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PRIVATE PILOT PROGRESS: WHERE DO WE FALL DOWN?

Beth M. Beaudin-Seiler

Abstract

This project suggests that we examine training curriculums for areas that need reinforcement. In this study the electronic flight records of sixty-seven participants enrolled in the private pilot curriculum were studied to understand which lessons were most failed and which objectives were most responsible for the failure. Findings show that lessons immediately before important milestones such as solo and end of course checks were failed the most. The objectives failed in those lessons revolved mostly around landing techniques but also included items such as aeronautical decision making and diversion to alternate.

An understanding of student pilot progress in private pilot curriculums is important to accomplish the goal of graduating quality pilots from collegiate programs. (Beaudin-Seiler, et al, 2008). As the airline industry and the aviation training arena move forward with the Airline Safety and Federal Aviation Administration Extension Act (2010) it will be even more imperative to understand how our students progress through flight training. Among some of the sections outlined in this Act that will impact pilot training programs are the establishment of task forces on air carrier safety and pilot training, pilot fatigue, safety management systems, flight crewmember screening, and qualifications and airline transport pilot certification. As it stands currently, minimum qualifications for all flight crewmembers will be to hold an airline transport pilot certificate, which is at least 1500 flight hours. However, the quality of instruction in both flight and academic courses given to students could allow for credit toward flight hours under this Act (Airline Safety and Federal Aviation Administration Extension Act, 2010). This opens up an opportunity for flight training programs to exam themselves and to establish best practices on how to provide the highest quality training to flight students.

There have been a number of articles researching

general aviation accidents and incidents. One study showed that flare accidents – when the aircraft is transitioned from the approach attitude to the landing attitude – accounts for 17.88% of landing accidents (Benbassat, et al, 2005). Another study shows that an estimation of 70%-80% of accidents and incidents in both civilian and military aviation are partially caused by human error (Olson & Austin, 2006). Still other studies show that crosswind weather conditions are a contributory factor in many general aviation incidents and accidents, that these conditions increase the physical demands and cognitive effort needed to land, and that those accidents that involved adverse weather were most likely to involve fatalities (Ebbatson, et al, 2007). While the research has been focused on the accidents and incidents in general aviation, it is a retrospective approach. The question becomes, if we know these are the areas in which general aviation is having accidents and incidents, can we take a step back and examine the training curriculums and methodologies to pinpoint the areas that need training reinforcement? The inherent challenge of flight instruction and flight training programs is to help inexperienced pilots become proficient as quickly as possible while being as safe as possible (Olson & Austin, 2006).

Understanding the quality of flight instruction

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given in its flight program has been a focus at WMU's College of Aviation for a number of years (Beaudin-Seiler, et al, 2008). For WMU, research was undertaken in our private pilot curriculum to identify where remedial and failed lessons took place, what objectives were included in those lessons, and how we could adjust our instruction to meet the challenges of these lessons.

Method

Participants

All participants were enrolled in the private pilot course at WMU's College of Aviation during the Spring 2009, Summer 2009, Fall 2009 and Spring 2010 semesters. None had previously obtained a private pilot certificate prior to beginning their course work, nor had they any meaningful flight experience. All participants had completed the private pilot course prior to the beginning of data collection in Summer 2010. There were a total of 67 participants: eight students during the Spring 2009 semester, 12 students during the Summer 2009 semester, 34 students during the Fall 2009 semester, and 13 students during the Spring 2010 semester. Consistent with previous years' enrollment records, most of the participants were male (89.6% vs. 10.4% female overall). The mean age of the participants was 19.93 years ($SD = 1.87$), which is again consistent with previous enrollment records.

Definitions

Remedial lessons are defined as lessons that are scheduled by the flight instructor to provide more practice for certain elements of flight. The objectives of these lessons vary by student need and are decided upon by the instructor.

Repeat lessons are defined as lessons that are completed but the student cannot pass at the practical test standard, therefore needing to repeat the objectives failed. Discretion of objectives is not at liberty of the instructor, but is syllabus driven instead.

Total flight hours are defined as the number of flight hours (including hours in a flight training device) accumulated to complete the private pilot course.

