Journal of Aviation/Aerospace Education & Research

Volume 32 | Number 3 Article 2

2023

The Effects of Operationally Limited Environments on Primary Flight Training at the Collegiate Level

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Scholarly Commons Citation

Bursaw, K. M., & Casebolt, M. K. (2023). The Effects of Operationally Limited Environments on Primary Flight Training at the Collegiate Level. *Journal of Aviation/Aerospace Education & Research, 32*(3). DOI: https://doi.org/10.58940/2329-258X.1978

Abstract

This national research study examined the effects operationally limited environments have on primary flight training at the collegiate level. The study utilized the operationally limited environment of the COVID-19 pandemic to quantify the amount of training that was done pre, post, and during the pandemic to evaluate the effects operationally limited environments have on primary flight training at the collegiate level to help aid in planning for future possible disturbances and successful self-mitigation measures. Data was collected from 10 FAA Part 141 collegiate flight schools that offered a four-year bachelor's degree and operated their own fleet of aircraft were analyzed for the findings and conclusions in this study.

Introduction

In March of 2020, COVID-19 was declared a global pandemic by the World Health Organization. Within a few days most countries worldwide reacted to the declaration of the global pandemic and went into some form of lockdown that kept people from leaving their homes. Included in this was the global aviation industry, most notably Part 141 collegiate flight training schools with Private Pilot's License (PPL) programs in the United States (U.S.). As a result of the global pandemic, students were sent home, and schooling was placed online. The progression of flight courses and training for collegiate aviation students was affected during the lockdowns. Because collegiate aviation is the traditional starting point for pilot training in the U.S, this disturbance of the pilot supply chain directly affects pilot production in the US. This study sought to quantify the amount of training that was done pre, post, and during the pandemic to evaluate the effects operationally limited environments have on primary flight training at the collegiate level, to aid in planning for

possible future disturbances, and to ensure pilot training continues for a stable U.S. pilot supply chain. In addition to quantifying the amount of training, this research also recorded COVID-19 self-mitigation measures that collegiate flight programs reported to see if those measures were successful in resuming flight training.

Purpose of the Study

The purpose of this study was to investigate flight training at Part 141 collegiate flight programs pre, post, and during COVID-19 to understand the effects operationally limited environments have on primary flight training, as well as to identify if self-mitigation measures taken by collegiate flight programs helped regain flight training.

Research Questions

To understand the effects operationally limited environments have on collegiate primary flight training, the follow research questions guided this study:

1. How was collegiate flight training affected by the COVID-19 pandemic?
2. What mitigation measures did collegiate flight programs take to resume in-person flight training?
3. How effective were collegiate flight programs' mitigation measures in resuming flight training?

Literature Review

The State of the United States Pilot Training Pipeline

In order to understand the full effects an operationally limited environment has on the collegiate primary flight training pipeline, it is also critical to understand the current state of the industry since collegiate aviation is one of the traditional starting points for the U.S. pilot training pipeline. Citing a study conducted before the COVID-19 pandemic outbreak,

Caraway (2020), notes that the Federal Aviation Administration (FAA) has projected that North America needs to train 360,000 pilots by 2037 to meet forecast demand and growth. These projections are supported by Lutte et al.'s (2014) findings which project a shortage of 95,000 pilots in the United States alone in the next 20 years. The Boeing Pilot and Technician Outlook 2020-2039 estimates that 763,000 additional pilots will be needed by the end of 2039 (Boeing, 2020). In addition to issues of growth and demand, additional research by Lutte et al. (2014) and Depperschmidt (2013) sought to explain the effects increased flight hour requirements for flight students to obtain their restricted ATP licensing, will have on aspiring pilots. These studies identified that collegiate flight student participants had negative perceptions of entering and/or continuing training after its passage. To illustrate the current state of the industry, Caraway (2020) cites an FAA study explaining that to end this shortage of pilots, the industry must bring in 36,683 pilots every year until 2037. In addition, Casebolt et al. (2017) found that from a recruitment standpoint, collegiate flight students have a negative perception of the act and expressed negative concerns on retention and recruitment into the industry.

Klapper and Ruff-Stahl (2019) illustrate the projected shortage by explaining that when airlines do not have the employees to crew jets they park them, leading to lost revenue from reduced passenger capacity, thus violating capacity-purchase agreements (CPAs) with major airlines. CPAs are vital to the regional airlines' revenue stream (Klapper & Ruff-Stahl, 2019). According to Klapper and Ruff-Stahl (2019), the regional airline industry will contract by 2023 due to lack of pilots. Their forecast predicts a shortage of 5,333 pilots in best case scenarios, and a shortage of 8,000 pilots in worst case scenarios (Klapper & Ruff-Stahl, 2019). Klapper and Ruff-Stahl (2019) explain that, as a result, major airlines will focus on

cutting regional airline contracts and providing bridge programs to new pilots to enter their firms. It is important to note that these numbers are pre-COVID, as no other peer reviewed studies have been done to date after the effects of the pandemic.

To get a glimpse into the post-COVID-19 world of aviation, Stalnaker et al. (2021) note that, while COVID-19 is not over yet, by early 2022, demand for air travel will be back at 2019 levels. Stalnaker et al.(2021) explain that because of the loss of flight training and new trainee attrition during the lockdowns, the United States could be facing an even bigger shortage than initially predicted. Murray & Green (2021) examined a similar unpredicted incident for the airline industry by evaluating the falling percentages of new pilot certifications after 9/11 and identified a 30 to 40% drop. Murray & Green projects a loss of 25,000 to 35,000 current and future pilots because of the pandemic (Murray & Green, 2021).

Primary Flight Training

To understand the effects operationally limited environments have on collegiate primary flight training, it is important to understand the critical learning value imbedded in primary flight training and its importance to collegiate institutions and the aviation industry. Pilot training in the United States is governed by the Federal Aviation Regulations (FARs). These regulations are released yearly with any associated changes.

The starting point for primary flight training at collegiate institutions is the private pilot license (PPL), where students are instructed on single engine airplanes with specific requirements from FAA-approved curriculum including ground school and flight training requirements (FAA, 2021). Traditionally, in a normal operating environment, this training and education takes place on campus or in a flight center for collegiate aviation students.

During primary flight training collegiate aviation students are educated and trained for situational awareness and Aeronautical Decision Making (ADM) using blended instruction techniques to encourage the inception and retention of higher order thinking skills (Robertson, 2005). According to the FAA (1991) this training is vital for student pilots because ADM trained students had 10 to 50% fewer judgmental errors while operating aircraft. ADM addresses the five hazardous attitudes in aviation, as well as stress, and risk management (FAA, 1991). Operationally-limited environments have the potential to affect collegiate institutions' abilities to successfully teach ADM to collegiate flight students. To be able to effectively teach ADM, and the operation of any aircraft, it is imperative to understand the learning styles of collegiate aviation students in normal operating environments. According to Kanske and Brewster (2001) these learning styles are generally the converger and assimilator learning styles of the Kolb Learning Style Inventory. Kanske and Brewster (2001) note that this learning style emerges right after the freshman year and that most of the students who do not move towards this style generally drop flight training and move onto other studies. Another critical learning outcome in a normal operational environment in primary flight training for students is Scenario Based Training (SBT). According to Doskow (2012) SBT, when compared to the traditional Maneuver Based Training, was found to lead to a positive increase in ADM. A study by Allen (2008) of flight school incident data provides the importance of ADM through SBT. Allen (2008) observed that one of the biggest hurdles student pilots must overcome is landing the aircraft, which is where, in the study, the majority of poor ADM applications led to accidents. The ability to properly train flight students in ADM and SBT is something that could be severely affected in an operationally limited environment.

