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 aircraft utilization. The utilization of available capacity affects the benefits and costs that accrue directly to aircraft operators and indirectly to users and society.

3.1.1 User Group Concept and Definitions

In this report, data are presented for four user groups together with the sub-groupings shown below.[1] 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.[2]

User Groups

Group 1: Part 121 air carrier operations of passenger aircraft
- A: Air carriers filing Schedule P-5.2[1]
- B: Air carriers filing Schedule P-5.1[1]

Group 2: Part 121 air carrier operations of all-cargo aircraft
- A: Air carriers filing Schedule P-5.2
- B: Air carriers filing Schedule P-5.1

Group 3: General aviation aircraft by the Federal Aviation Regulation (FAR) that the activity was conducted under:
- A: General aviation only
- B: Air taxi only

Group 4: Military aircraft

The overall user group structure is similar to that used in the prior economic values report (Updated Report, Revised June 17, 2015); however, some aircraft categories have changed to reflect the current fleet. Details are provided in the sections below. In addition, an effort was made to align the data with the certification category of aircraft and the operating regulations that apply to them. This was done to provide a better basis for the evaluation of investment or regulatory programs affecting portions of the aircraft fleet.

[1] In some cases, more disaggregate data are presented.

[2] 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.

3.1.2 Regulatory Structure

Title 14 of the Code of Federal Regulations (CFR) covers Aeronautics and Space. There are two types of regulations in Title 14 with direct applicability to this report: aircraft airworthiness certification and aircraft operations regulations. Aircraft may be grouped by the FAR Part under which they are certificated for one type of analysis, and by the Part (or Parts) under which they are operated for another, or both.[3] These data also may be used in the analysis of investment and regulatory decisions not affecting aircraft certification or operating regulations.

3.1.2.1 Aircraft Certification Part—In order for an aircraft to be flown in the United States, it must be considered airworthy.[4] To obtain a standard airworthiness certificate, an aircraft must conform to a type certificate and be in a condition for safe operation. A type certificate is a document issued by the FAA to an applicant who has proven that an aircraft meets the requirements of the pertinent FAR(s). The issuance of a type certificate approves the type design. There are four Parts under Title 14 which deal with airworthiness standards for aircraft:

- **Part 23** covers "Normal, Utility, Acrobatic and Commuter Category Airplanes." Normal, Utility and Acrobatic aircraft are limited to a maximum of nine passenger seats and a maximum takeoff weight (MTOW) of 12,500 pounds. Commuter airplanes, which must have two or more propeller-driven engines, are limited to a maximum of 19 passenger seats and a MTOW of 19,000 pounds.
- **Part 25** covers "Transport Category Airplanes," which applies to all fixed-wing aircraft that do not meet the standards of Part 23.[5]
- **Part 27** covers "Normal Category Rotorcraft." These rotorcraft are limited to a MTOW of 7,000 pounds[6] and nine passenger seats. They may be piston- or turbine-powered, and have single or multiple engines.
- **Part 29** covers "Transport Category Rotorcraft," which applies to all rotary-wing aircraft that do not meet the standards of Part 27.

[3] These are the principal regulations affecting U.S. aircraft manufacturers and aircraft operators that are used to categorize the population of civil aircraft. For the purposes of presentation, we have grouped aircraft certified under the older Civil Air Regulations (CARs) with the same size and category of aircraft under the current Federal Aviation Regulations (FARs). This distinction would likely only arise in an evaluation for a regulatory specific aircraft make-model at which point the exact certification basis could be determined.

[4] There are exceptions to this for homebuilt and experimental aircraft. Such aircraft may not be sold or operated commercially. They are generally small, piston-powered aircraft that would otherwise be certificated under FAR Part 23 (fixed-wing) or FAR Part 27 (rotorcraft) regulations.

[5] In general terms, piston-powered fixed-wing aircraft are certificated under Part 23, as are turboprops with fewer than 20 seats. Larger turboprops and all jet-powered airplanes are certificated under Part 25.

[6] While the maximum certified takeoff weight for Part 27 is at 7,000 pounds, the weights assigned for aircraft in the GA Survey were developed through an analysis of secondary source data. Thus, it is possible that some rotorcraft with weights less than (but close to) 7,000 pounds are included in Part 29, which applies to larger rotorcraft. However, we do not believe that this has a large impact on the reported results.

3.1.2.2 Operating FAR—Standards for conducting civilian flights in the United States are contained in several parts of Title 14:[7]

- **Part 91** contains general regulations for the operation of powered aircraft (excluding ultralights). Part 91 regulations are sometimes referred to as "General Aviation" operations. It is the least restrictive category of operation for such aircraft. Operations that do not include activities that are regulated under one of the other parts operate by default under Part 91.
- **Part 121** contains standards applicable to the domestic and flag operations of the holders of air carrier or operating certificates under Part 119. Domestic and flag operations involve common carriage, the transportation of people or goods for compensation, in aircraft with more than nine passenger seats or a cargo capacity of more than 7,500 pounds. This is the structure under which most large airlines operate.
- **Part 125** regulates non-commercial operations conducted with fixed-wing aircraft with 20 or more seats, which do not fit into Parts 121, 129, 135 or 137. Part 125 applies when common carriage is not involved.
- **Part 129** regulates foreign air carriers or operators who would like to conduct passengers or cargo operations to, from, and transiting the United States.
- **Part 133** governs the operation of any rotary wing aircraft carrying an external load.
- **Part 135** covers commuter (using aircraft of nine seats or less and a maximum payload of 7,500 pounds or less) or on-demand operations by holders of air carrier or other operating certificates, which are required for certain activities: transportation of mail, certain sightseeing or air tour flights, air taxi (on-demand) flights, and commuter flights. Scheduled passenger carrying operations with turbojet aircraft having one or more seats must be conducted under Part 121.
- **Part 137** applies to all operations involving the aerial application of substances. This application may be in support of agriculture, firefighting, public health sprayings or cloud seeding.

