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Field Action Report

The Direct Impact of a Flight Simulation Training Device on Student Pilot's Flight Training :

A Survey

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ABSTRACT

This survey analyzed data of student pilots who were trained in the flight simulation training device (FSTD) in our institute before their inflight trainings started. The data from the FSTD revealed three most frequent reasons for student pilot failure in the given tasks. Fails and retakes of FSTD training numbers indicate the most problematic areas that students should master prior to inflight training. For the survey, a questionnaire was given to eight flight instructors. It was found that, FSTD training advances students who are capable in checklist utilization and communication observed in their first five hours of inflight training. The resulting data shows that the use of the FSTD for flight training before student pilots' inflight training starts is highly advantageous.

INTRODUCTION

This survey aims to collect data about the addition of a flight simulation training device (FSTD) in the student pilots 'training program. We collected data in the Elba Aviation Institute. The International Civil Aviation Organization (ICAO) and the European Aviation Safety Agency (EASA) say there is a necessity of converting and/or embedding evidence-based training (EBT) instead of competency-based training (CBT) for various reasons (ICAO, 2013; EASA, 2016)). CBT is a reform from time-based and teacher-centered education to defined tasks and learner-centered performance (IATA, 2019). It is further improved by EBT, which arose from the need to develop a new paradigm for CBT and assessment of airline pilots based on evidence (IATA, 2013).

While EBT eventually emerged from the collected data in the training configurations, its operation requires specific actions to be taken. Our institute performed a specific task - the use of the FSTD- to acquire data.

This survey used data from FSTD training and sought to understand if the FSTD was advantageous to flight training norms. There is an immediate need for this data by the flight instructors (FIs) who trained students without using the FSTD. The FI's said they often had to remind students about their theory courses, especially the lectures on aircraft instruments and communication. We tried to understand if the theory courses are more memorable and/or applicable with the use of the FSTD by the student pilot.

Thirty-three student pilots did FSTD training prior to their flight training on the field. The success rates of the students in the FSTD t714raining and their competency in field flight training were analyzed.

Student pilots start their pilot training program with theory courses and then after attending all the lectures start inflight training. This arrangement of programs is based on the CBT. In our institute, we oblige the pilot students of Antalya Bilim University to undertake FSTD training before starting the inflight phase. The students, who pass the theory course exams of Private Pilot License training, are allowed to proceed to the FSTD. Those who fail the theory courses are obliged to repeat until they get the minimum score (85%) before proceeding to the FSTD. The theory course lectures are shown in Table 1, which includes the lecture hours.

Theory Courses	**Lecture Hours**
History of Aviation	3
Air Law	18
Aircraft General Knowledge	24
Flight Performance and Planning	24
Human Performance	18
Meteorology	24
Navigation	30
Operational Procedures	10
Principles of Flight	24
Communication	12
Geography and Chart Usage	6
Mathematics-Physics and Fluid Dynamics	6
Basics of Air Vehicles	3
Air Vehicle Design	3
Visual Flight Rules-Standard Operating Procedures (VFR-SOP)	24
Safety Management	6
Systems Logic and Mathematics	6
Evasion and Escape Reflexes	3
Total Hours	**244**

Table 1

Theory courses and lecture hours of the private pilot training program.

Table 1 shows the minimum hours for each theory course. Once students complete the courses and pass the exams, they continue their training in the FSTD.

The training that is performed in the FSTD demands that each student should go through each lesson and meet its requirements. Since the FSTD is an added training component, we developed the requirements of each lesson in accordance with the theory courses. These requirements are listed in forms for an observer pilot to fill. The observer pilot gives a student pilot a preflight briefing to explain what to perform in the FSTD lesson. If the requirements of the FSTD lesson do not match with the student pilot's theoretical knowledge and/or ability to perform according to the given instructions, the student retakes the FSTD lesson.

MATERIALS AND METHOD

In this survey, we analyzed the FSTD documents to identify the most frequent reason for retakes. The data of 33 student pilots studying in Antalya Bilim University were used in our survey. Requirements were established for each FSTD lesson, and these were repeatedly explained to each student in preflight briefing.

QUALIFICATIONS FOR PILOT STUDENTS

The FSTD form requirements are listed below.

In the first two lessons of the FSTD, the students should meet the following requirements:

- *Flight Plan:* Is the student able to fill a flight plan with the knowledge obtained in the aircraft general knowledge, air law and flight performance and planning theory courses?
- *Weight and Balance Sheet:* Is the student able to fill a weight and balance sheet with the knowledge acquired in aircraft general knowledge and flight performance and planning theory courses?
- *Meteorology:* Is the student able to understand meteorological reports (the meteorological terminal area report and terminal area forecast)?
- *Pilot's Operating Handbook and Standard Operating Procedures:* Is the student able to recall specific information from the pilot's operating handbook (POH) and standard operating procedures (SOP) manual sections? Is the student able to relate the knowledge in the POH-SOP to the knowledge in the aircraft general knowledge, performance and planning, human performance, navigation, operational procedures, weight and balance, safety management and VFR-SOP theory courses?
- *Checklist Procedure:* Is the student able to perform a proper checklist procedure as given in the preflight briefing?
- *Passenger Briefing:* Is the student able to perform a passenger briefing as given in the preflight briefing?
- *Safety Briefing:* Is the student able to perform a safety briefing as required in the preflight briefing and with the knowledge acquired in the aircraft general knowledge, flight performance and planning, navigation, operational procedures, weight and balance, safety management and VFR-SOP theory courses?
- *Communication:* Is the student able to communicate as instructed in the preflight briefing and with the knowledge acquired in the communication theory course?
- *Taxi:* Is the student able to control the plane on the ground as instructed in the preflight briefing?
- *Take-off Run:* Is the student able to control the plane on the ground for take-off purposes as instructed in the preflight briefing?