Year in program refers to the year the participant is in the flight science program. (i.e., freshman, sophomore, junior, or senior.)

Primary instructor refers to the flight instructor that has given the most dual instruction to the participant during the private pilot curriculum.

Flight Training Curricula

The flight training curricula during these semesters stayed constant without any modifications.

Objectives. During this stage, the student shall complete all aeronautical experience, skill, and knowledge

requirements to accomplish all private pilot areas of operation and flight tasks. Also, the student shall be introduced to elements of crew resource management in flight operations and/or flight training device applications and demonstrate proper flight ethics and responsibility.

Completion/Performance Standard. The student shall complete all private pilot tasks to practical test standards. The student shall complete all lessons and final stage checks to specified performance standards as defined by the Federal Aviation Administration ("FAA"). The student shall obtain the private pilot certificate.

Practical Test Standard. The approved pass or fail standard as published by the FAA to determine pilot competency. PTS also identifies those tasks that are mandatory to demonstrate and those that are desirable in obtaining a private pilot certificate (FAA, 2010).

Aeronautical Experience. This course includes 40 hours of flight training for private pilot certification. Twenty-two hours of dual instruction and a maximum of three hours of flight training device (FTD) training time shall be completed for a total of 65 program hours (Western Michigan University, 2008).

Design and Procedure

Electronic Records. The data were collected from student electronic flight records. Data collection occurred after the participants had completed the private pilot theory and flight courses. As such, there was no real-time communication with either the participants or their flight instructors with regard to their progress in the private pilot course. Any comments or notes provided regarding participant's progress by flight instructors were taken from the comment sections of each lesson. This was done to assure timely comments on private pilot progress, not retrospective comments on the student as a whole.

Measured variables included year in program, total flight hours, repeated lessons, primary instructor, and total number of remedial lessons. Of the most repeated lessons, instructor comments were scoured to identify the exact objectives that were not of passing standards and to uncover any unusual circumstances in that lesson, such as a mechanical issue with the airplane.

Results

Data collected indicated that most students experienced both repeated lessons ($M=3.03$, $SD=2.33$) and remedial lessons ($M=4.79$, $SD=5.36$). While the syllabus calls for 65 hours to the end of the private pilot course, through the data collected we found that the repeated and remedial lessons were indeed impacting the total flight hours for the course ($M=77.43$, $SD=15.06$). Since remedial

lessons can be done because a lesson was failed, to provide an opportunity for extra practice, or simply at the instructor's discretion, the focus of the data collected is on repeated or failed lessons.

The data showed that there were ten lessons that were most repeated:

Lesson	Number of Times Repeated
#49 – Evaluation of the student's progress in single-engine operations, emergencies and navigation. End of Course.	30
#48 – To evaluate the student preparation for the end of course by review and/or practice of Private PTS task.	28
#22 – To demonstrate required elements for safe solo flight in known flight conditions.	27
#18 – To fly normal glide patterns at an airport. The student will perform the actions to show understanding of managing with an engine failure after take off.	20
#23– To practice normal traffic patterns and also includes EFATO procedure drills (emergencies on take off)	19
#47 – To review general handling maneuvers, navigation procedures, and emergency procedures in preparation for the end of course flight check.	15
#19 – Reviews the pilot preparation for solo flight. An understanding of basic attitude flying, recognize an approaching stall, and understand the proper recovery method. Understand traffic pattern and required adjustments.	10
#43 – To review general handling maneuvers and emergency procedures in preparation for the end of course flight check.	9
#27 - To review the procedures for short field takeoffs and landings and stalling. In addition, learn to fly the airplane with steep angle of bank.	7
#33 – To learn how to fly a cross-country route in visual conditions including considerations for hazardous weather and power assisted (precautionary) off airport landing.	5

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In looking for what specific objectives out of these lessons that were failed, a qualitative analysis was completed. Comments from the instructor comment section of the electronic flight records were scoured to further understand the nature of the failures or repeats. From this analysis a number of objectives repeatedly were the reasons for failures of a lesson. The table in Appendix "A" shows the objectives that were failed the most, the number of times they were failed, the corresponding lesson numbers where the failures occurred and a short description of the objective of the lesson.