3.1.3 Aircraft Groupings

Aircraft are placed into groups likely to be relevant to conducting regulatory analyses. Within each group, data are reported by generic aircraft classifications. Groupings are discussed in the following sections and detailed in the tables. Finally, user profiles are constructed for selected user groupings.

The factors in Table 3-1 are reported for air carrier, general aviation, and military user types, respectively, with differences based on data limitations.

[7] In order to conduct operations on a commercial basis, an operator must have an air carrier or other operating certificate, issued under Part 119, Certification: Air Carriers and Commercial Operators.

Table 3-1: Factors Presented by User Type

Factor	Air Carrier	General Aviation	Military
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)	X (year)
Average speed	X	-	-
Average gross weight	-	X	-

The air carrier sub-groupings for passenger and freight are defined by aircraft operator. All-cargo operators are those that report no passenger traffic. In 2018, there were a small number of operators that predominantly operated all-cargo flights with a small number of passenger flights. These operators were classified as all-cargo operators for this report. Passenger operators can produce both passenger and cargo services by using empty space in the aircraft divided into a number of compartments to carry air freight.

General aviation capacity data are also divided into a number of subgroups depending on the type of operation. In this section, GA aircraft and activity are also categorized by the parts of aircraft certification and operating regulations that the activity falls under.

Information on capacity and utilization factors for military aircraft is also presented in this section. From a regulatory or system investment standpoint, FAA actions will primarily affect military flight time; the costs of 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 less detailed data, and general aviation activity data are somewhat limited. The individual tables show specific definitions for each data element.

3.2 AIR CARRIER AIRCRAFT

Table 3-2 shows the air carrier aircraft categories used in this report. The categories are unchanged from the 2015 Economic Values update. The groups in this report cover both the operating and certification standards relevant for each category.[8]

[8] Aircraft certified under Part 23 and Part 25 were recorded based on *Jane's All the World's Aircraft* (various editions). If no certification part is listed in a table, they are assumed to be certified to Part 25 (or predecessor regulations).

Table 3-2: Air Carrier Aircraft Categories

2020 - Passenger	2020 - Cargo
Narrow-body 160 seats and below	Narrow-body 160 seats equivalent and below
Narrow-body more 160 seats	Narrow-body more 160 seats equivalent
Wide-body 300 seats and below	Two-engine wide-body
Wide-body more than 300 seats	Three-engine wide-body
	Four-engine wide-body
RJ 60 seats and below	RJ 60 seats equivalent and below
RJ more than 60 seats	RJ more than 60 seats equivalent
Turboprop under 20 seats (Part 23)	Turboprop under 20 seats equivalent (Part 23)
Turboprop under 20 seats (Part 25)	Turboprop under 20 seats equivalent (Part 25)
Turboprop 20-60 seats	Turboprop 20-60 seats equivalent
Turboprop more than 60 seats	Turboprop more than 60 seats equivalent
Piston engine (Part 23)	Piston engine (Part 23)
Piston engine (Part 25)	Piston engine (Part 25)

3.2.1 Air Carrier Aircraft Groups, Certification and Operating FARs

Aircraft capacity and utilization factors for calendar year 2018 were obtained from Schedule T-100 data submitted by air carriers to the Bureau of Transportation Statistics (BTS).[9] Data are summarized in the following tables for aircraft classification groups and for the total fleet.

As noted above, air carriers were divided into two groups: Part 121 air carriers that filed Schedule P-5.2 and Part 121 air carriers that filed Schedule P-5.1. Table 3-3 provides a summary of block hour (gate to gate) activity for all air carriers considered in this study. The vast majority of hours were operated by air carriers that filed Schedule P-5.2. The table also notes those aircraft that were certified under Part 23 versus Part 25. Aircraft without an aircraft certification basis noted are Part 25 aircraft.

[9] All large certificated U.S. air carriers are required to file Schedule T-100. Large certificated air carriers are defined as air carriers holding a certificate issued under 49 U.S.C. 41102, as amended, that: (1) Operates aircraft designed to have a maximum passenger capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds; or (2) Conducts operations where one or both terminals of a flight stage are outside the 50 states of the United States, District of Columbia, the Commonwealth of Puerto Rico and the U.S. Virgin Islands.

