbine, one-engine	Part 27/29	$232	$209	$416	$858	$625	$145,160	$155,505	$653	$1,510	460
Rotorcraft turbine, multi-engine	Part 27/29	$312	$436	$992	$1,740	$1,428	$245,970	$345,381	$1,463	$3,203	424
Other		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft--Weighted Averages		**$223**	**$328**	**$380**	**$930**	**$708**	**$71,844**	**$154,472**	**$641**	**$1,572**	**264**

Sources: GRA analysis of FAA's 2017 Aircraft Registration Database, Conklin & de Decker's Aircraft Cost Evaluator (v18.2.0, 2018).
NR = Not Reported
Col 1: Crew: for piston engine airplanes and piston rotorcraft, crew cost = value of time = $63.20; for other categories, crew cost includes salaries and benefits, divided by annual utilization hours, as reported by Conklin and deDecker
Col 2: Fuel, oil and additives used per hour, with fuel at $5.13 per gallon for pistons and $4.73 per gallon for all other economic values groups
Col 3: Total Maintenance cost, including labor, parts, engine allowances, propeller/thrust reverser overhaul, and APU overhaul if applicable
Col 4: Columns 1 + 2 + 3
Col 5: Columns 2 + 3
Col 6: Annual fixed cost including hangar cost, insurance cost, training cost, services typically used by air taxi and commercial operators (e.g., Weather service, maintenance programs, etc.)
Col 7: Average annual aircraft depreciation using Conklin and de Decker Market depreciation rates: 4% annually for turbojet/turbofan, 5% annually for rotorcraft and 6% annually for piston and turboprop
Col 8: Fixed Cost per hour, assuming hours of utilization reported in Column 10 = (Column 6 + Column 7)/Column 10
Col 9: Total Cost per Hour: Column 4 + Column 8
Col 10: Average (weighted) annual hours of utilization for each Category

Table 4-11 shows variable and total aircraft operating costs for aircraft under the various parts of the operating regulations. Among Economic Values Categories, Part 125 aircraft have the highest total cost per hour ($8,587) because they are much larger than the aircraft in other groups. Part 91 costs per hour ($1,266) are a little less than one-half of the costs per flight hour ($2,749) for Part 135 aircraft operations.

Calculation of costs by operating rule part

- For each aircraft, multiply variable and total costs by the number of hours it operated under uses corresponding to each of the operating rule parts.
- Sum these products by Aircraft Category, producing a single value for each cost element, for each operating rule part.
- Divide these sums by the total hours flown by aircraft in that Aircraft Category under that operating rule part.

That is, for each operating rule part, the mean of a cost element is calculated reflecting only the hours flown under that rule part, not all hours flown by all aircraft. If flights under an operating rule part are conducted disproportionately by aircraft with higher operating costs within an Aircraft Category, the costs under that rule part in Table 4-11 will be higher than the overall costs for that Category shown in Table 4-10. Note that due to data availability limitations, in this edition, Table 4-10 represents 2018 costs weighted by aircraft count, while Table 4-11 represents 2014 costs indexed to 2018 dollars, weighted by hours flown.

Table 4-11: GA Operating and Fixed Costs by Operating Rule Part ($2018) (Weighted by Part Hours)

		1	2	1	2	1	2	1	2	1	2
Aircraft Category	**Certification**	**PART 91**		**PART 125**		**PART 133**		**PART 135**		**PART 137**	
		Variable Operating Costs (Including Crew)	**Total Cost Per Hour (Including Crew)**	**Variable Operating Costs (Including Crew)**	**Total Cost Per Hour (Including Crew)**	**Variable Operating Costs (Including Crew)**	**Total Cost Per Hour (Including Crew)**	**Variable Operating Costs (Including Crew)**	**Total Cost Per Hour (Including Crew)**	**Variable Operating Costs (Including Crew)**	**Total Cost Per Hour (Including Crew)**
Piston engine airplanes, one-engine	Part 23	$263	$491	NR	NR	NR	NR	$279	$497	$280	$504
Piston engine airplanes, multi-engine	Part 23	$550	$1,019	NR	NR	NR	NR	$663	$1,104	$666	$1,027
Turboprop airplanes, one-engine	Part 23	$452	$855	NR	NR	NR	NR	$418	$794	$289	$633
Turboprop airplanes, multi-engine	Part 23/25	$1,484	$1,910	$3,376	$4,111	NR	NR	$1,353	$1,710	$1,435	$1,772
Turbojet/turbofan airplanes	Part 23/25	$3,652	$5,262	$6,397	$9,311	NR	NR	$4,092	$5,701	$6,220	$8,773
Rotorcraft piston	Part 27/29	$333	$460	NR	NR	$369	$520	$373	$525	$416	$515
Rotorcraft turbine, one-engine	Part 27/29	$1,029	$1,551	NR	NR	$1,165	$1,677	$962	$1,572	$1,085	$1,542
Rotorcraft turbine, multi-engine	Part 27/29	$1,913	$3,239	NR	NR	$2,805	$4,068	$1,742	$2,959	$2,208	$3,615
Other		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
All Aircraft--Weighted Average Cost per Hour		**$829**	**$1,266**	**$5,890**	**$8,587**	**$1,124**	**$1,691**	**$1,926**	**$2,749**	**$473**	**$787**

