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Training Aircraft Fleet Planning for Southern Illinois University

Jack M. Hoyt
Southern Illinois University Carbondale

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by
Jack M. Hoyt
1914 Illinois Av.
Murphysboro, IL.62966
(618) 687-3188

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Dr. David A. NewMyer
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The purpose of this thesis is to study and analyze the fleet of training aircraft to determine current and future needs for flight training aircraft. This thesis will follow the basic structure of this outline.

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Glossary

AF- Aviation Flight- a course designator prefix.

A&P Mechanic- A Federally licensed and certified engine and airframe repair specialist.

Cont.- Continental- An engine manufacturer for small general aviation aircraft.

FAA- Federal Aviation Administration.

Lyc.- Lycoming- An engine manufacturer for small general aviation aircraft.

TBO- Time Before Overhaul.

Southern Illinois University at Carbondale began offering courses in Aviation Flight in 1959. And in 1984 the University began conferring Associate Degrees in Aviation Flight. The Aviation Flight program accepts approximately 240 students into the entry level flight courses every semester. Once admitted the student pilot will have the chance to begin flying in a Cessna 152 or 172.These aircraft are the University's basic trainers and work horses of the training fleet. If students make satisfactory progress then they will be able to fly in the University's complex and multi- engine aircraft. The student will also spend time in one of the University's Frasca flight simulators.

SIU-C's total enrollment stands at close to 24,000. All of the Aviation students (flight, management, and maintenance) make up approximately 3.75 % of the total enrollment. The Aviation Flight students make up only 1%. Even with such a small percentage of total enrollment, The Aviation Programs at SIU-C have established a reputation as one of the best Aviation programs in the United States, and therefore one of the best in the world.

The Aviation Flight Department of Southern Illinois University at Carbondale is currently operating an "All- Cessna" fleet of aircraft for its flight training courses and Intra- University charter operations. Each type of aircraft has one or more specific courses that it is used for.

The University operates nineteen (19) C-152's in the beginning aviation flight courses AF 201, 203, 204, and 206.

The University operates seven (7) C- 172's. These are also used in the same beginning flight classes that the C-152 is used in. These aircraft are assigned on a basis of ' what is available.'

The C- 172 RG aircraft are used in the more advanced flight courses AF 206 and 207A.

There are two (2) C-310 twin engine aircraft that the University uses in the more advanced flight courses. AF 207B, 301, and even 304 when needed.

The University also operates one (1) C-340 and one (1) C-402, primarily in the AF 304 course.

Before any school can teach, it must first have teachers. SIU-C is well-off in this case since they teach their own teachers. Applicants for flight instructor come from within the SIU flight department and from outside the University. The University is fortunate in that it very seldom has a shortage of instructors. "Some of our flight training staff will leave to join airlines or to participate in an internship. This has caused a slight shortage of instructors in some of the flight courses from time to time. But the shortages are short lived." replied "Mr.B" from the management team of the Aviation Flight department. Another staff member of the Aviation Flight department,"Mr.D" said, "When we hire an instructor we will screen all applicants." This must be done to ensure the quality and safety of the flight instruction that the University offers. "We do not hire anyone just because they have an instructors certificate or because they may have earned it here."

Airplanes are like many other machines. The more they are used, the more you must do to maintain them. Every hour of flight time is balanced by hours of maintenance time. There are certain maintenance requirements that are established by the FAA and others that are "Suggested" by the aircraft manufacturer. These requirements from the

FAA and manufacturers standpoint are meant to promote safety. Everyone is justly concerned with safety. But with all the regulations and procedures mandated by the FAA and aircraft manufacturers there is still some leeway available to the end user. The aircraft operator may, at their discretion, increase the maintenance requirements in order to improve safety by shortening the time between inspections.
"This University was having a problem with carbon fouled plugs that were causing in flight engine problems when we still went by the FAA mandated 100 hours inspection. Since then we have instituted a 50 hour inspection schedule and eliminated that problem." The 50 hour inspection includes spark plug inspection \ cleaning and oil change.

The University has also been having problems with its complex aircraft, the retractable gear single and multi- engine aircraft. " Due to the tremendous beating that the aircraft take in SIU's training environment, we have had problems with our aircraft that not even Cessna has had any experience with. We now replace certain parrs of the landing gear based on the number of cycles, or takeoffs and landings, rather than the number of flight hours."