Table 3-3: 2018 Block Hours by Aircraft Certification and Reporting Group

Aircraft Category	Part 121 Air Carrier Filing Schedule P-5.2		Part 121 Air Carrier Filing Schedule P-5.1		Total	
	Passenger	All-Cargo	Passenger	All-Cargo	Passenger	All-Cargo
Wide-body more than 300 seats	220,210		NR		220,210	
Wide-body 300 seats and below	2,091,230		NR		2,091,230	
Four-engine wide-body		289,242		14,569		303,811
Three-engine wide-body		285,182		22,778		307,960
Two-engine wide-body		770,899		2,269		773,168
Narrow-body more than 160 seats	3,991,243	206,491	2,313	3,150	3,993,556	209,641
Narrow-body 160 seats and below	9,267,585	13,946	39,553	27,242	9,307,138	41,188
RJ more than 60 seats	3,565,900	NR	1,240	NR	3,567,140	NR
RJ 60 seats and below	1,326,851	1,542	NR	1,076	1,326,851	2,618
Turboprop more than 60 seats	116,701	NR	NR	7,099	116,701	7,099
Turboprop 20-60 seats	NR	NR	NR	4,700	NR	4,700
Turboprop under 20 seats (Part 25)	NR	NR	NR	NR	NR	NR
Turboprop under 20 seats (Part 23)	NR	93,751	NR	1,762	NR	95,513
Piston engine (Part 25)	NR	NR	NR	11	NR	11
Piston engine (Part 23)	NR	51,686	NR	NR	NR	51,686
Total	20,579,720	1,712,739	43,106	84,656	20,622,826	1,797,395

Sources: 2018 Schedule T-100 traffic data and FAA Type Certificate Data Sheets Database; NR: Not reported

A number of capacity and utilization factors useful for understanding the air carrier industry were calculated using 2018 T-100 data. Table 3-4 provides an overview of how the various factors were derived.

Table 3-4: Air Carrier Capacity and Utilization Factors

Factor	Derivation
Number of Aircraft	"Aircraft Days Assigned to Service" divided by 365
Departures	"Revenue Aircraft Departures Performed"
Passenger Capacity*	"Available Seat Miles" divided by "Revenue Aircraft Miles Flown"
Passenger Load Factor*	"Revenue Passenger Miles" divided by "Available Seat Miles"
Capacity (tons)	"Available Ton Miles" divided by "Revenue Aircraft Miles Flown"
Capacity Load Factor	"Revenue Ton Miles" divided by "Available Ton Miles"
Crew Size	Flight deck crew size from FAA Type Certificate Data Sheets (TCDS) database; Flight attendants estimated as one per 50 passenger seats (for aircraft with more than 9 seats)
Block Hours	"Aircraft Hours, Ramp to Ramp"
Average Block Speed (MPH)	"Revenue Aircraft Miles Flown" divided by "Aircraft hours, Ramp to Ramp"
Daily Utilization (hours)	"Aircraft Hours, Ramp to Ramp" divided by "Aircraft Days Assigned to Service"
Fuel Burn per Hour (gallons)	"Aircraft Fuel" divided by "Aircraft Hours, Ramp to Ramp"

*Calculated only for passenger air carriers

Factors related to passenger air carriers that filed Schedule P-5.2 are shown in Table 3-5. There was an average of 5,761 in-service aircraft reported for these carriers. The crew size includes both flight deck crew and cabin crew. The number of flight deck crew for the aircraft in each grouping was identified using the FAA Type Certificate Data Sheets (TCDS) database. The

number of cabin crew was estimated as one flight attendant per 50 passenger seats.[10] The actual number of flight attendants varies based on the size of the aircraft and staffing policy of individual carriers.

As can be seen, the 5,761 aircraft accounted for 8.3 million departures in 2018. These aircraft were utilized for 9.8 hours per day on average and had an average capacity of 160 passenger seats. The average passenger load factor was 84 percent.

Table 3-5: 2018 Passenger Air Carriers Filing Schedule P-5.2 Capacity and Utilization Factors

Aircraft Category	Number of Aircraft	Departures	Passenger Capacity	Passenger Load Factor	Capacity (tons)	Capacity Load Factor	Crew Size	Block Hours	Average Block Speed (MPH)	Daily Utilization (Hours)	Fuel Burn per Hour (Gallons)
Wide-body more than 300 seats	46	20,038	327	81%	62	62%	9	220,210	504	13.1	2,451
Wide-body 300 seats and below	467	250,735	256	82%	47	59%	8	2,091,230	484	12.3	1,860
Narrow-body more than 160 seats	980	1,180,930	183	86%	24	67%	6	3,991,243	400	11.2	911
Narrow-body 160 seats and below	2,525	3,920,223	152	84%	19	69%	6	9,267,585	366	10.1	779
RJ more than 60 seats	1,113	1,922,613	76	80%	10	62%	4	3,565,900	297	8.8	504
RJ 60 seats and below	586	872,665	49	79%	6	67%	3	1,326,851	251	6.2	576
Turboprop more than 60 seats	44	96,381	76	78%	9	66%	4	116,701	224	7.3	301
All Aircraft	5,761	8,263,585	160	84%	22	65%	5	20,579,720	366	9.8	869

Sources: 2018 Form 41 Schedule T-100 traffic data and FAA Type Certificate Data Sheets Database

Table 3-6 shows capacity and utilization figures for all-cargo air carriers that filed Schedule P-5.2. In 2018, 1,036 all-cargo aircraft were reported by these carriers. As can be seen, these aircraft have much lower levels of daily utilization (4.5 block hours per day on average) than the passenger aircraft.