Sources: GRA analysis of responses to FAA's General Aviation and Part 135 Activity Survey CY2013, Conklin & de Decker's Aircraft Cost Evaluator (v14.2.0, 2014). Adjusted to 2018 dollars using the Producer Price Index for Nonscheduled Air Transportation. https://beta.bls.gov/dataViewer/view/timeseries/PCU48121-48121-
NR = Not Reported
Col 1: Variable operating costs include crew, fuel and oil, and maintenance costs
Col 2: Total costs per hour include variable costs (Col 1) and fixed costs

4.3.3. Fractional Ownership Operating Costs

Table 4-12 presents operating costs for fractionally owned aircraft. The General Aviation Survey results for 2013 were used to identify the fractionally owned aircraft. The *Aircraft Cost Evaluator* from Conklin & de Decker was then used as a source of operating cost data for aircraft types identified as fractionally owned through the GA Survey. Operating costs for fractional aircraft were weighted by the number of fractional aircraft in order to arrive at average operating costs by economic values category as well as for all fractionally owned aircraft.

Operating costs for fractionally owned aircraft are not directly comparable to those of other general aviation aircraft because the Conklin & de Decker data, as can be seen in Table 4-12, do not include the operating cost components (i.e., fuel, maintenance, etc.,) only the total hourly variable operating costs. In addition, costs in *Aircraft Cost Evaluator* are reported by fractional ownership provider and fractional ownership share. A single fractional ownership provider was chosen to represent all aircraft in those aircraft types offered by more than one provider because costs do not differ significantly between the different providers of services of the same aircraft type. The hourly operating costs reported in Table 4-12 assume quarter share ownership and no depreciation. Average total operating costs per hour for all fractionally owned aircraft are higher than those of general aviation aircraft.

Fractional Ownership costs in this report

Fractional ownership costs were no longer available in the 2018 edition of the Aircraft Cost Evaluator, and Conklin & de Decker explained that their industry sources had stopped providing information just after the 2014 ACE was released.

Table 4-12 was produced by indexing the 2014 costs to 2018 dollars using the Producer Price Index (PPI) for Nonscheduled Air Transportation, as used for Table 4-11.

Table 4-12: Fractional Ownership Costs ($2018) (Average Weighted by the Number of Aircraft)

	1	2	3	4	5	6	7
Aircraft Category	**Total Aircraft**	**Quarter Share Acquisition**	**Fixed Annual Budget**	**Fixed Cost Per Hour**	**Hourly Variable Operating Cost + Tax**	**Total Operating Cost Per Hour**	**Contract Block Hours Per Year**
Piston engine airplanes, 1-3 seats	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Piston engine airplanes, 4-9 seats one-engine	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Piston engine airplanes, 4-9 seats multi-engine	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Piston engine airplanes 10 or more seats	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Turboprop airplanes, 1-9 seats one-engine	5	N/A	N/A	N/A	N/A	N/A	N/A
Turboprop airplanes, 1-9 seats multi-engine	18	N/A	N/A	N/A	N/A	N/A	N/A
Turboprop airplanes, 10-19 seats	110	$1,268,075	$228,253	$1,141	$1,135	$2,276	200
Turboprop airplanes, 20 or more seats	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Turbojet/turbofan airplanes, <= 12,500 lbs	48	N/A	N/A	N/A	N/A	N/A	N/A
Turbojet/turbofan airplanes, > 12,500 lbs and <= 65,000 lbs	774	$2,755,282	$549,906	$2,750	$4,125	$6,874	200
Turbojet/turbofan airplanes, > 65,000 lbs	117	$11,798,431	$905,726	$4,529	$7,143	$11,672	200
Rotorcraft piston <= 6,000 lbs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rotorcraft turbine <= 6,000 lbs	49	N/A	N/A	N/A	N/A	N/A	N/A
Rotorcraft piston > 6,000 lbs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rotorcraft turbine > 6,000 lbs	N/A	$2,118,588	$664,816	$6,648	$2,322	$8,970	100
Other	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Experimental	2	N/A	N/A	N/A	N/A	N/A	N/A
Light Sport	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Evaluated Aircraft--Weighted Average per Aircraft	**1,001**	**$3,650,582**	**$556,308**	**$2,782**	**$4,151**	**$6,932**	**200**
Total Fractional Aircraft	**1,122**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Sources: Aircraft types and counts come from FAA's General Aviation and Part 135 Activity Survey CY2013, fractional ownership costs come from Conklin & de Decker's Aircraft Cost Evaluator (v14.2.0 2014). Indexed to 2018 dollars using the Producer Price Index for Nonscheduled Air Transportation. https://beta.bls.gov/dataViewer/view/timeseries/PCU48121-48121-

Col 1: Total number of fractionally owned aircraft by economic values category, as reported in GA Survey