As time has gone on, primary flight training and the education have evolved, and school has started moving online more frequently (Prather, 2007). In particular, aviation degrees have moved online in a distance learning format. Whereas flight hours must still be done in the actual aircraft, most ground school classes can be done on the internet. A study by Prather (2007) reviewed the history of distance learning, from its roots in correspondence classes at the turn of the century, to today's online degrees, while theorizing what the future of collegiate aviation distance learning might look like. Prather found that there were only 24 colleges in the United States and Canada offering online aviation courses, and only four of these had completely online degrees (2007). He found that none of these degrees are of the professional pilot nature due to the required flight training only being available in-person. However, Prather (2007) discusses how distance learning will enable persons of different demographics and remote locations, who normally would not have the opportunity to explore aviation education at the collegiate level, to participate in greater numbers. At the time of this research in 2007, only a handful of Part 141 flight schools were exploring or implementing distance learning in collegiate aviation

To further understand the potential effects operationally-limited environments can have on primary flight training, it is important to consider distance learning and instructor continuity in primary flight training and its effects on flight students. A study done by Goff (2013) on United States Air Force pilots flying the T-1A out of Columbus Air Force Base revealed that, out of 144 students surveyed, there was a statistically significant negative effect on grades with exposure to excess numbers of flight instructors. The data presented a one-point degradation, in check ride scores, per extra instructor outside the recommended number, that the student pilot flew with (Goff, 2013). This study helps illustrate a closely

held belief in the aviation industry that a student should fly with a lower number of flight instructors in training to help build and refine critical skills (Goff, 2013).

Methodology

This study surveyed school administrators and flight program directors regarding the impact the COVID-19 pandemic had on collegiate flight training. This study sought to quantify the amount of flight training that occurred pre, post, and during the COVD-19 pandemic to identify the effects operationally-limited environments have on primary flight training at the collegiate level to support future planning ideas for collegiate flight programs in similar situations to help diminish loss of training. This study examined the effect on training during the COVID-19 pandemic to see if a plan could be established in the future for similar situations to help with training in an operationally limited environment to ensure a healthy U.S. pilot supply.

Research Survey

A 13-question research survey (see Appendix A) was developed that asked for the number of flight hours flown and percentage of fleet usage (in semester increments) to compare pre-COVID-19 training to training during the pandemic as well as post pandemic. The Spring 2019 to Fall 2021 semester range was selected to give three full semesters (1 year) of pre-COVID-19 data to compare to three full semesters (1 year) during COVID-19, and three full semesters (1 year) after the initial declared pandemic. The responses given about flight hours helped researchers compare hours flown during the different phases of the pandemic. Additional questions on the research survey inquired about the total enrollment and certificate completion numbers in PPL programs to examine how PPL training was affected at the collegiate level. Further questions inquired about the size of the Part 141's

aircraft fleet, their utilization and if the number of aircraft impeded the return to instruction in any way. These questions provided clarity on the usage of aircraft for training, and if that was a factor in any lost training. Additional questions asked if aviation professionals/industry consultation were included in the creation of COVID-19 mitigation measures. Further survey questions asked about training cessation and resumption dates to accurately ascertain which semesters were most affected by the operationally-limited environment. Finally, the last part of the survey had open-ended questions where respondents could report what mitigation measures, if any, were used to reduce virus transmission at their institutions.

Participants

The participants for this research study were Part 141 approved collegiate flight schools offering a four-year program culminating in a bachelor's degree and operating their own fleet of aircraft. These schools were identified for contact using the FAA Part 141 school online database. This survey was composed of school administrators and flight program directors and not the student pilots.

Data Collection

The data collection for this study consisted of three steps. The researchers first identified and emailed Part 141 collegiate flight schools in the U.S. from the FAA online database (https://av-info.faa.gov/PilotSchool.asp). Next, the researchers contacted the identified school's Chief Flight Instructor via email and asked for their willingness to participate in the study. Following this, a survey with the research questions was emailed, with a consent form, to the flight schools willing to participate in the study. Schools had 30 days to respond to the survey. A two-week reminder was sent within 14 days of the survey being opened. After the collection of all data, the researchers removed any identifying

information from the schools and analyzed the data that was returned. Data collection and final analysis was completed by early May 2022. This research survey was approved by the Oklahoma State University Institutional Review Board IRB-22-16.

Reliability and Validity

Reliability and validity are used in social science research to evaluate the quality of research to be trustworthy and useful. Reliability was established with trustworthiness. Trustworthiness is the name given to the four criteria that, if attained, will allow "increased confidence in the rigorousness of the findings" (Lewis-Beck et al., 2004, n.p.). "Credibility refers to the plausibility of an account" (Lewis-Beck et al., 2004, n.p.). In addition to this definition, credibility is one of the four trustworthiness criteria (Lewis-Beck et al., 2004). To help establish trustworthiness in this study, the researchers followed the four criteria. The first criterion was credibility. The researchers established this by having three other collegiate aviation professionals screen the survey questions. In addition, the researchers gathered input provided by the aviation professionals to amend the questions as needed. Transferability was attained by the specific wording of the survey questions, and final analysis and plan, so that they could be applied to flight schools in different populations. Dependability and confirmability were met by keeping detailed, digital logs of all the research study design and data collection processes. In addition, validity was established from three collegiate aviation professionals (two of which have over 10 years of service in the industry), and their suggestions were used in the final version of the survey that was sent out to the Part 141 flight schools.

Data Analysis

The data for this research was analyzed with descriptive statistics. Descriptive statistics was used for depicting the basic elements of a set of data such as the mean or range (American Psychological Association, 2022). The data was used as a timeline to help illustrate where programs were pre-, during, and post-pandemic

In addition to descriptive statistics, this research also used thematic analysis to aid in the basic framework for a future plan for operations for flight schools in an operationally limited environment. Thematic analysis, although sometimes disorganized, is best due to its theoretical flexibility (Lester et al., 2020). Lester et al. (2020) discusses how the thematic analysis approach allows the researcher to talk in comprehensive illustrative terms when referring to their research. The process for thematic analysis generally has seven phases: preparing data, transcribing data, becoming familiar with the data, memoing, coding, moving from codes to categories and categories to themes, and making the analytic process transparent (Lester et al., 2020). This process allowed for the ability to use the data to construct a basic framework for operations in an operationally limited environment. An inductive approach was used with the data. Thomas (2006) indicates how inductive thematic analysis allows themes to emerge without being bound by the preconceptions of the researcher. In addition to this, the inductive approach is "intended to aid in understanding of meaning in complex data through the development of summary themes or categories from raw data" (Thomas, 2006, p. 239).

