Fleet Characteristics of Collegiate Aviation Flight Programs

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ABSTRACT

The University Aviation Association (1991) completed the last report on the status of collegiate aviation programs over two decades ago. The purpose of the current report is to update the field regarding the status of collegiate aviation fleet characteristics. Using existing survey data, collected in 2010 from 38 collegiate aviation programs in the United States that use aircraft or flight-training devices (FTD), fleet size, hours in use, aircraft and FTD types used, and the number of students in each program were investigated. The results indicate that collegiate aviation flight programs have increased their number of aircraft and FTD since the 1991 study.

INTRODUCTION

Over the last 20 years, multiple changes to collegiate aviation programs have occurred. The aircraft fleet size, diversity of aircraft used in training, student population, and cost all have been variable factors in training future airline pilots (Depperschmidt, 2008; Karp, 1996; Karp et al., 2001; University Aviation Association, 1991). While a variety of aircraft are utilized to train pilots, many descriptive characteristics of collegiate aviation fleets are unknown. This study will describe the current fleet of training aircraft used in collegiate aviation. The background, type, and size will be examined in conjunction with a literature review of past research into fleet characteristics in collegiate aviation.

Preexisting data from April of 2010 is used in an attempt to discover the needs and wants of collegiate aviation programs that offer flight training. The importance of this study is to create some guidance for new students looking at collegiate aviation programs as well as program administrators comparing aviation programs' strengths and weaknesses. Additionally, this article describes data that is of interest to aircraft manufacturers, flight schools, and individuals making decisions regarding proposed legislation.

REVIEW OF LITERATURE

As an industry, scholars and practitioners have a limited understanding of various fleet characteristics. One major issue with current collegiate aviation programs is the lack of data regarding how many training aircraft and flight-training devices are used to train professional pilots. Another issue related to fleet characteristics is the average age of training aircraft, the amount of hours that each airplane flies per year, and how the ownership characteristics of the flight training aircraft affect the flight program. All of which are useful for administrators to understand. In this study, we present data from a survey that investigated the fleet characteristics of two- and four-year collegiate aviation programs.

In 1991, the University Aviation Association undertook a national survey of collegiate aviation programs in the United States that used aircraft and flight-training devices (FTD) in their curriculum. The findings of the study, despite being over twenty years old, identify the status of the fleet of aircraft used in collegiate aviation programs at the time. This study found that 58% (N = 119, M = 13) of all schools operating aircraft used between 1 and 10 aircraft and 48% of the flight schools operated between 1 and 5 FTD. Since 1991, no other study has looked specifically at the descriptive statistics of the aviation programs offering flight training at the collegiate level.

The Federal Aviation Administration (FAA) tracks the number of aircraft certified for specific use each year. The data shown in Table 1 for 2009 indicates the percentage of general aviation flying that was instructional (Federal Aviation Administration, 2009b).

Table 1. *2009 General Aviation and Air Taxi Number of Active Aircraft by Primary Use*

Aircraft Type	Total Active	Instructional	Percentage
Fixed Wing: Total	177,446	12,061	6.8%
Piston: Total	157,123	11,912	7.6%
1 Engine: Total	140,649	10,986	7.8%
2 Engine: Total	16,474	926	5.6%

Note. Adapted from the (Federal Aviation Administration, 2009b)

According to the FAA Aerospace Forecast (2010), "the active general aviation fleet is estimated to have increased 0.1 percent in 2010 from 223,948 to 224,172. With the increase in the active fleet, general aviation flight hours are estimated to have increased 1.2 percent in 2010 to 24.1 million" (p. 25). This equates to approximately 107.5 hours per aircraft annually. In comparison, the average hours flown by commercial U.S. air carrier operators is 8.26 hours per day, or 3,015 hours annually (Darby, 2008, p. 24).

The average number of pilots per aircraft is another important consideration in both collegiate training programs and other sectors of the aviation industry. Darby (2008), presenting at the 33rd Annual FAA Forecast Conference in Washington, D.C. on the future of U.S. airline pilots, stated that there was an industry average of 9.63 pilots per aircraft. Lovelace and Higgins (2010) reported that the average for legacy and major carriers is 12.65 per aircraft. According to the FAA (2009a), there were 594,285 active pilots in the U.S. and 223,920 total aircraft (Federal Aviation Administration, 2010) for an average of 2.65 pilots per general aviation aircraft. Neither the commercial nor the general aviation statistics are appropriate in addressing the collegiate aviation training fleet because the mission is very different for each fleet of aircraft. Understanding the proper ratio of pilots to training aircraft in collegiate aviation will allow for better utilization, lower operating costs, and maximum profit for each program.

Another important aspect of collegiate aviation is fleet management. According to Christensen and Thorpe (2009), in their report on ground based fleet management, one of the purposes of introducing fleet management is to "create the most lean, cost-effective, efficient, and environmentally sustainable fleet policies, procedures, and operations possible" (p. 19). Administrations can benefit from understanding what other flight programs are doing in order to predict fleet operation size with regard to student enrollment numbers. The commercial airlines predict that, for every aircraft brought into service, a certain number of pilots are needed to manage those aircraft. Furthermore, Boeing (2011) predicted that 466,650 trained pilots are needed to properly staff the world's airlines over the next 20 years. However, collegiate aviation does not have any studies that specifically address how they will meet the need of the pilot shortage or manage the collegiate fleet size to train future aviators.