Col 2: Quarter share acquisition, from Conklin & deDecker

Col 3: Fixed annual cost, does not include depreciation, Conklin & deDecker

Col 4: Fixed costs per hour: column 3 divided by column 7

Col 5: Variable hourly operating cost with tax, Conklin & deDecker. Does not include any applicable fuel cost adjustment (FCA) imposed by fractional provider

Col 6: Total operating costs per hour: column 4 plus column 5

Col 7: Contract block hours as reported by Conklin & deDecker

N/A = Not Available

4.4 MILITARY OPERATING COSTS

Data on military aircraft operating costs were developed in consultation with the various branches of the armed services. Available data were obtained both from public websites as well as telephone interviews with appropriate DOD and FAA personnel. In general, the values were applied on an aircraft type-by-aircraft type basis where there were cost observations from at least one military air service. In cases where there were no observed costs for a specific aircraft type, the group average was applied. In the table below, the average weighted total is based on the hourly weighted operating costs of each aircraft type.

The cost data were taken from data on aircraft reimbursement rates for various types of aircraft.[13] Reimbursement rates are reported for four categories of users: DOD, Federal Agency, Foreign Military Sales Users, and All Other Users. This report uses the All Other category because it is the most complete cost metric. The aircraft operating costs include crews and reflect the varying sizes of crews for a specific aircraft. For example, most military rotary wing aircraft operate with a pilot, co-pilot and one or two other crew members. Some of the larger turbojet aircraft with three or more engines conduct electronic surveillance operations and have large on-board crews. The crew costs reported in Table 4-13 reflect this. In addition to crew cost, the reimbursement costs include operations and maintenance costs and an asset utilization factor.[14] The asset utilization factor includes an allocation of healthcare costs for military personnel.

DOD does not include an element of ownership costs in the reimbursement rates. Asset valuation for DOD aircraft is extremely complex because the assets are long lived and have had many major upgrades over the useful life. For example, the Boeing B-52 has been in operation by the military service since 1954, more than 60 years. It has had upgrades to its engines, avionics, weapons systems and offensive and defensive electronic systems.[15] Aircraft replacement costs are described in Section 5.

[13] DOD, Office of the Undersecretary of Defense, *Fiscal Year (FY) 2014 Department of Defense (DoD) Fixed Wing and Helicopter Reimbursement Rates*. Accessed February 12, 2015, Fixed Wing and Helicopter Reimbursement Rates; DOD, Office of the Undersecretary of Defense, Comptroller, "Collections for Reimbursements of DoD-Owned Aircraft (Rotary Wing)," in *Financial Management Regulation, Volume 11A: Reimbursable Operations Policy. DoD 7000.14-R*, Chapter 6, Appendix G. Accessed February 12, 2015, Reimburseable Operations Policy.
[14] The asset utilization factor is 4 percent times the sum of costs for: fuel, depot level repairables, depot maintenance, other and crew salary for each specific aircraft.
[15] *Boeing B-52*. Accessed March 23, 2015, Boeing B-52.

Table 4-13: Estimated Military Operating Costs Per Hour (FY2014) (Average Weighted by Flight Hour)

	1	2	3	4	5	6
Aircraft Category	**Crew**	**Operations and Maintenance**	**Asset Utilization**	**Total Operating Costs (Excluding Crew)**	**Total Operating Costs (Including Crew)**	**Total Costs Per Hour (Including Crew)**
Turbojet/fan 3+ Engine	$352	$15,303	$626	$15,303	$15,655	$16,282
Turbojet/fan Attack/Fighter	$125	$13,280	$536	$13,280	$13,405	$13,942
Turbojet/fan Other	$146	$3,844	$160	$3,844	$3,990	$4,149
Turboprop	$310	$4,245	$182	$4,245	$4,555	$4,737
Piston	$143	$2,629	$111	$2,629	$2,773	$2,884
Rotary Wing Aircraft	$226	$5,385	$226	$5,385	$5,611	$5,837
UAV	$133	$2,781	$117	$2,781	$2,914	$3,030
Glider	$87	$0	$3	$0	$87	$90
All Aircraft - Weighted Average Cost per Hour	**$232**	**$8,398**	**$346**	**$8,398**	**$8,630**	**$8,976**

Source: DOD, Office of the Undersecretary of Defense. *Fiscal Year (FY) 2014 Department of Defense (DoD) Fixed Wing and Helicopter Reimbursement Rates*.
Operating Costs are weighted by Fleet Hours from the 2007 *Economic Values for FAA Investment and Regulatory Decisions*.
Used Average Flight Hours for aircraft (Table 3-17.2 in the 2007 *Economic Values for FAA Investment and Regulatory Decisions*). If aircraft was found used average fleet hours, otherwise used group average.
Operating cost are not available for all aircraft

Col 1: Crew cost, average weighted by fleet
Col 2: Operation and Maintenance costs (O&M), average weighted by fleet
Col 3: Asset Utilization, average weighted by fleet
Col 4: Same as Col. 2
Col 5: Columns 1 + 2
Col 6: Columns 1 + 2 + 3