Findings

Reported Flight Hours

Question one of the research surveys asked Part 141 schools to report their number of flight hours flown during nine semesters (3 years) to compare pre-COVID-19 training, during COVID-19 training, and post-COVID-19 training. Table 1 in Appendix B shows the reported flight hours for Schools A through J. Table 1 illustrates flight hours flown, per semester, by the 10 respondents. Schools F and J declined to respond to this question. For comparison, the researchers used 2019 pre-COVID-19 reported flight hours. This question sought to identify a difference in flight hours flown pre-COVID-19 pandemic to determine what the loss of flight training, if any, was in PPL programs.

Sustaining training in the operationally limited environment was approached in different ways by schools. Table 1 in Appendix B shows variations among different flight schools pre-, during, and post-COVID-19. Ninety percent of flight schools reported that their flight hours were the same or even greater during the emergence of COVID-19. Fifty percent reported meeting their 2019 semester numbers, while 10% exceeded them. School A reported a decrease in hours from Spring 2019 from 401-600 hours to 201-400 hours, (a 40% loss), in the Spring 2020 semester. School D showed a 15% increase in reported hours from 1001-1200 to 1201-1400 hours flown beginning with the Summer 2020 semester and continuing throughout the rest of the survey period. Seventy percent of programs reported the same summer semester hours for all three years, with the exception of School D.

Reported Student Enrollment

Table 2 *Reported Student Enrollment* in Appendix C shows the reported student enrollment (in semester increments) in the Part 141 PPL programs. Ninety percent of the

schools surveyed responded, while 10% declined to provide an answer. School J was the school that abstained. School I chose to report total student enrollment in their entire flight program, not just PPL program enrollment. Similar to Table 1, Table 2 also used the 2019 semester (pre-COVID) for comparison. This question sought to identify changes in student enrollments to investigate if the number of flight students or new enrollments declined as a result of the pandemic. Question two of the research survey asked flight schools about their student enrollment in PPL flight courses. Eighty percent of schools reported the same enrollment or an increase in enrollment. Schools A, C, E, F, G, and H, (60% of respondents) reported the same number of students in relation to their pre-COVID-19 semesters. Thirty percent of schools reported an increase in student enrollment in some capacity. Of that 30%, two respondents, starting in the Summer 2020 semester, reported an increase in student enrollment that continued throughout the remainder of the surveyed semesters. School B went from a student enrollment of 101-125 from Spring 2019 to Spring 2020. School B increased their student enrollment in Summer 2020 from 18 to 126-150 for the rest of the survey period. School D, in Summer 2020, went from 76-100 students to 101-125 students in their PPL program, a 22% increase. Both schools' increase in enrollment came within the same semester. School I reported their student enrollment as 0-25 students in Spring 2019 and 26-50 from Summer 2019 to Spring 2021 a 66% increase. School I then reported that they declined in enrollment to 0-25 for Summer 2021 and increased to 26-50 the following semester.

Reported Student Certificate Completion

Part 141 schools were asked to report student completion numbers in their PPL programs in question three of the research survey. This data was utilized to compare the

student completion numbers from the three pre-COVID-19 semesters to the six semesters finished in the operationally limited environment. Table 3 in Appendix D shows the survey results for reported flight certificate completion. These results are shown by semester. The certificate completed was the PPL, the first major certificate a student pilot earns. School I reported all certificates completed by their institution, not just PPLs. For comparison, the 2019 semester (pre-COVID) was used. This question sought to identify if there was a decline in student flight certificate completions during and post-pandemic.

Twenty percent of schools answered the certificate completion question by showing a 22% and 28% growth respectively during the Summer 2020 semester. This new higher completion rate was maintained during the subsequent semesters until the end of the survey period. School A reported a 66% decrease in completions during the Spring 2020 (the beginning of COVID-19) semester and 65% growth, (from 0-25 to 26-50 student completions), for both summer semesters in 2020 and 2021. School C reported lower student completion numbers of 40% in the Spring 2020 and Summer 2020 semesters but returned to their 2019 numbers of 51-75 student completions in the Spring and Fall 2021 semesters and 76-100 student completions in the Summer 2021 semester. Ten percent of schools that participated showed the same number of certificate completions as in the year 2019. Thirty percent of respondents (Schools F, G, and H) showed the same certificate completion for every semester surveyed, regardless of year. School I reported 26-50 student completions for their 2019 semesters. A loss in completions (66%) occurred during the Spring 2020, Summer 2020, and Spring 2021 semesters. Completions increased during Summer 2021 by 40% from Summer 2019 and by 80% from Summer 2020. Completions returned to 2019 numbers for School I in Fall 2021.

Reported Fleet Size

The fourth question of the research survey looked to see the total number or aircraft Part 141 schools utilized during the nine surveyed semesters to see if aircraft had been bought or divested during COVID-19. Table 4 in Appendix E shows the reported aircraft fleet size for each surveyed Part 141 school. School J did not respond to this question. The 2019 semester, which was pre-COVID-19, was used for comparison. This question was to identify if Part 141 schools divested or invested in new aircraft based on the new operationally-limited environment and their return to in-person instruction. Table 4 in Appendix E shows the results to question four. One hundred percent of Part 141 Flight Schools that answered the survey reported the same number of aircraft in their fleet for all semesters surveyed.

Reported In-Person Instruction Cease and Restart Dates

The research survey queried schools regarding the dates they ceased and restarted in-person flight instruction in question five. The data this question petitioned was for the purpose of analyzing the duration schools were not able to give in-person instruction. In person flight instruction cessation was reported by 80% of flight schools who answered the survey. Twenty percent (two flight schools) did not shut down in-person flight instruction during any of the nine semesters surveyed. Fifty percent of respondents reported shutting down in-person flight instruction in March of 2020. Schools E, H, and J restarted their in-person flight instruction in July of 2020 and School G returned in May 2020. Ten percent of schools (School I) did not report any return date. Twenty percent of Part 141 schools reported in-person instruction cessation dates in April 2020 and returns in May 2020. School A only reported a return date to instruction in June 2020 and no cessation date was reported.

Size of Institutions' Fleet Impeding Return to Instruction

Question six of the research survey asked Part 141 schools if the size of the schools' fleet was detrimental to returning to in-person instruction. One hundred percent of Part 141 schools surveyed reported that the size of the aircraft fleet was not a detriment to returning to in-person instruction for flight training.

Reported Fleet Utilization

The seventh question of the research survey sought to identify what the schools' aircraft fleet utilization was during the nine surveyed semesters, to compare how the fleets were utilized pre-COVID-19 and during the operationally-limited environment that emerged. Appendix F Table 5 displays this data. Seventy percent of part 141 schools answered that they experienced zero changes during any semester from Spring 2019 to Fall 2021. Thirty percent of schools reported a decline in fleet utilization from 81-100% in the Fall 2019 semester to 61-80% during the Spring and Summer 2020 semesters. School C returned to 81-100% aircraft fleet utilization during the Fall 2020 semester and continued at this level for the remainder of the survey.