Table 3-6: 2018 All-Cargo Air Carriers Filing Schedule P-5.2 Capacity and Utilization Factors

Aircraft Category	Number of Aircraft	Departures	Capacity (tons)	Capacity Load Factor	Crew Size	Block Hours	Average Block Speed (MPH)	Daily Utilization (Hours)	Fuel Burn per Hour (Gallons)
Four-engine wide-body	89	43,677	157	51%	2	289,242	470	8.9	5,042
Three-engine wide-body	120	86,632	90	55%	2	285,182	420	6.5	2,172
Two-engine wide-body	310	261,720	77	52%	2	770,899	410	6.8	1,488
Narrow-body more than 160 seats	178	108,528	33	49%	2	206,491	365	3.2	990
Narrow-body 160 seats and below	10	6,959	27	23%	2	13,946	345	3.9	1,009
RJ 60 seats and below	3	943	3	13%	2	1,542	310	1.4	354
Turboprop under 20 seats (Part 23)	232	85,461	2	36%	1	93,751	135	1.1	NR
Piston engine (Part 23)	94	34,804	7	40%	1	51,686	206	1.5	NR
All Aircraft	1,036	628,724	87	52%	2	1,712,739	394	4.5	2,011

Sources: 2018 Form 41 Schedule T-100 traffic data and FAA Type Certificate Data Sheets Database; NR: Not Reported

[10] FAR 121.391(a) generally requires a minimum of one flight attendant for each 50 installed seats for aircraft with more than 9 seats.

Data on capacity and utilization for passenger air carriers that filed Schedule P-5.1 are reported in Table 3-7. The average aircraft had 159 passenger seats. These aircraft accounted for about 43,000 block hours in 2018.

Table 3-7: 2018 Passenger Air Carriers Filing Schedule P-5.1 Capacity and Utilization Factors

Aircraft Category	Number of Aircraft	Departures	Passenger Capacity	Passenger Load Factor	Capacity (tons)	Capacity Load Factor	Crew Size	Block Hours	Average Block Speed (MPH)	Daily Utilization (Hours)	Fuel Burn per Hour (Gallons)
Narrow-body more than 160 seats	2	552	197	45%	*	*	6	2,313	422	3.5	2,928
Narrow-body 160 seats and below	31	17,416	159	42%	18	38%	6	39,553	358	3.5	1,388
RJ more than 60 seats	3	588	57	58%	9	36%	4	1,240	363	1.2	1,284
All Aircraft	36	18,556	159	42%	18	38%	6	43,106	361	3.2	1,467

Sources: 2018 T-100 traffic data and FAA Type Certificate Data Sheets Database; * Data not reliable due to small sample size

Table 3-8 shows capacity and utilization factors for all-cargo air carriers that filed Schedule P-5.1. There were 65 aircraft in service on average in 2018. These aircraft accounted for about 84,650 block hours in 2018.

Table 3-8: 2018 All-Cargo Air Carriers Filing Schedule P-5.1 Capacity and Utilization Factors

Aircraft Category	Number of Aircraft	Departures	Capacity (tons)	Capacity Load Factor	Crew Size	Block Hours	Average Block Speed (MPH)	Daily Utilization (Hours)	Fuel Burn per Hour (Gallons)
Four-engine wide-body	7	1,832	132	58%	2	14,569	369	6.1	2,191
Three-engine wide-body	6	6,115	102	52%	2	22,778	357	11.2	1,479
Two-engine wide-body	1	770	59	80%	2	2,269	405	4.7	NR
Narrow-body more than 160 seats	2	596	29	50%	2	3,150	460	4.3	1,017
Narrow-body 160 seats and below	28	23,150	20	35%	2	27,242	281	2.6	913
RJ 60 seats and below	1	597	7	26%	2	1,076	370	3.3	369
Turboprop more than 60 seats	7	4,252	24	32%	3	7,099	261	2.9	703
Turboprop 20-60 seats	10	3,005	6	72%	2	4,700	258	1.3	408
Turboprop under 20 seats (Part 23)	3	1,472	1	38%	1	1,762	177	1.6	71
Piston engine (Part 25)	0	7	0	44%	1	11	104	0.1	45
All Aircraft	65	41,796	68	53%	2	84,656	322	3.6	1,194

Sources: 2018 T-100 traffic data and FAA Type Certificate Data Sheets Database; NR: Not Reported

3.3 GENERAL AVIATION AIRCRAFT

Data from the 2017 GA Survey by FAA's Office of Accident Investigation & Prevention (AVP-200) was used to estimate the number of active aircraft and annual utilization.[11] The actual sample size for the 2017 GA Survey was 84,997 aircraft.[12] There were responses representing 34,370 aircraft received,[13] of which 29,374 indicated that the aircraft was active (flew at least once) during 2017. Using the GA Survey's weighting methodology, these 29,374 records represent 211,756 U.S.-registered active GA aircraft.

[11] *General Aviation and Part 135 Activity Survey* (Washington, DC: Federal Aviation Administration, 2018).
[12] Data provided by TetraTech.
[13] A survey response may be for a single aircraft or a fleet of many aircraft.

3.3.1 Aircraft Categories

For this edition of the Economic Values report, the 2017 GA Survey data was provided as a set of summary tables, rather than as anonymized individual responses as used in prior releases. This precluded breakdown of aircraft into more granular categories on a make-model basis. The number of GA Survey categories aircraft are divided into varies slightly among these tables. For consistency, these categories are displayed as nine aircraft types based on criteria such as engine type, as shown in Table 3-9.