Discussion

There are 49 lessons to complete in the private pilot course. The 49th lesson is the quality check sign off given by our lead flight faculty that approves the student to schedule the FAA check-ride to test for the private pilot certificate. Lesson 22 is a two part lesson - 22A is the final dual lesson before going solo while 22S is the first solo lesson for the student. The results show that out of 67 participants, nearly 45% of the students failed the quality check lesson (#49), and nearly 42% failed the lesson prior to the quality check (#48). Similarly, the first portion of the lesson 22 prior to solo, resulted in 40% of the students failing.

We can see from the data collected that there are groupings of areas where students seem to repeat more often. Prior to solo – lessons 18, 19, 22 and 23; Introduction to more demanding tasks such as steep turns and cross country flying – lessons 27 and 33; Preparation for end of course – lessons 43, 47, 48 and 49.

These findings suggest several possibilities. First, it is possible the flight instructors are scoring students harder in the final lessons leading up to the quality check lesson, including the final check before allowing the student to fly with an FAA examiner. With lessons 43, 47, 48 and 49 making it to the top of the worst offenders list it may provide support for a higher level of expectation on performance. Or second, the flight instructors may not be scoring as hard as they should in earlier lessons, causing the most repeats to happen just before the end of the course when proficiency must be proven or before a major milestone such as solo. Either way, identifying that these are problem areas allows the program to investigate further whether we need to remedy our instructional objectives in certain lessons, provide recurrent training for instructors on the scoring rubric used in the flight program, or a combination of both.

The drill down analysis of the lessons failed looked

to identify the objectives that were failed the most. Appendix "A" shows the table, and once again clear groupings occur with the objectives that make the worst offenders list. Landings – short field and soft field occur late in the course mostly in lessons 47, 48 and 49. Landing roll out, flare technique, and crosswind patterns and landings occur most often in earlier lessons, prior to solo in lessons 18, 19, 22.

The remaining objectives failed include slow flight, power on and off stalls, soft field and short field take offs, pilotage, diversion to alternate, simulated engine malfunction, level steep turns, turns around a point, emergency approach and aeronautical decision. Almost all of these remaining objectives that are failed the most, come during the end of the course in lessons 47, 48 and 49. These findings providing further support that our flight instructors may not be scoring as hard in previous lessons or scoring more harshly at milestone lessons prior to important checks.

Recommendations

Consistent with these findings from the analysis of objectives within each lesson, other researchers have seen that learning to appropriately flare an aircraft has traditionally been one of the more difficult tasks for student pilots and that pilots of various experience levels believe the landing flare to be an especially difficult maneuver (Benbassat, et al, 2005). Benbassat, et al (2005) also found that leveling off and rounding out the aircraft requires experience and repeated practice for an improved and satisfactory level of performance. However, it is difficult to understand what is explicitly understood by the student in these elements of landing, thus teaching landing flare procedures is difficult for instructors as well as students. Continued research on what students explicitly understand during the elements of landing may help to provide better techniques for instructors to utilize.

The other failed objectives of aeronautical decision making, pilotage, slow flight, diversion to alternate should prompt us to find other ways of teaching situational awareness skills to the students. Preliminary research has found that other environmental factors such as the type of scan used when making an approach to landing can increase or decrease the workload and is crucial for maintaining situational awareness. (Heiligers, et al, 2009, Covelli, et al, 2010). Focusing on how our students conduct their scans could help increase their situational awareness and lower the number of failures on objectives that reflect decision making.

Research has shown that training student pilots with flight training devices that have high functionality and fidelity can be effectively transferred to an actual airplane (Macchiarella, et al, 2006). Therefore more use of WMU's high fidelity flight training devices on the elements of landing procedures may benefit the student by providing more experience, while containing costs of instruction as compared to flying the actual airplane. More attention to the techniques of a student's scan, and the development of scenario based training sessions designed to stress aeronautical decision making and situational awareness could be completed in either a high fidelity flight training device or actual aircraft and could prove beneficial as well.