When Did Schools Return to 100% Fleet Utilization?

Question eight requested the dates that the Part 141 schools returned to 100% aircraft fleet utilization. Two flight schools (20%) reported that they never shut their flight programs down, so they did not have a return to 100% fleet utilization, as they continued flight operations. Thirty percent of Part 141 schools responded that they returned to 100% fleet utilization during the Summer 2020 semester, whereas all but one of the respondents returned in Fall 2020. School I did not return to 100% fleet utilization until the Fall 2021 semester, but also reported that during that same semester they operated approximately 30% above their

original forecast hours. School G responded that they never returned to 100% fleet utilization due to scheduled and unscheduled maintenance during the surveyed semesters. Overall, 90% of schools were able to achieve 100% fleet utilization after the Spring 2020 semester when COVID-19 emerged.

Reported Self-Mitigation Measures

The ninth question of the research survey sought to identify mitigation measures Part 141 schools took to gather data on the measures that flight schools did to help return to in-person flight instruction. This question was an open text box that allowed for individual responses from schools.. This data was intended to illustrate questions about flight hours flown, student enrollment and certificate completions, as well as fleet utilization.

A few mitigation measures that were identical were present among Part 141 schools' responses; however, there were multiple variances as well. Ninety percent of schools reported the use of sanitization of the cockpit and/or simulators between uses. School J mentioned that the initial sanitization plan (cleaning before and after a flight) was having a damaging effect on some displays in their cockpits therefore, as a result, their institution changed to just sanitizing after flights. Eighty percent of those flight schools surveyed (Schools A, C, E, F, G, H, I, and J) all implemented mask requirements for aircrew in the aircraft. Schools B and D did not report any mask requirements. Schools F and J reported phased re-openings from Spring 2020 to Fall 2021, with School J's only current restriction to stay home if an individual is sick.

School I responded with an eight-page document that went through every faucet of the school's plan for sustained operations during COVID-19. This included restricted entry points, screening, and social distancing, as well as a discipline plan for repeated violations

from personnel. Social distancing measures were included by 60% of Part 141 schools. Schools A, I, and H altered their dispatch plans as self-mitigation measures. School H staggered the takeoffs to reduce the number of people at dispatch at one time and put-up clear barriers of plastic to further limit contact between the dispatcher and the students and instructors. School F had a phase-in strategy to help limit the number of people in the dispatch area at the same time. Additionally, School F recalled five students at a time based on where they were in the syllabus when the Summer 2020 semester began. As ratings were issued to those five students, another five students were recalled. After two weeks of this, and no positive cases, students were called back 10 at a time. Pre-COVID-19 student capacity resumed in the Fall 2020 semester.

Were Aviation Professionals Included in COVID-19 Decision Making?

Question ten sought to identify if aviation professionals' industry consultation was included in COVID-19 decision making to add clarity to how mitigation plans were made, and if any professionals who had experience and understanding of the industry were included to help make a workable plan. One hundred percent of schools that responded to the survey reported that aviation professionals were included in some capacity in the decision-making process during the onset of COVID-19 and the emergence of subsequent variants.

Most Effective Mitigation Measure

Question eleven sought to ascertain what mitigation measures were the most effective for Part 141 schools to return to, and sustain, in-person operations. The question of most effective mitigation measures was used with the goal to provide Part 141 schools' view as to what worked for them and what did not. When asked what was perceived by the Part 141 Schools as the most effective mitigation measure Schools C, D, and E (30%) all reported that

they did not believe any measure was more effective than others. Twenty percent of schools (Schools B and F) reported that their most effective measure was the sanitation guidelines utilized. School B also reported the screening measures as an equally effective tool. It is worth noting that School B not only reported in this section that they never had an increase in the spread of the virus, but operational tempo increased during 2020 and 2021. School G responded that quarantine was their most effective measure, whereas Schools I and J talked about how their return-to-work plans made the difference above other measures. School A reported that instituting a culture of reporting and testing helped them manage the pandemic better than any other measure. Additionally, School A reported their discontinuance of masks and gloves in their aircraft after one semester due to the lack of air conditioning and environmental factors. School A reported that they saw a decrease in infection rates after the lifting of the mask and glove requirement, even as subsequent variants emerged.

Personal Comments

The twelfth question of the research survey allowed schools to share any information they wished about their operations or experiences in the operationally-limited environment that was not covered by previous questions. This question was answered in a free response text box. Schools E and J reported that none of their mitigation measures seemed to make a notable difference. School J reported that "hindsight tells me it was a waste of time and energy." School A doubled down on their establishment of a culture of testing and reporting as the way to make it work, as long as the plan for implementation was not too difficult. School G reiterated their plan to sanitize cockpits and other regularly-touched surfaces in aircraft. School H commented about how their students had the option to pause their training

if they did not feel safe in the training environment, and School I referenced their COVID-19 operations eight-page guide again as their difference maker throughout the survey period.

Non-COVID-19 Related Factors

The final question of the research survey asked if there were any non-COVID-19 related factors affecting data that were known by Part 141 schools that responded to the survey. This data was solicited to help clarify the data reported in previous questions. Non-COVID-19 related factors affecting flight training were requested from every school. Only 20% of schools had any non-COVID-19 related factors affecting their operations throughout the survey period. School D reported that factors (including COVID-19) did not lead to a decrease in flight training, but that their entire program grew by 20%. School A reported a major ice and hailstorm in Spring 2021 affected their training that semester only, and School F reported frequent issues due to unscheduled maintenance as a factor of delayed flight training in Summer 2021 and Fall 2021.

Research Question 1

How was collegiate flight training affected as a result of the COVID-19 pandemic?

Flight Hours

Although other sectors of the world were shut down as a result of the COVID-19 pandemic, this was not the case for collegiate flight schools. Multiple schools reported no loss of hours, and in some cases reported more hours flown than during their pre-COVID-19 2019 semesters. In most cases, the amount of training that was potentially lost was negligible; however, this does not take into account the quality of the training that was completed. In a few cases, training was not lost but gained. The results showed that only one school reported a decrease in flight hours. With the exception of one school, other schools

that participated in this study reported that their hours flown in PPL courses were either the same as or greater than their hours flown before the onset of the COVID-19 pandemic. This means that, even with the lockdowns, flight schools managed to continue to fly during the COVID-19 pandemic. This result was unanticipated, as it was not expected for the training pipeline to be able to adapt this quickly to a new type of training environment. The reason that this result was so unexpected was because the new operationally limited environment was borne out of the COVID-19 lockdowns in March 2020. These lockdowns were unprecedented, as their goal of flattening the curve of infection rates involved restricting *all* people to their homes and pausing normal human interactions (Onyeaka et al., 2021). It is not known at this time what the cause of the greater number of flight hours flown was due to. This could be due to students who did not complete their originally scheduled courses being held back resulting in more students in PPL flight courses than normal, or due to more students applying and being admitted than the flight schools normally allow.