Table 3-9: GA Survey and Economic Values Aircraft Classification Groups

Economic Values Category	Aircraft Category	Certification
1	Piston engine airplanes, one-engine	Part 23
2	Piston engine airplanes, multi-engine	Part 23
3	Turboprop airplanes, one-engine	Part 23
4	Turboprop airplanes, multi-engine	Part 23/25
5	Turbojet/turbofan airplanes	Part 23/25
6	Rotorcraft piston	Part 27/Part 29
7	Rotorcraft turbine, one-engine	Part 27/Part 29
8	Rotorcraft turbine, multi-engine	Part 27/Part 29
9	Other	

Source: FAA, *General Aviation and Part 135 Activity Survey CY 2017.*

Piston and turboprop fixed-wing aircraft were grouped into categories based on number of engines. Rotorcraft were grouped into categories based on engine type and number. Aircraft were also grouped into categories based on year of manufacture: pre-1983, and 1983 and later.

3.3.2 Flight Hours by Activity Type and Aircraft Age

The GA Survey asked respondents how many total hours the aircraft flew during 2017, and the percentage of hours that were flown in each of 15 activity types. GRA grouped these activity types into the operating regulation parts that cover them to produce the percentage of time each aircraft flew under each part.

The following GA survey categories were assigned to the operating authorities to develop the following groups:[14]

- **Part 91**—Personal, business, instructional, corporate, sightseeing[15] and work
- **Part 125**—Airplanes (not rotorcraft) 20 or more seats and not Part 135 or 137
- **Part 133**—Rotorcraft hours reported as external lift
- **Part 135**—Air taxi, air tours and medical
- **Part 137**—Aerial application in agriculture and forestry and other aerial application

[14] All assignments based on reported actual use in GA Survey. While the categories used in the GA Survey do not exactly correspond to the operating regulations, this allows a reasonable estimate of the activity levels under each part.

[15] Some sightseeing activity, which would otherwise be Part 91, must be conducted under Part 136. The 2017 GA Survey does not break this activity out and it remains under Part 91 in this report.

In addition to the regulatory structure above, selected aircraft and hours flown information was tabulated from the GA Survey responses, and reported for the following categories:[16]

- **Fractional Ownership**—Percentage of time the aircraft was operated as part of a Fractional Ownership program
- **Public**—Percentage of time the aircraft was operated in a public use

Table 3-10 shows the active general aviation aircraft by aircraft category. The 211,756 estimated active aircraft accounted for 25.2 million flight hours in 2017. It also shows the number of aircraft that reported air taxi usage as well as those that reported public (fulfilling a government function) usage. There were 11,890 aircraft that reported some air taxi use and nearly 11,400 reporting some public use in 2017. Also shown are the average annual hours flown for each aircraft category. Overall, general aviation aircraft averaged 119 hours of flight time in 2017. The more sophisticated aircraft had much higher levels of utilization.

Table 3-10: 2017 Estimated Active General Aviation Aircraft and Hours Flown

		1	2	3	4	5	6
Aircraft Category	Certification	All Aircraft	Air Taxi Aircraft	Public Aircraft	Fractionally-Owned Aircraft	GA Survey Total Hours	Average Annual Hours All Aircraft
Piston engine airplanes, one-engine	Part 23	129,832	2,395	4,009	-	12,047,095	93
Piston engine airplanes, multi-engine	Part 23	13,084	1,034	737	-	1,536,405	117
Turboprop airplanes, one-engine	Part 23	4,800	758	527	*	1,448,302	302
Turboprop airplanes, multi-engine	Part 23/25	5,149	1,183	1,285	93	1,176,576	229
Turbojet/turbofan airplanes	Part 23/25	14,217	4,767	748	2,213	4,065,207	286
Rotorcraft piston	Part 27/Part 29	3,270	202	363	-	782,347	239
Rotorcraft turbine, one-engine	Part 27/Part 29	5,380	1,158	2,752	*	1,992,383	370
Rotorcraft turbine, multi-engine	Part 27/Part 29	1,860	393	598	-	545,282	293
Other		34,164	*	351	*	1,618,576	47
		211,756	11,890	11,370	2,306	25,212,173	119

Source: Analysis of FAA's General Aviation and Part 135 Activity Survey CY 2017
Certification regulations assigned based on the current regulatory structure; many GA aircraft are certified to regulations which pre-date these.
Columns are not addiitive; aircraft may be used for multiple purposes during a year.
Col 1: Aircraft reported
Col 2: Aircraft for which Air Taxi hours reported. The number of aircraft in this category is significantly higher than the number of aircraft for which air taxi operations are their primary use
Col 3: Aircraft for which Public hours reported
Col 4: Aircraft for which Fractional Ownership hours reported
Col 5: Total hours reported
Col 6: Column 5 divided by Column 1
* Insufficient number of aircraft to maintain respondent anonymity

Table 3-11 shows the estimated general aviation hours flown by operating and certification part. As can be seen, the largest proportions of the hours were flown under Part 91, the general flight rules, and Part 125, general flight rules for fixed-wing aircraft of 20 or more

[16] The aircraft or hours reported are not additive with other aircraft data in the GA Survey.

seats. Activities under Part 135 (air taxi and some types of air tours and air medical services) and Part 137 (aerial application) are the next two most prevalent uses of general aviation aircraft. The total hours distributed by FAR part differ slightly from the total hours reported in the survey due to a rounding error in the reported survey totals.