While many statistics have described the size and scope of the general aviation fleet and the airline fleet, few specifically have targeted collegiate aviation. The number of general aviation aircraft is up, as are flight hours, but no recent data exists describing the collegiate aviation training fleet (Federal Aviation Administration, 2010). Brown Aviation Lease conducted a study in March of 2010 to answer some of the lingering questions regarding the makeup of the collegiate aviation training fleet (both aircraft and FTD).

Thus, the purpose of the current study was to determine the number of aircraft and flight-training devices of collegiate aviation flight programs in the United States and to update the profession regarding collegiate flight training programs.

The survey was used to assist in answering the following research questions:

1. What is the aircraft fleet size of collegiate aviation programs?
2. What type of flight simulation is used in collegiate aviation?
3. What is the age and flight hours per year of the aircraft used by collegiate aviation programs?
4. What type of aircraft is used in flight training?
5. What is the rate per hour students pay for aircraft?
6. How many students does the average collegiate flight school have?

METHODOLOGY

Data and Recruitment

In the spring of 2010, Brown Aviation Lease conducted a survey of collegiate aviation programs in the United States listed in the University Aviation Association (UAA) *Collegiate Aviation Guide*. This guide lists all two- and four-year public and private higher education schools that are members of the University Aviation Association. While this list of aviation schools may not include all collegiate aviation programs, other scholars in the field that study collegiate aviation programs (e.g., Ison, 2008; Ruiz, 2004) have used this selection procedure.

The preexisting data used in this paper was gathered by Brown Aviation Lease by sending out emails to 98 aviation program chairs or departmental leaders describing the online survey and inviting participation in the study. The participants followed a link to a secure Web site operated by the marketing firm Constant Contact. A month after initial contact, telephone reminders were made to institutions that had not yet completed the survey. Thirty-eight of the 98 programs listed in the *Collegiate Aviation Guide* responded to these requests (response rate of 38.8%); however, only 31 programs that responded operate a fleet of aircraft. Thus, the total response rate for this study is 31 collegiate aviation programs.

Analytic Strategy

Data were input into SPSS and checked against the actual surveys. Because the data was preexisting in categorical form, this paper only addresses the research questions by reporting the number of responses and percentages. Comparative data was not collected as part of this research project.

RESULTS

To identify the number of aircraft used in flight programs, participants responded to the survey question, “How many primary training aircraft do you operate?” Possible categorical responses to this question were 0 to 4, 5 to 9, 10 to 19, and more than 20 aircraft. Of the 31 flight schools surveyed, all indicated that they operated five or more aircraft. Fifteen programs operated 5-9 aircraft, and more than half of the programs operated 10 or more aircraft. The responses to this question are found in Table 2.

Table 2. *Number of Primary Aircraft per Flight School*

Number of Aircraft	Schools	Percentage
0-4	0	0%
5-9	15	48.4%
10-19	11	35.5%
> 20	5	16.1%

To determine the type of flight simulation utilized in collegiate aviation programs, the participants were asked, "Do you utilize simulation equipment and, if so, what type of equipment?" The majority of flight schools (n = 27) used flight-training devices. The least frequently used type of simulation was full-motion simulators (n = 2). Thirteen collegiate aviation programs used only one type of simulation, 14 programs utilized two types of simulation, and two programs reported using three different types of simulation. Table 3 indicates the type of flight simulation used.

Table 3. *Type of Simulation Utilized in Flight Schools*

Type of Simulation Equipment	Schools
PC ATD	14
AATD	18
FTD	27
Full Motion Simulator	2

Note. Flight programs could indicate more than one response to this question.

In Table 4, the average age and flight hours per year on aircraft used by collegiate aviation programs was calculated. According to the survey, the mode age of their primary aircraft was 5-9 years old.

Table 4. *Average age of primary training aircraft*

Aircraft age in years	Response	Percentage
0-4	5	16%
5-9	12	38%
10-19	6	19%
>20	9	29%

Note. Percentages do not add up to 100% due to rounding

The total number of hours used per aircraft is important when planning for future upgrades to fleet size or maintenance schedules. Of the schools reporting annual usage (N = 31), over 90% used their aircraft between 200-799 hours annually. Table 5 shows the number of flight hours per year for primary training aircraft.

Table 5. *Annual number of flight hours per primary training aircraft*

Number of flight hours	Number of responses	Percentage
0-199	1	3%
200 - 399	12	38%
400 - 799	16	52%
>800	2	6%

Note. Percentages do not add up to 100% due to rounding.