Student Enrollment

Only one school reported a decrease in student enrollment in their PPL program. The other schools equaled or exceeded their pre-COVID-19 enrollment numbers. This helps illustrate what the pipeline looked like during the onset of COVID-19 and the emergence of subsequent variants. Additionally, this data demonstrates that the beginning of the U.S. pilot training pipeline is adaptable when operationally limited environments occur. The reason for the increases in enrollment was not investigated in this study. It could be due to excess students in the pipeline from lockdowns still looking to complete their PPL flight courses or greater enrollment than normal.

Student Completions

The results from the study reveal evidence that the U.S. pilot supply pipeline wasn't negatively affected during the onset and continuance of the pandemic, with one notable exception. PPL completion numbers were the same or greater for all but 20% of the respondents, showing that the pipeline adapted quickly. However, this is lower than the student enrollment and hours reported and does not match up perfectly. The conclusion can be drawn in some cases that flight hours weren't lost; it may have taken more flight hours than average to complete a PPL. This could signal a possible degradation in training that may need to be planned for in operationally limited environments. Only quantity of training was studied during this research, not quality, which may have been negatively impacted. To reiterate, there may also have been some students left over from the normal PPL completion timeline due to the lockdowns. This possibility would also have led to a higher completion number than pre-COVID-19 semesters.

Aircraft Fleet Size

This study aimed to identify if flight schools adjusted their number of aircraft to help with the return to training, or if the number had to be reduced because there were not enough students to fly them. According to the results, all schools operated the same number of aircraft throughout the nine surveyed semesters. There were no additions or subtractions to fleets. This could signify that, even with a surge in students and flight hours, the current fleet size was sufficient to continue normal operations without any significant changes.

In-Person Instruction Dates

When asked if in-person flight instruction ceased and resumed, there were a multitude of answers from Part 141 schools. Two schools chose not to cease in-person

instruction at all, while the remainder of schools cancelled their in-person instruction either in March or April of 2020, coinciding with the lockdowns. The latest return date was July of 2020. The average length of time that a Part 141 school shut down their in-person operations was two months. This could help explain why the flight hours reported by these Part 141 schools had not decreased. The pipeline was extremely resilient in returning to work in-person.

Fleet Size and Utilization

Part 141 schools reported that the size of the fleets did not impede the return to in-person instruction. This means that even with mitigation measures in place, including the sanitization of aircraft, there was not a detrimental effect on sortie generation. Additionally, Part 141 schools reported numbers similar to the flight hours question. Ninety percent of the respondents utilized their fleets from 81-100% during the entire nine semesters (3 years) pre-, post-, and during COVID-19. Demonstrating that fleets were utilized effectively, even with COVID-19 restrictions to help flight programs continue training. Analyzing when these Part 141 schools returned to 100% aircraft fleet utilization, the earliest were the schools that did not shut down, and the latest was in Fall 2021. According to the results of this study, fleet size did not negatively affect the return to in-person instruction and was utilized similarly to pre COVID-19. Maintenance was able to be maintained as well during this time. Overall, these data points display what is now emerging as a sign of the resiliency of the collegiate aviation industry that was not previously known.

Research Question 2

What mitigation measures did collegiate flight programs take to resume in person flight training?

Results from the research survey showed that Part 141 schools used a multitude of different mitigation measures, throughout COVID-19, to resume and sustain operations in the operationally limited environment. These measures were not stagnant, but constantly evolving to fit the safety protocols in place at different schools, as well as to meet the goal of in-person flight training and certificate completion.

Mitigation Measures

To mitigate and combat the COVID-19 pandemic and to remain operable, a majority of Part 141 schools mandated masks during training. However, a few schools did not mandate masks. According to the results of this study, schools without mask mandates were also the schools that reported growth during COVID-19. It is unknown at this time if their response and mitigation of COVID-19 led to program growth. Schools sanitized aircraft and/or simulators and in some cases elected to institute some sort of restricted entry point, screening process and social distancing measures. One school went as far as providing their eight-page guide to mitigation and return-to-work plan. This guide and the other responses (some on a small scale, others on a very large scale) show that mitigation measures in place were able to save at least some amount of training. Again, this only speaks to the quantity of training, not the quality. It cannot be determined, even with the mitigation measures in place during in-person instruction, that the instruction was as effective as it was pre-COVID, only that training did occur.

A minority of schools altered their dispatch procedures to help alleviate crowding during dispatch and possible transfer of COVID-19. It is unknown what this did to the flow of the operations, but in terms of limiting contact in the flight environment it succeeded. One school implemented a phase-in strategy to return to in-person instruction. Other schools did

not report their flight hours, but had steady student enrollment and certificate completion rates, meaning that possibly their strategy allowed them to at least not lose enrollment or certificate completion. Overall, every institution handled the new operationally limited environment in a different way. From the metrics given, it seems that the part 141 schools with the highest in-person flight training and certificate completion were the ones with the least amount of mitigation or the simplest mitigation plan.

Most Effective Mitigation Measures

When asked which mitigation measures were the most effective, schools reported some similar responses. Most respondents reported that no single measure seemed to be better suited to overcome constraints than any other; quarantines, return to work plans, culture changes or sanitization guidelines made the difference in the long run. No school reported the vaccine as the most effective measure. One school believed that their sanitization helped them return to instruction more quickly. The same school also believed their sanitization aided in not having any increase in the virus spreading and in increasing their operational tempo. This remark aligns with their reported figures for flight hours. According to these results, it can be inferred that sanitization plans were a positive factor in keeping students flying and could possibly be beneficial if replicated at other Part 141 schools. Comparison of participants' responses to flight hours shows that the school that claimed their culture change was the defining factor, lost the greatest number of hours flown of all of the schools. The same school also took more time to return to their 2019 numbers compared to other participants.

The last response was from School A, which reported the largest decline in hours during any of the nine semesters surveyed but was back to 2019 pre-COVID-19 numbers

during their final four semesters. It could be concluded that School A's mitigation measures may not have been as effective in the short-term but were long term. It is worth noting that according to the results, School A altered their plan drastically after only a semester and had positive results. School A discontinued the use of all masks and gloves in cockpits after only a semester due to their perceived uselessness, and discomfort in un-airconditioned aircraft. This removal of mitigation measures led to a self-reported decrease in infections, including during the spread of additional variants. The results of this study suggest that less restrictive measures were the most effective at reestablishing and sustaining operations in this school's new operationally limited environment.

Personal Narratives

Part 141 schools had the chance to add personal comments about their mitigation measures to capture any additional data that was not asked in the previous questions. Responses varied. Schools that made their own return-to-work plans and had them evolve as the virus ran its course, believe that these plans were a driving factor in keeping their training pipelines open. Signs of mental fatigue can be seen in some responses from schools. This research did not investigate the mental fatigue of pilots in an operationally limited environment, but the researchers believe it would be a valuable future study. Overall, those schools that answered this question seemed to use their answer to justify other answers, such as mitigation measures taken.