The C-310's in particular have had problems with the landing gear. As mentioned before, SIU has an intense training environment. The problem is that the C-310 was not built to be a training aircraft. The repetitive landings and especially hard landings associated with the novice pilots were causing the main landing gear to bulge up on the top of the main wing. This problem has been fixed by the installation of a reinforcement kit to strengthen the landing gear. Since this modification, the C-310's have had no problems of that nature with the landing gear.

If there is one thing an airplane can expect to go through repeatedly it is inspections. The larger the aircraft the more thorough their inspections will be. For this thesis I will limit explanations to the inspections most often done at SIU-C.

Pre-flight-

This is the most often performed inspection on an aircraft. Like the name says, this inspection must be performed before every flight to ensure that the aircraft is air worthy. This inspection is completed by the pilot before the engine is started. A check list, kept in the aircraft, is used to ensure thoroughness. Any discrepancies will be noted, and if the pilot thinks it necessary, brought to the attention of an A&P mechanic for evaluation and\ or repair.

Post-flight-

This inspection is completed after the flight to see if anything has been damaged and to assure that the aircraft is ready for the next flight.

The following inspections are performed by trained A&P mechanics only.

50 Hour Inspection-

This is an 'in house' inspection initiated by the maintenance department to correct problems that were being found while the aircraft were under the 100 Hour inspection cycle. Special items on this inspection are: remove, clean , reinstall spark plugs, change engine oil and filter, and inspect the tires, brakes, and lights and repair as necessary.

100 Hour-

This is an FAA mandated inspection that must be performed every 100 hours of flight time on revenue earning aircraft. This is a very detailed inspection of the entire aircraft. Everything that is done on a 50 hour inspection is also accomplished at this time.

Annual-

This is also an FAA mandated inspection that must be performed on all general aviation aircraft regardless of use. This inspection must be performed every twelve (12) calendar months. The 100 Hour and the annual are essentially the same inspection. It can be signed off either way. The only difference is the wording in the log book and who signs it off.

TBO-

This the most expensive inspection that is done on the aircraft. Actually, it is not done on the aircraft but on the engine. When an engine reaches its TBO it must be removed from the aircraft and sent to be overhauled. The overhaul of a Lyc. O-235- L2C, the standard engine on all the University's C-152's will cost approximately $10,000(Weeghman,1991). Luckily this does not happen very often. Even in SIU-C's heavy training environment, an aircraft will only reach its TBO every four to five years.

The cost of these inspections can vary depending on how many discrepancies are found. The cost for a 'normal' 50 hour inspection can vary from $30 to 50. A 100 Hour\ Annual will average about $ 200 to 600.

Durability and Reliability are Critical Issues

Most businesses try to be cost effective in order to maintain profitability. This is especially important to the Aviation Flight department since it operates on a cost recovery basis. If there is a

step that can be taken toward saving money without sacrificing safety the Aviation Flight department will take it.

A standardized fleet is the greatest step taken towards saving money and reducing expenses. As mentioned above the University has an " all Cessna" fleet. This has numerous advantages. Service and training is narrow in scope but high in proficiency. Parts inventory is minimized due in part to many of the Cessna parts are common among all Cessna aircraft and partly due to the fact that all of the C-152's that the University operates have the Lycoming O-235-L2C engine. Cessna is still relatively easy to get parts for. "The aircraft systems are all similar, making for faster, efficient, and thorough maintenance."

The people that maintain the aircraft are just as important as the people who teach others to fly them. There has been mention of a slight problem of using student A&P mechanics within the maintenance department. It was said that through inexperience, not malice, that they have been making mistakes that a more experienced mechanic would not have made. So it is being considered that one or two permanent mechanics be hired.

"Build a better mouse trap and the world will beat a path to your door."

SIU-C's Aviation Flight Department in not building mouse traps, but that which it is producing, flight training, is enjoying comparable success. "The aviation flight department has always filled enrollment." "At times we have had to use a selective screening process to pick the best students who would finish AF 201 in a semester."

From a high of approximately three hundred students in the Fall of 1990, the enrollment has gradually shrunk until it reached its present level. This gradual shrinking had been the result of the department restricting the numbers of enrollments down to a size that can be handled efficiently. From the Fall of 1990 until the Fall of 1997, the flight enrollment is expected to remain at approximately 235 to 240.