The most common manufacturer of aircraft used as a primary trainer in collegiate aviation flight training programs is Cessna Aircraft (n = 21), followed by Piper Aircraft (n = 7). Aircraft listed in the "Other" category in Table 6 that are used as primary trainers in flight programs included the Beech Sundowner, Cessna 172RG, Diamond DA-40, Liberty XLS, Piper Archer, Piper Seminole, Piper Arrow, and Maule aircraft.

Table 6. *Primary Training Aircraft*

Aircraft	Response	Percentage
Cessna 152	6	14.0%
Cessna 172	15	34.9%
Piper Warrior	7	16.3%
Cirrus SR20	3	7.0%
Diamond DA20	2	4.7%
Other	10	23.3%

Note. Percentages do not add up to 100% due to rounding.

In Table 7, the average cost to the student for a primary training aircraft per hour is listed. The cost per hour is for a primary training aircraft with fuel and no instructor.

Table 7. *Estimated hourly rate of primary training aircraft*

Cost	Number of responses	Percentage
$0-99	6	20.0%
$100-134	13	43.3%
$135-159	9	30.0%
160-184	2	6.7%

To provide some demographics of the respondents of the survey, Table 8 displays the number of students in each flight program. According to the results, most collegiate aviation programs have between 50 and 149 students enrolled. Only three schools indicated an enrollment greater than 200 students. The preexisting data does not specify the exact number of students beyond 200.

Table 8. *Number of students per flight school*

Number of students	Number of responses	Percentage
0-49	5	16.1%
50-99	11	35.5%
100-149	10	32.3%
150-199	2	6.5%
> 200	3	9.6%

DISCUSSION AND CONCLUSIONS

While the data from this survey was preexisting, it did provide some descriptive differences between the UAA 1991 report and current data. It appears from the data collected by this survey that 83.8% of flight schools now operate between 5-15 aircraft signifying that each school has increased in size to accommodate a larger student body. From this survey, 89% of programs reported using some type of simulation in their flight program, a sharp increase from the 48% of schools that reported using simulation in the 1991 UAA report demonstrating that simulation is used more frequently to train students in collegiate aviation programs.

The mode age of aircraft used by collegiate flight programs is from five to nine years old and of the schools reporting annual usage (n = 31), over 90% used their aircraft between 200-799 hours. The most prevalent aircraft manufacturer is still Cessna (n = 21) followed by Piper (n = 7). The 1991 UAA report stated that Cessna manufactured 65% of training aircraft, indicating a diversification of aircraft within the collegiate aviation environment.

The last part of the results of this section deal with the size of the flight programs and the cost associated with flight training. According to the survey, the mode (n = 13) for the cost per flight hour is between $100-$134 per flight hour. The UAA 1991 report did not address the per hour cost of flight training, only the aggregate cost of each rating with a median cost. The size of collegiate programs ranged from zero to over 200 with more than 67% of the schools reporting sizes between 50 and 149 students. The UAA (1991) report did not specify the number of students in each flight program. The existing data did not allow for further analysis based on school size.

Every flight program deals with fleet management issues with aircraft. Understanding how many hours each aircraft operates as well as the cost structure associated with each aircraft helps to set standards, differentiate themselves from the competition, and potentially help prospective students choose a school.

RECOMMENDATIONS

The findings of this study help to illustrate some of the fleet characteristics of collegiate flight programs. While this is by no means a comprehensive study, it does shed some light on areas where more research is needed to properly identify information such as average usage hours of aircraft and simulators, ratio of students to aircraft, average cost of aircraft and FTDs, and size of programs involved in collegiate aviation training. This information would be important to government, industry, and education to identify training capacity and cost of collegiate aviation training, which would be useful in times of pilot shortages.

The nature of the preexisting data used in this study did not allow for strong structural analysis. The disadvantage of this study is it does not allow the researcher to quantify many of the results because large schools (>20 aircraft and/or >200 students) could have exactly 20 aircraft or 200 aircraft with no way of knowing. Therefore, the results of this study are limited in nature and serve as one leg of a triangulation study addressing all of the fleet characteristics of collegiate aviation.

Based upon these observations, more research is needed to address issues in collegiate aviation, including creating a more robust national survey to identify more specific fleet characteristics. Identifying what aircraft and FTD are being used to fulfill advanced ratings requirements such as complex, high-performance, acrobatic, tail wheel, turbine, helicopter, and seaplane flying would be useful. Because some advanced aircraft can be used as primary trainers, this study is limited in its scope but still provides details updating the results of the UAA (1991) national survey of collegiate aviation programs in the United States.

This survey has helped to shed light on some of the operational challenges that are facing the collegiate flight training industry. From the limited data, it appears that some collegiate aviation programs utilize aircraft at a greater rate than others do, with no justification as to why or how they do it; this would be an excellent opportunity for additional research. As a small segment of the aviation environment, collegiate aviation programs can band together to address the pilot training issues by understanding how other programs operate.

As reported the average hour increase in utilization of collegiate aviation aircraft is still unknown, while other sectors of the aviation industry have readily available information on utilization of aircraft. This information would be useful for both practitioners and researchers to understand how utilization changes costs for students, aircraft availability, and hours flown per year.

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