Non-COVID-19 Related Factors

To explain any loss of flight hours that was not due to COVID-19, schools had the option to bring attention to any non-COVID-19 related factors that may have impacted their number of flight hours flown. The only things reported were a major hailstorm and an

increase in normal maintenance issues. Both of these factors would have affected flight hours for the schools reporting them. When compared with the flight hours flown and the fleet utilization, it can help explain the loss of some of the training or fleet utilization during certain time periods in the survey. Eighty percent of Part 141 schools did not report any non-COVID related factors affecting training. This helps establish that the hours reported by 80% were not affected by COVID-19 and demonstrates it's effects to the beginning of the pilot pipeline.

Research Question 3

How effective were collegiate flight programs mitigation measures in resuming flight training?

All mitigation measures showed some sort of effectiveness, as evidenced by the return to pre-COVID-19 numbers, leading the conclusion of the third research question to be that the simplest and least restrictive measures were the most effective in a shorter time span. Schools with more complex plans either posted an initial decrease in hours or were able to continue operations at their normal levels, albeit with much greater effort and use of resources. The more complex plans, in some cases, included additional staffing requirements and the use of physical barriers to protect personnel, but did not discuss plans for implementation, just their use. This would have disrupted any normal operations flow personnel were used to, possibly leading to lost training as procedures were rebuilt to accommodate complex plans. Some measures, such as not shutting down and repeated sanitization of aircraft and simulators, were more effective than others. There were some schools that had extremely simple plans to mitigate the effects of the pandemic. These schools showed a tendency to not only continue to fly their 2019 pre-COVID-19 hours, but in

some cases to exceed them. More complex and detailed plans led to lower effectiveness in the short term but worked in the long term.

Recommendations

Based on the findings of the study, the researchers offer the following recommendations.

Recommendation 1

Collegiate flight Part 141 schools should be prepared for possible growth in their primary flight courses. Even in the face of massive layoffs and furloughs in the aviation industry, students continued their primary flight courses, and in some cases, more students enrolled in the primary flight courses. Resources need to be considered (as economically and institutionally feasible as possible) for accommodating this possible growth including aircraft, simulators, instructors, and airspace availability. Virtual reality is worth looking into as a cheaper simulator alternative to help manage growth.

Recommendation 2

One goal of this research project was to provide a detailed flexible off-the-shelf plan for the emergence of another operationally limited environment. Upon the analysis of the data, the simplest plan and execution was found to be the best option for continuing training. The following is recommended as the foundation of an off-the-shelf flexible plan for sustained operations.

1. For operating in an environment with a transmissible virus, such as COVID-19, plans need to be kept simple. Mitigation for the virus could include more social distancing or use of personal protective equipment. To help keep these plans simple, new technology should be leveraged and built into existing programs' infrastructure. Electronic Flight Bags

should be required of each student. This is not only to give students experience with them before use in the airlines, but also provides a way to send schedules, deconflict takeoff times, and possibly dispatch aircraft, leading to less use of resources to fortify dispatch areas against virus transmission. This leads to less sanitation needed if everyone uses their own equipment. Additionally, this provides a platform for controlled entry screening if desired.

2. In terms of instruction, if in-person courses need to be paused for a time, current online learning infrastructure should be used for non-flying. If distance learning is not currently available for online aviation courses, research on possible implementation is recommended. This will allow students to continue to progress in their non-flying coursework and be ready to fly as soon as the option presents itself, thus keeping the return-to-work timeline short. Additionally, this will allow flight briefs and debriefs socially distanced if desired. The EFB would be an ideal platform to perform this. If further program growth is desired or required, the online option would provide the best suited launch platform.

3. If students or faculty are sick, they should refrain from attending in-person instruction, either in the classroom or aircraft/simulator. The structure of how faculty and students are organized needs to be addressed. Instructors and students should be grouped together in groups of a 3:1 student to instructor ratio. This would help mitigate any social distancing concerns if one person in a group gets sick and a quarantine period is needed, while leveraging instructor continuity with the ability to quickly disseminate pertinent information.

4. Takeoff times should be staggered to help with social distancing (if required), and to alleviate congestion in small areas, the ramp, and airspace.

5. A sanitization option for post-flight operations should be implemented, with care to make sure that the sanitization is not harming the aircraft.

6. Lessons learned from COVID-19 and any further experiences should be shared by *all* Part 141 flight schools. Whether or not the protective measures are implemented by all schools is irrelevant. The lessons learned should help the population progress and continue training. This will help the entire flight training community keep better situational awareness and potentially mitigate any major safety or operational issues that may arise as operationally limited environments evolve, and schools adapt to continue sustained operations.

Recommendations for Further Research

This study presented the researchers with the answers to the research questions but also presented several additional areas of research that were not apparent until after the data was analyzed. The research may provide a launching platform to study other parts of the pipeline and alternative methods of flight school operations and primary flight training.

From the data analyzed in the findings, it is recommended that a study be done on COVID-19's effect on all stages of the pilot training pipeline. Whereas the pipeline grew in its initial phases, a significant pilot shortage still exists. Research needs to be done to determine where new pilots drop out of the training pipeline before they make it to the regional or major airlines. This research could help determine not only the overall effect of operationally-limited environments on flight training at all levels but help forecast the ripple effects the environments have on the pipeline as a whole and where to flex resources and additional help to ensure student pilots finish their training.

Military and non-collegiate programs should be studied to see a more complete picture of what COVID-19 did to the U.S. pilot training pipeline. This would allow for better

forecasting for pilot production and a clearer understanding of the ripple effects heading through the pipeline right now. Additionally, a study should be commissioned to determine the effectiveness or quality of the training that was achieved during the operationally limited environment. This could be examined through the lens of how many additional rides students needed to complete training over the average number needed, or how many students failed check rides. This study could address the relationship between the number of hours flown (e.g., a normal or greater amount) and whether the flight training was effective as the flight training done pre-Covid-19.

A look at safety management data needs to be done, such as including incident rates, voluntary safety reports, flight data, and instructor ratings. With a pause in operations, and with flying being a perishable skillset, potential safety incidents could have arisen. Such a study could help determine a predictive model for equipment failures or poor decision making. The results of this research could help formulate maintenance plans as well as timely safety briefs or special interest items for aircrew to review before returning to operations, or as operations ramp-up again to a normal tempo, leading to an overall safer flight environment.

Further research is needed on sanitizing solutions and their effect on aircraft equipment. Research should be conducted on what different sanitizing solutions do to the aircraft instruments in the cockpit as well as research into high sanitization rates and their effect as well. Research could determine that there are more caustic solutions or higher rates that lead to early replacement of instruments and what resource planning would be needed to keep aircraft flying. Finally, further study is recommended on the mental side to see the effects of long-term operations in operationally limited environments. Some fatigue was

evident in the responses from certain Part 141 schools and needs to be researched to see what happens during sustained operations in an operationally limited environment.

Conclusion

The goal of this study was to define how consecutive years of operationally limited environments affect collegiate flight training. An initial thought before conducting this research was that collegiate flight training followed suit with the rest of the world and economy, and hours flown, student enrollment, and certification completion was negatively affected and ceased. This study revealed the resilience of collegiate flight training because results showed overall it was not negatively impacted. Only 10% of schools surveyed showed a loss of flight time, and only 10% showed a decrease in student enrollment. All these decreases were made up within one to two semesters time and all schools were at or above their pre-COVID-19 numbers by the beginning of the 2021 calendar year.