Finally and quite possibly the most important recommendation is the development of calibration exercises for flight instructors in the assessment of our flight student's

performance. Calibration of the assessment given by our flight instructors would provide more assurance that students are being properly evaluated, lessons that are failed are accurate and the too harsh/too nice that may possibly going on right now could be addressed.

Conclusion

This study has uncovered the problem lessons for students in the private pilot curriculum at WMU and has allowed for deeper analysis into the specific objectives that are the most repeated offenders in failing a lesson. A study such as this allows the program to revamp instructional methodologies, as needed, and opens the door for discussion on assessment of flight student performance among our certified flight instruction staff. →

Beth Beaudin-Seiler is a research associate in the College of Aviation at Western Michigan University. Her research focuses on transference of behaviors in high risk industries (aviation and healthcare); the development and use of simulation in healthcare to trigger team events; understanding collegiate flight training progress; and safety reporting systems in collegiate flight training environments. Ms. Beaudin-Seiler has publications in a wide variety of peer reviewed journals. In addition, she has received grant funding from the American College of Cardiology.

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Appendix A

Failed Objectives Table.

Objective	Number of times Objective was failed	Lesson Number	Objective of Lesson
<i>Short field landing (total 24)</i>	9	47	To review general handling maneuvers, navigation procedures, and emergency procedures in preparation for the end of course flight-check.
	8	48	To evaluate the student preparation for the end of course by review and/or practice of Private PTS task.
	7	49	Evaluation of the student's progress in single-engine operations, emergencies and navigation. End of course.
<i>Soft field landing (total 23)</i>	1	33	To learn how to fly a cross-country route in visual conditions including considerations for hazardous weather and power assisted (precautionary), off airport landing.
	1	43	To review general handling maneuvers and emergency procedures in preparation for the end of course flight check. Preflight briefing includes standards required by PTS for the private check ride.
	8	47	Review for end of course....
	9	48	End of course preparation....
	4	49	End of course
<i>Landing roll out and flare techniques (total 21)</i>	2	18	To fly normal and glide patterns at an airport. The student will perform the actions to show understanding of managing with an engine failure after takeoff.
	3	19	Reviews the pilot preparation for solo flight. An understanding of basic attitude flying, recognize an approaching stall, and understand the proper recovery method. Understand traffic

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			pattern and required adjustments.
	11	22	To demonstrate required elements for safe solo flight in known flight conditions.
	5	23	To practice normal traffic patterns and also includes EFATO procedure drills.
Slow flight (total 19)	3	43	Review of general handling maneuvers....
	9	48	End of course preparation...
	7	49	End of course
Power off stalls (total 18)	2	27	To review the procedures for short field takeoffs and landings and stalling. In addition, learn to fly the airplane with a steep angle of bank.
	3	43	Review of general handling maneuvers....
	8	48	End of course preparation....
	5	49	End of course
Soft field take off (total 16)	2	33	Cross country route....
	8	47	Review for end of course.....
	3	48	End of course preparation....
	3	49	End of course
Power on stalls (total 14)	3	43	Review of general handling maneuvers....
	8	48	End of course preparation....
	3	49	End of course
Pilotage (total 13)	1	27	Review short field take off and landings....
	5	33	Cross country route....
	1	47	Review for end of course...
	6	49	End of course
Diversion to alternate (total 12)	4	47	Review for end of course...
	1	48	End of course preparation....
	7	49	End of course
Crosswind patterns and landings (total 12)	8	18	Solo preparation...
	4	49	End of course
Simulated engine malfunction (total 11)	2	18	Solo preparation....
	2	19	Solo preparation – stage check....
	7	48	End of course preparation....

<i>Level steep turns (total 11)</i>	3	43	Review of general handing maneuvers....
	8	48	End of course preparation....
<i>Turns around a point (total 10)</i>	6	43	Review of general handing maneuvers....
	3	48	End of course preparation....
	1	49	End of course
<i>Emergency approach (total 9)</i>	2	27	Review short field take off and landings....
	1	43	Review of general handing maneuvers....
	6	49	End of course
<i>Short field take off (total 8)</i>	1	47	Review for end of course...
	4	48	End of course preparation....
	3	49	End of course
<i>Aeronautical Decision Making (total 7)</i>	7	49	End of course