Air Taxi vs. Part 135

It is important to note the distinction between the terms "air taxi" and "Part 135," since they are often used interchangeably. The GA Survey queries aircraft owners on the three types of activity conducted under Part 135:

1. Air Taxi – FAR Part 135 on-demand passenger and all cargo operations (excluding air tours, air medical services, or scheduled passenger service). There were 2.4 million hours flown in 2017.
2. Air Tours – Commercial sight-seeing conducted under FAR Part 135. 379,000 hours flown.
3. Air Medical Services – Air ambulance services, rescue, human organ transportation, and emergency medical services conducted under FAR Part 135. 767,000 hours flown.

All three types of hours are included in Column 4 of Table 3-11, while only air taxi hours are included in Column 4 of Table 3-13. Column 2 of Table 3-10 counts aircraft that have air taxi hours; an aircraft with only air tours or air medical services hours would not be included.

Table 3-11: 2017 GA Hours Flown by Operating Rule and Aircraft Type

	1	2	3	4	5	6
Aircraft Category	GA Survey Total Hours	Operating Rules				Total Hours by FAR Part
		Part 91 / 125	Part 133	Part 135	Part 137	
Piston engine airplanes, one-engine	12,047,095	1,409,136	-	273,400	303,009	1,985,545
Piston engine airplanes, multi-engine	1,536,404	1,308,088	-	179,224	-	1,487,312
Turboprop airplanes, one-engine	1,448,301	403,745	-	397,431	636,171	1,437,347
Turboprop airplanes, multi-engine	1,176,576	619,842	-	378,687	63,814	1,062,343
Turbojet/turbofan airplanes	4,065,207	2,821,382	-	1,118,599	111,591	4,051,572
Rotorcraft piston	782,346	670,753	-	50,435	45,472	766,660
Rotorcraft turbine, one-engine	1,992,383	958,307	79,673	720,629	233,774	1,992,383
Rotorcraft turbine, multi-engine	545,282	217,026	28,022	260,587	31,188	536,823
Other	1,618,576	1,303,687	-	-	-	1,303,687
All Aircraft	25,212,170	19,711,966	107,695	3,378,992	1,425,019	4,623,672

Source: Analysis of responses to FAA's General Aviation and Part 135 Activity Survey CY 2017

The GA Survey provided total hours flown (GA Survey Total Hours) and hours by category which are grouped here into FAR parts. The total of hours by category differs slightly from the total hours flown.
Col 1: Total hours reported
Cols 2 - 5: Hours reported under categories which correspond to Operating Rules shown
Col 6: Sum of hours reported under all categories

Table 3-12 shows the active general aviation aircraft and hours flown distributed by aircraft age. The general line of demarcation is aircraft built before 1983, and those built in 1983

and beyond. In the mid-1980s, most general aviation aircraft production in the United States ceased, especially for piston engine airplanes. It is interesting to note that about 61 percent of the active aircraft were built before 1983. However, the majority of turboprop, jet, and rotorcraft hours were flown in aircraft produced after 1982.

Table 3-12: 2017 Active Aircraft and Hours Flown by Age Category

		1	2	3	4	5	6
Aircraft Category	Certification	Total Hours Flown			Active Aircraft		
		All Aircraft	Aircraft Built Before 1983	Aircraft Built in 1983 and Beyond	All Aircraft	Aircraft Built Before 1983	Aircraft Built in 1983 and Beyond
Piston engine airplanes, one-engine	Part 23	12,047,095	8,038,242	4,008,853	29,832	106,228	23,604
Piston engine airplanes, multi-engine	Part 23	1,536,405	1,167,935	368,470	13,084	11,533	1,551
Turboprop airplanes, one-engine	Part 23	1,448,302	68,743	1,379,559	4,800	246	4,554
Turboprop airplanes, multi-engine	Part 23/25	1,176,576	490,969	685,607	5,149	2,601	2,548
Turbojet/turbofan airplanes	Part 23/25	4,065,207	245,871	3,819,336	14,217	1,245	12,972
Rotorcraft piston	Part 27/Part 29	782,347	48,851	733,496	3,270	608	2,662
Rotorcraft turbine, one-engine	Part 27/Part 29	1,992,383	553,554	1,438,829	5,380	1,795	3,585
Rotorcraft turbine, multi-engine	Part 27/Part 29	545,282	74,198	471,084	1,860	347	1,513
Other		1,618,576	141,399	1,477,177	34,164	3,951	30,213
All Aircraft		25,212,173	10,829,762	14,382,411	211,756	128,554	83,202

Source: Analysis of responses to FAA's General Aviation and Part 135 Activity Survey CY 2017

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

Col 1: Total hours reported

Col 2: Total hours reported for aircraft built in 1982 or earlier

Col 3: Total hours reported for aircraft built in 1983 or later

Col 4: Aircraft reported

Col 5: Aircraft reported which were built in 1982 or earlier

Col 6: Aircraft reported which were built in 1983 or later

Table 3-13 shows the number of reported air taxi aircraft and hours flown from the GA Survey. As noted above, there were approximately 11,900 aircraft with at least some air taxi operations, which flew an estimated 2.4 million flight hours. Turboprops and jets have the highest percentages of air taxi hours flown.