When examining fleet size as a factor in training, results revealed it did not hinder returning to in-person instruction. Only 20% of schools responded that they encountered a decline in fleet usage (during the Spring 2020 and Summer 2020 semesters), and one school reported non-COVID factors as their reason for a decline in fleet utilization. The remining school had a complex return-to-work plan that, while effective, hindered their ability to fully utilize their fleet for two semesters.

According to the results from this study, schools that were less restrictive accomplished more training in flight hours flown, as well as in student completions. In addition to production, it is interesting to note that the Part 141 schools with less restrictive measures reported fewer infections and less spread of the virus. Ninety percent of schools reported sanitization measures, with only one school showing a loss of flight training. The

sanitization measures (which were used by both schools that showed program growth) made a positive impact in the return to in-person instruction and sustained operations during the operationally limited environment.

Looking at the beginning of the U.S. pilot training pipeline during COVID-19, the earliest stage of the pipeline has shown the ability to adapt and overcome major world events in the emergence of long-term operationally limited environments. The pipeline has never been tested like this over its development and sustainment because COVID-19 was unanticipated. The beginning of the pipeline has also demonstrated the ability for growth during the shock that the new environment presented to faculty and students at Part 141 schools. In the opinion of the researchers, this resiliency is commendable.

References

Allen, R. T. (2008). Study of flight school pilot incident data: Implication for educators. *Collegiate Aviation Review*, *26*(2), 91-99. https://doi.org/10.22488/okstate.18.100381

American Psychological Association. (2022). *APA dictionary of psychology*. https://dictionary.apa.org/descriptive-statistics

Boeing. (2020). *Pilot and technician outlook 2020-2039*. https://www.boeing.com/resources/boeingdotcom/market/assets/downloads/2020_PTO_PDF_Download.pdf

Caraway, C. L. (2020). A looming pilot shortage: It is time to revisit regulations. *International Journal of Aviation, Aeronautics, and Aerospace*, *7*(2). https://doi.org/10.15394/ijaaa.2020.1470

Casebolt, M. K., Bliss, T. J., & Depperschmidt, C. L. (2017). The impact of public law 111-216: Perceptions of U.S. collegiate flight students. *Collegiate Aviation Review*, *35*(1), 53-69. https://doi.org/10.22488/okstate.18.100474

Depperschmidt, C. L. (2013). Public law 111-216: Effects of new legislation on collegiate aviation flight training programs. *Collegiate Aviation Review*, *31*(1), 1-16. https://doi.org/10.22488/okstate.18.100434

Doskow, M. G. (2012). *Analysis of the impact of scenario-based training on the aeronautical decision making of collegiate flight students* [Doctoral dissertation, Embry-Riddle Aeronautical University]. Scholarly Commons. https://commons.erau.edu/edt/48/

Federal Aviation Administration. (1991). *Advisory circular: Aeronautical decision making* (AC 60-22). U.S. Department of Transportation. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_60-22.pdf

Federal Aviation Administration. (2021). *Federal aviation regulations/aeronautical information manual*. U.S. Department of Transportation.

Goff, E. M. (2013). *Effects of instructor continuity on a large-scale pilot training program* [Master's thesis, University of North Dakota]. Scholarly Commons. https://commons.und.edu/theses/1426/

Kanske, C. A., & Brewster, L. T. (2001). The learning styles of college aviation students. *Collegiate Aviation Review*, *19*(1), 62-70. https://doi.org/10.22488/okstate.18.100298

Klapper, E. S., & Ruff-Stahl, H. K.. (2019). Effects of the pilot shortage on the regional airline industry: A 2023 forecast. *International Journal of Aviation, Aeronautics, and Aerospace*, *6*(3). https://doi.org/10.15394/ijaaa.2019.1321

Lester, J. N. Cho, Y., & Lochmiller, C. R. (2020). Learning to do qualitative data analysis: A starting point. *Human Resource Development Review*, *19*(1), 94–106. https://doi.org/10.1177/1534484320903890

Lewis-Beck, B. A., Bryman, A., & Liao, T. F. (2004). *The SAGE encyclopedia of social science research methods*. SAGE. https://sk.sagepub.com/reference/socialscience

Lutte, R., Higgins, J., Lovelace, K., Bjerke, E., Lounsberry, N., Friedenzohn, D., Pavel, S., Chase, B. & Craig, P. (2014). An investigation of the United States airline pilot labor supply. *Journal of Air Transport Studies*, *5*. https://doi.org/10.38008/jats.v5i2.68

Murray, G. & Green, J. (2021). *After Covid-19, aviation faces a pilot shortage*. Oliver Wyman. Retrieved June 22, 2021, from https://www.oliverwyman.com/our-expertise/insights/2021/mar/after-covid-19-aviation-faces-a-pilot-shortage.html

Onyeaka, H., Anumudu, C. K., Al-Sharify, Z. T., Egele-Godswill, E., Mbaegbu, P. (2021). COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. *Science Progress*, *104*(2). https:doi.org/10.1177/00368504211019854

Prather, C. D. (2007). Distance learning in collegiate aviation: A survey of the historical, theoretical, and contemporary aspects. *Journal of Aviation/Aerospace Education and Research*, *17*(1). https://doi.org/10.15394/jaaer.2007.1435

Robertson, C. L. (2005). *Development and transfer of higher order thinking skills in pilots* [Doctoral dissertation, Capella University]. ProQuest Dissertations Publishing.

Stalnaker, T., Usman, K., Buchanan, A., Alport, G., Taylor, A., & Heilakka, R. (2021). *Airline Economic Analysis 2020 - 2021*. Oliver Wyman. Retrieved June 22, 2021, from https://www.oliverwyman.com/our-expertise/insights/2021/mar/airline-economic-analysis-2020-2021.html

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, *27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Appendix A

Research Survey

The Effects of Operationally Limited Training Environments on Primary Flight Training at the Collegiate Level

In March 2020, the SARS-CoV-2 (COVID-19) virus was declared a global pandemic. Countries were forced to issue strict lockdowns to attempt to control the spread of the virus. The effect of this on aviation training was unprecedented. In-person flight instruction at collegiate institutions ceased for a period and then slowly returned. As students and instructors returned to fly, different had different mitigation measures they implemented and then adapted for the everchanging conditions that COVID-19 present the industry with.