The aviation flight department could accept all the applicants that applied. This would maximize revenue and possibly give the department the money that it needs to expand. But the constraints that the aviation flight department operates under makes such a situation very unwise if not impossible.

From the cumulative research done on the training fleet that SIU operates, the future of that fleet and the amount of students that will fly those airplanes are restricted or constrained by the existing facilities at the airport. "This airport is so saturated with training flights that we have to send airplanes to Pickneyville\
Du Quoin and Marion for training. The Southern Illinois airport just cannot handle the capacity."(Mr.B)"Right now the number of slots available for training flights at this airport is maxed out. One of the reasons is that the controllers think that they have as many flights as they can handle safely." The installation of a new frequency to be used for 18L\ 36R will help relieve the constriction some what. It also appears that installation of radar to help the controllers to better handle the current amount of flights would also help.

Another block to hurdle is the amount of aircraft. The University has a large fleet that is being flown as much as conditions permit. Acquiring more aircraft means more students flying.

The Aviation Flight department is walking a fine line in between what it has and what it wants. The determining factor, as with many things, is money. The fleet is handling the training load well now. But the training load could be better handled if some of the constraints that have been mentioned are relieved.

Faculty Opinions- New Acquisitions

Consultation with members of the Aviation Flight management team revealed a slight mix of opinions on acquiring new equipment. "Mr. A," on the management team would like to see a couple of things done. He would like to replace a C-172 with a C-172 RG. He would also like to add one C-310. This would increase the fleet by one aircraft and would help account for the slight increase in Aviation Flight classes that he projects.

"Mr.B" expressed some of the same opinions as "Mr.A." "Mr.B" iis of the opinion that the University should look to replacing the more aged aircraft rather than adding additional aircraft to the fleet. The reasoning is that the University would save money by selling the older aircraft that tend to require more frequent and expensive maintenance. The more expensive maintenance happens because as aircraft get older it becomes harder to find the parts that are wearing out more frequently.

Both "Mr.A and Mr.B" said that they were looking at the pros and cons of acquiring a turboprop aircraft. The benefits that they cited were giving the SIU-C charter service the longer range and payload that it needs. "Mr.B" said, 'If we wanted to get from Carbondale to Midway in a C-340 or C402, fully loaded, non-stop, we just cannot do it!" "Mr.B" also expressed some reservations about new aircraft or turbo-prop

aircraft. "The aircraft would also come with additional costs that he did not think that the Aviation Flight budget could handle right now.

I regards to adding a turbo-prop aircraft to the fleet, "Mr.C" said it is possible, but it will cost more money. "Mr.C" said that he likes the Cessna Caravan, It is a good airplane and the maintenance department has experience maintaining the PT- 6 engine. " The PT-6 can go for 3,500 hours before TBO, but offset that with the cost of overhaul, $120,000. "Mr.C" also said that he dislikes the Beech King-Air. Mostly due to the cost of overhauling two engines. He said, "If we get any new aircraft we are looking at purchase cost, technical publications, special tools, and increasing parts inventory."

"Mr.D", when asked about instructors learning to teach in new aircraft said, Transition into a new aircraft would not be very difficult. The instructor must first become proficient in flying the aircraft, know its systems, and be able to operate the aircraft in a safe and efficient manner."

"Mr.B" thinks that acquiring a good multi- engine simulator would reduce the constraints.

Recommendations

1. As proven by past experience, it is recommended that the training fleet remain "All Cessna", for reciprocating aircraft.

2. Since the IBHE has designated SIUC as the state supported flight training institution and that the University of Illinois' flight training program has lost all state funding and is experiencing financial difficulties, it is recommended that s study be done to assess the demand for flight training services state- wide. And see how all the institutions that provide flight training will be affected. The results of the study may then be used to lobby the Federal government, State government, IBHE, and the appropriate governing body at SIUC.

3. consultations with "Mr.B" revealed that the University of Illinois will be doing away with four Cessna C-310's in June 1995. It is recommended that one or more of those C-310's can be acquired and added to SIU-C's training fleet.

4. Study the feasibility of a joint effort between SIU-C and the Southern Illinois Airport Authority to help increase the ability of the Air Traffic Control tower to be able to handle more flights.