Table 3-13: 2017 Estimated Total Active Aircraft and Hours Flown for All Aircraft and Reported Air Taxi Aircraft

		1	2	3	4	5	6	7
Aircraft Category	Certification	Active Aircraft	Air Taxi Aircraft	Estimated Total Hours Flown	Estimated Air Taxi Hours Flown	Percent Air Taxi Hours	Estimated Average Hours-Total	Estimated Average Hours-Air Taxi
Piston engine airplanes, one-engine	Part 23	129,832	2,395	12,047,095	273,400	2%	93	114
Piston engine airplanes, multi-engine	Part 23	13,084	1,034	1,536,404	179,224	12%	117	173
Turboprop airplanes, one-engine	Part 23	4,800	758	1,448,301	363,341	25%	302	479
Turboprop airplanes, multi-engine	Part 23/25	5,149	1,183	1,176,576	378,687	32%	229	320
Turbojet/turbofan airplanes	Part 23/25	14,217	4,767	4,065,207	1,023,745	25%	286	215
Rotorcraft piston	Part 27/29	3,270	202	782,346	11,176	1%	239	55
Rotorcraft turbine, one-engine	Part 27/ 29	5,380	1,158	1,992,383	94,082	5%	370	81
Rotorcraft turbine, multi-engine	Part 27/29	1,860	393	545,282	30,757	6%	293	78
Other		34,164	*	1,618,576	-	0%	47	N/A
All Aircraft		211,756	11,890	25,212,170	2,354,412	9%	119	198

Source: Analysis of FAA's General Aviation and Part 135 Activity Survey CY 2017
Col 1: Active aircraft are those flown at least once during the year
Col 2: Active aircraft reporting air taxi use
Col 3: Total hours flown by active aircraft, including air taxi
Col 4: Reported air taxi hours (also included in Column 3). The number of aircraft in this category is significantly higher than the number of aircraft for which air taxi operations are their primary use
Col 5: Column 4 divided by Column 3
Col 6: Column 3 divided by Column 1
Col 7: Column 4 divided by Column 2
* Insufficient number of aircraft to maintain respondent anonymity

Table 3-14 shows a distribution by five-year increments of age for the active general aviation aircraft in the fleet and hours flown by operating regulation. As can be seen, many of the aircraft hours flown are by aircraft produced decades ago. Aircraft manufactured before 1978 flew more hours in total than aircraft produced in any subsequent 5-year increment. This is a product of the Part 91 and 125 (general aviation) hours flown by pre-1978 aircraft, which alone are more than the total hours flown by aircraft in any subsequent 5-year increment. It is clear that these 40+ year old aircraft play a major role in general aviation in the United States. Older aircraft also dominate in Part 133 (external load) and Part 137 (agricultural aircraft) operations.[17]

Conversely, for Part 135 operations, where passengers or cargo are transported on a commercial basis (excluding Part 133), newer aircraft dominate. The largest number of hours was flown by aircraft made between 2003 and 2007, and other 5-year increments beginning in 1998 show similarly high numbers. Even for Part 135 operations, however, pre-1978 aircraft are heavily used, flying more hours than aircraft manufactured between 2013 and 2017.

[17] Part 133 operations are those where a load is transported while suspended underneath a rotorcraft. Part 137 operations are also known as “aerial application” or “cropdusting.”

Table 3-14: 2017 Hours Flown Distribution of GA Aircraft by 5-Year Increments of Age

Age Increment	Active Aircraft	Hours Flown				
Year of Manufacture		Part 91/125	Part 133	Part 135	Part 137	Total Hours by FAR Part
2013 – 2017	13,539	2,181,086	2,963	390,723	179,321	2,815,254
2008 – 2012	13,654	1,965,808	4,848	429,679	153,479	2,629,621
2003 – 2007	20,816	2,569,539	7,374	491,336	124,010	3,276,992
1998 – 2002	14,726	2,086,379	5,304	440,248	93,417	2,674,078
1993 – 1997	8,405	794,876	6,142	204,998	203,651	1,238,692
1988 – 1992	5,387	449,519	13,206	264,649	88,081	830,790
1983 – 1987	6,675	674,344	4,582	197,336	29,780	916,983
1982 – 1978	25,745	2,900,403	27,289	302,354	173,305	3,437,182
1977 & Earlier	102,809	6,469,843	42,900	408,974	451,269	7,392,577
All Aircraft	**211,756**	**20,091,797**	**114,609**	**3,130,297**	**1,496,313**	**25,212,170**

Source: Analysis of responses to FAA's General Aviation and Part 135 Activity Survey CY 2017
Col 1: Aircraft reported
Cols 2 - 5: Hours reported under categories which correspond to Operating Rules shown
Col 6: Sum of hours reported under all categories

3.3.3 GA Capacity and Utilization

Table 3-15 shows the average capacity (in seats and gross weight) as well as the average percentage of seats occupied for each aircraft group. These data were tabulated from the NTSB accident database for the 1982 to 2018 time period. In this time period, there were 69,463 accidents and incidents with sufficient aircraft characteristic data to assign the aircraft to an economic values aircraft category. This period was selected to provide a large number of observations. The analysis assumes that number of seats, occupants, and gross weight of accident aircraft apply to the population of aircraft within each group. The average GA aircraft had about 3.7 seats and flew about half-full during the period.