I. Student Load

1. What was the total number of hours flown (by semester) by students in a Private Pilot's License program for the following semesters? (Spring 2019-Fall 2021)

- Spring 2019
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Summer 2019
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Fall 2019
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Spring 2020
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Summer 2020
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Fall 2020
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Spring 2021
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Summer 2021
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

- Fall 2021
[ ] 0-200 [ ] 201-400 [ ] 410-600 [ ] 601-800 [ ] 801-1000
[ ] 1001-1200 [ ] 1201-1400 [ ] over 1400+

2. What was total student enrollment in the Private Pilot's License program (by semester) for the following semesters? (Spring 2019-Fall 2021)

- Spring 2019
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2019
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2019
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Spring 2020
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2020
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2020
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Spring 2021
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2021
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2021
[ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
[ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

3. How many students (by semester) finished a Private Pilot's License during the following semesters? (Spring 2019-Fall 2021)

- Spring 2019
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2019
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2019
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Spring 2020
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2020
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2020
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Spring 2021
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Summer 2021
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

- Fall 2021
  [ ] 0-25 [ ] 26-50 [ ] 51-75 [ ] 76-100
  [ ] 101-125 [ ] 126-150 [ ] 151-175 [ ] 176-200 [ ] over 200+

II. Fleet Usage

4. How many aircraft were in the institution's fleet during the following semesters (Spring 2019 to Fall 2021)?

- Spring 2019
  [ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Summer 2019
  [ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Fall 2019
  [ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Spring 2020

[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Summer 2020
[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Fall 2020
[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Spring 2021
[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Summer 2021
[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

- Fall 2021
[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] over 50+

5. On what dates did in-person flight instruction cease and resume during COVID-19 for the following period? (Spring 2019-Fall 2021)

6. Did the size of the institution's fleet impede the return to in-person flight instruction?
Yes [ ] No [ ]

7. At what aircraft fleet capacity (by semester) did the institution utilize the fleet when in-person flight instruction resumed? (Spring 2019-Fall 2021)
- Spring 2019
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Summer 2019
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Fall 2019
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Spring 2020
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Summer 2020

[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Fall 2020
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Spring 2021
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Summer 2021
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

- Fall 2021
[ ] 0%-20% [ ] 21%-40% [ ] 41%-60% [ ] 61%-80% [ ] 81%-100%

8. During what semester did the institution return to 100%fleet utilization?

III. Mitigation Measures

9. What COVID-19 mitigation measures were taken by the institution during the following semesters? (Spring 2019-Fall 2021)

10. Were any aviation professionals or faculty included in the decision making for COVID-19 mitigation measures?
Yes [ ] No [ ]

11. What proved to be the most effective mitigation measure to help students return to in-person flight instruction?

12. Personal comments on mitigation measures taken to get student pilots back into the cockpit with an instructor.

13. Were there any non-COVID related factors that impacted flight operations from the Spring 2019 semester to Fall 2021?

[ ] Yes [ ] No

If yes, what?

Appendix B

Reported Flight Hours

Appendix B shows the number of reported flight hours during nine semesters. This period covers three years: pre, post, and during COVID-19.

Table 1

Reported Flight Hours

Reported Flight Hours										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Spring 2019	401-600	over 1400	over 1400	1001-1200	201-400		201-400	0-200	over 1400	
Summer 2019	0-200	over 1400	over 1400	1001-1200	0-200		0-200	0-200	over 1400	
Fall 2019	401-600	over 1400	over 1400	1001-1200	201-400		401-600	0-200	over 1400	
Spring 2020	201-400	over 1400	over 1400	1001-1200	201-400		201-400	0-200	over 1400	
Summer 2020	0-200	over 1400	over 1400	1201-1400	0-200		0-200	0-200	over 1400	
Fall 2020	401-600	over 1400	over 1400	1201-1400	201-400		201-400	0-200	over 1400	
Spring 2021	401-600	over 1400	over 1400	1201-1400	201-400		201-400	0-200	over 1400	
Summer 2021	0-200	over 1400	over 1400	1201-1400	0-200		201-400	0-200	over 1400	
Fall 2021	401-600	over 1400	over 1400	1201-1400	201-400		201-400	0-200	over 1400	

Appendix C

Reported Student Enrollment

Appendix C shows the reported student enrollment for participating intuitions.

Table 2

Reported Student Enrollment

Reported Student Enrollment										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Spring 2019	26-50	101-125	over 200+	76-100	26-50	0-25	0-25	0-25	0-25	
Summer 2019	0-25	101-125	over 200+	76-100	0-25	0-25	0-25	0-25	26-50	
Fall 2019	26-50	101-125	over 200+	76-100	26-50	0-25	26-50	0-25	26-50	
Spring 2020	26-50	101-125	over 200+	76-100	26-50	0-25	0-25	0-25	26-50	
Summer 2020	0-25	126-150	over 200+	101-125	0-25	0-25	0-25	0-25	26-50	
Fall 2020	26-50	126-150	over 200+	101-125	26-50	0-25	26-50	0-25	26-50	
Spring 2021	26-50	126-150	over 200+	101-125	26-50	0-25	0-25	0-25	26-50	
Summer 2021	0-25	126-150	over 200+	101-125	0-25	0-25	0-25	0-25	0-25	
Fall 2021	26-50	126-150	over 200+	101-125	26-50	0-25	0-25	0-25	26-50	

Appendix D

Reported Student Certificate Completion

Appendix D shows the reported certificate completion rate of schools in 2019, 2020, and 2021.

Table 3

Reported Student Certificate Completion

Reported Student Certificate Completion										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Spring 2019	26-50	76-100	51-75	51-75	26-50	0-25	0-25	0-25	26-50	
Summer 2019	0-25	76-100	76-100	51-75	0-25	0-25	0-25	0-25	26-50	
Fall 2019	26-50	76-100	51-75	51-75	26-50	0-25	0-25	0-25	26-50	
Spring 2020	0-25	76-100	26-50	51-75	26-50	0-25	0-25	0-25	0-25	
Summer 2020	26-50	101-125	51-75	76-100	0-25	0-25	0-25	0-25	0-25	
Fall 2020	26-50	101-125	51-75	76-100	26-50	0-25	0-25	0-25	26-50	
Spring 2021	26-50	101-125	51-75	76-100	26-50	0-25	0-25	0-25	0-25	
Summer 2021	26-50	101-125	76-100	76-100	0-25	0-25	0-25	0-25	51-75	
Fall 2021	26-50	101-125	51-75	76-100	26-50	0-25	0-25	0-25	26-50	

Appendix E

Reported Fleet Size

Appendix E shows the number of reported aircraft in each institutions' fleet.

Table 4

Reported Fleet Size

Reported Fleet Size										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Spring 2019	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Summer 2019	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Fall 2019	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Spring 2020	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Summer 2020	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Fall 2020	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Spring 2021	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Summer 2021	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	
Fall 2021	11-20	31-40	over 50+	31-40	11-20	11-20	11-20	11-20	41-50	

Appendix F

Reported Fleet Utilization

Appendix F shows schools' aircraft fleet utilization pre, post, and during COVID-19.

Table 5

Reported Fleet Utilization

Reported Fleet Utilization										
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
Spring 2019	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%		81%-100%	81%-100%
Summer 2019	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%		81%-100%	81%-100%
Fall 2019	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%		81%-100%	81%-100%
Spring 2020	81%-100%	61%-80%	61%-80%	81%-100%	81%-100%	61%-80%	61%-80%	81%-100%	61%-80%	81%-100%
Summer 2020	81%-100%	61%-80%	61%-80%	81%-100%	81%-100%	61%-80%	61%-80%	81%-100%	61%-80%	81%-100%
Fall 2020	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%
Spring 2021	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%
Summer 2021	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%
Fall 2021	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%	81%-100%	61%-80%	81%-100%	81%-100%	81%-100%