Table 3-15: 1982-2017 GA Capacity and Utilization

Aircraft Category	Certification	1 Average Seats Occupied	2 Percent of Seats Occupied	3 Average Gross Weight
Piston engine airplanes, one-engine	Part 23	1.7	54.1%	2,646
Piston engine airplanes, multi-engine	Part 23	2.5	39.1%	6,331
Turboprop airplanes, one-engine	Part 23	1.3	60.7%	7,468
Turboprop airplanes, multi-engine	Part 23/25	3.3	36.0%	12,690
Turbojet/turbofan airplanes	Part 23/25	5.6	38.8%	39,861
Rotorcraft piston	Part 27/Part 29	1.6	66.1%	2,248
Rotorcraft turbine, one-engine	Part 27/Part 29	2.3	47.6%	4,110
Rotorcraft turbine, multi-engine	Part 27/Part 29	3.5	47.9%	10,176
Other		1.5	75.2%	1,258
All Aircraft		**1.9**	**50.6%**	**3,844**

Source: GRA analysis of NTSB accident and incident data for the 1982 to 2018 time period
Only data reported for accidents/incidents that were operating under Part 91, 125, 133, 135, and 137 are included
Col 1: Average (weighted) number of seats for aircraft in NTSB accident and incident data from 1982 to 2018
Col 2: Number of seats divided by number of passengers
Col 3: Weighted average gross weight (pounds)

3.3.4 Alternate Estimate of Air Taxi Hours

Table 3-16 shows an alternative estimate of air taxi hours flown using FAA data that report the number of aircraft that are authorized to conduct on-demand operations under Part 135 and the activity data for aircraft with Part 135 hours from the 2017 GA Survey. Using this method produces an estimate of 2.2 million hours for on-demand Part 135 operations. This can be contrasted with the 2.4 million "air taxi" or 3.5 million Part 135 hours tabulated from the GA Survey. The difference in hours is driven by the difference in aircraft; there are approximately 10,500 aircraft certificated to conduct on-demand operations, but nearly 11,900 (based on weighted survey responses) indicating some air taxi use. There is clearly uncertainty about the actual levels of on-demand Part 135 activity. Analysts can consult APO-110 staff analysts to get further information on Part 135 activity.

Table 3-16: 2017 Alternate Estimate of Air Taxi Hours Flown

	1	2	3	4	5
Aircraft Type	**Unique Aircraft**	**Average Annual Total Hours**	**Estimated Annual Total Hours**	**Average Annual Air Taxi Hours**	**Estimated Annual Air Taxi Hours**
Single-Engine Piston	1,204	204	245,336	100	120,366
Multiengine Piston	833	341	284,303	261	217,390
Turboprop	2,178	480	1,046,179	379	825,845
Jet	3,571	417	1,488,084	217	773,657
Rotorcraft Piston	233	333	77,484	64	14,967
Rotorcraft Turbine	2,505	357	894,347	101	253,312
All Aircraft	**10,524**	**N/A**	**4,035,732**	**N/A**	**2,205,537**

Source: Unique aircraft from FAA Operating Specification Subsystem (data as of May 2019); average total and air taxi hours from 2017 GA Survey
Col 1: Total unique Part 135 aircraft in FAA Operating Specification Subsystem, by aircraft type. One aircraft (a blimp/dirigible) is excluded from analysis
Col 2: Average annual hours from GA Survey
Col 3: Column 1 multiplied by column 2
Col 4: Average annual air taxi hours from GA Survey, by aircraft type
Col 5: Column 1 multiplied with column 4

3.4 MILITARY AIRCRAFT

Military aircraft can impact FAA investment decisions because they utilize the resources in the national airspace system. The data for the U.S. military aircraft fleet came from Flight Global's World Air Forces 2015. The fleet counts were adjusted to reflect only those aircraft types reported in Department of Defense (DOD) reimbursement rate data. Data on annual hours flown by aircraft type were obtained from the military services either via the worldwide web or through telephone interviews with relevant DOD and FAA staff during the prior economic values study. However, DOD would not provide certain data which has been identified as "For Official Use Only" because it could not be published in a report available to all.

Aircraft were assigned to the same categories as were used in the prior economic values publication. As shown in Table 3-17, the total military fleet contained almost 13,000 aircraft in FY2014. These aircraft averaged almost 400 hours a year in flight time. The largest aircraft category was rotary wing aircraft. The aircraft types with the largest number of average annual hours flown were turbojet and turbofan aircraft with three or more engines. These typically were transport, tanker or surveillance aircraft. There were limited data available for piston-engine, UAV and glider aircraft.

Table 3-17: FY2014 U.S. Military Fleet and Utilization Levels

Aircraft Type	1 Total Fleet	2 Average Flight Hours	3 Total Flight Hours
Turbojet/fan 3+ Engine	834	993	828,210
Turbojet/fan Attack/Fighter	3,256	313	1,017,719
Turbojet/fan Other	977	452	441,506
Turboprop	1,569	489	766,610
Piston	32	N/A	N/A
Rotary Wing Aircraft	6,030	303	1,824,114
UAV	301	N/A	N/A
Glider	N/A	N/A	N/A
All Aircraft	**12,999**	**385**	**4,878,160**

Sources: Fleet data from Flightglobal's *World Air Forces 2015.* Number of aircraft based on aircraft types in DOD reimbursement rate data. Used Average Flight Hours by aircraft from 2007 to obtain Total Flight Hours.

Col 1: Total number of aircraft (by aircraft type) in military service

Col 2: Average annual flight hours, weighted by fleet

Col 3: Total flight hours