In the following two lessons in the FSTD, students should meet these requirements:

- *Climb, Cruise, Approach and Before Landing Checklist:* Is the student able to perform a proper and full checklist procedure flight as instructed in the preflight briefing?

In the following lesson in the FSTD, students should be able to perform:

- *Navigation:* Is the student able to fill a navigation log? Is the student able to plan a flight using charts? Is the student able to perform a navigation flight as instructed in the preflight briefing and with the knowledge given in the VFR-SOP, navigation, geography and chart usage, meteorology, communication, flight performance and planning and aircraft general knowledge theory courses?

In the following lesson in the FSTD, students should meet this requirement:

- *Emergency:* Is the student able to perform a correct and full emergency checklist for a given emergency scenario with the knowledge given in air law, aircraft general knowledge, flight performance and planning, human performance, meteorology, navigation, operational procedures, principles of flight, communication, VFR-SOP, safety management, systems logic and mathematics and evasion and escape reflexes theory courses?

A student can only proceed to inflight training when he/she is able to perform the listed requirements effectively.

SYLLABUS AND RELATED MATTERS

In Turkey, the Directorate General of Civil Aviation of Turkey has a requirement that students should take theory classes before starting inflight training (DGCA, 2017). The university's syllabus demands students score at least 85% in each theory course before continuing their training. That pass mark is obtained by the score in the midterm and final exams (40% of the midterm exam plus 60% of the final exam).

We use the FSTD prior to inflight training; therefore, students who can not achieve this 85% score cannot continue to the FSTD training.

The only exception to this is the emergency procedure FSTD training in which students are obliged to have absolute success in every question.

FLIGHT INSTRUCTOR'S QUESTIONNAIRE

We created a questionnaire to collect even more data on FSTD training. Since FSTD training is a process designed to create a capable and skilled student, there is a need to understand if it works. We questioned eight FIs who performed inflight trainings from the start. Each FI who filled a questionnaire flew with both students who took and who did not take FSTD training. The questionnaires were delivered individually as sessions. The questions which were addressed to the FIs are listed below.

- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. With regard to *procedure application,* does the difference between the students who took the FSDT training and those who did not become apparent in the first hours of flights?
- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. Does the difference in *communication between the students* who took the FSDT training and those who did not become apparent in the first hours of flights?
- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. With respect to *cross check abilities,* does the difference between students who took the FSDT training and those who did not become apparent in the first hours of flights?
- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. As an FI, how quickly do you give to the students the abilities that you require them to have using FSTD training?
- The FSTD's training purpose is to shape procedure application, communication and cross check abilities.

As an FI, are you comfortable with your increasing work-load when a student requires more detailed knowledge and/or more specified answers under FSTD training?

- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. As an FI, can you identify which students are trained in the FSTD and which are not?
- The FSTD's training purpose is to shape procedure application, communication and cross check abilities. As an FI, among the students with FSTD training, is it more noticeable to you if one of them fails on a given task?

DISCUSSION AND RESULTS

EVALUATION OF FSTD FORMS

The 33 students with FSTD training had their FSTD forms analyzed. It is seen that the most frequent reason for students to get a retake in FSTD training is improper/insufficient POH-SOP knowledge. Table 2 shows the top three reasons for retakes.

Retake Reasons	**Retake Count**
Pilots Operating Handbook and Standart Operating Procedures	48
Checklist Procedure	44
Passenger and Safety Briefings	24
	116 Total Retakes

Table 2
Most frequent retake reasons for 33 students with retake counts.

Table 2 shows the 33 students had a total of 116 retakes in the given FSTD lessons. The three main reasons for student failure in a given task in the FSTD were improper/insufficient POH-SOP knowledge, checklist procedure and passenger and safety briefings.
Manuals are mandatory for students to have before starting their inflight training. There is no POH theory course; therefore students have to learn the manuals by themselves. There is no application that tests if students have learned the POH-SOP without the use of the FSTD.

Because the students are often unlikely to learn the manuals by themselves without the FSTD training, FIs usually show the necessity of manuals when inflight training starts. It becomes the FIs' job to force the students to memorize every item in the POH-SOP.
The second reason for getting retakes is the failure to execute the checklist procedure, which is often related to students' altered perception when FSTD training starts. Before the FSTD training, students only gather knowledge from theory courses. The FSTD is an instrument in which students learn to operationalize their theoretical knowledge. The necessity of the FSTD originates in this fact.

The third reason for retakes is improper/insufficient briefings. This is expected since the briefings contain knowledge about POH and SOP. Briefings are needed to clarify if the student has the operational knowledge (fuel quantity, weather reports, take-off information, abnormal situation procedures, etc.). Therefore it was anticipated that students would have problematic briefings.

EVALUATION OF FI QUESTIONNAIRE

Eight FIs, who flew with students who took and who did not take FSTD training, filled a questionnaire. Almost all the answers had the same pattern since the flight principle has a distinguishing form.

- All the FIs stated that for *procedure application,* in the first five hours, the students with FSTD training were more advanced than those without it.

- All the FIs stated that for behaviors and abilities expected, in the first five hours, FSTD-trained students were more advanced than students without the training.

- Six of the FIs stated that FSTD-trained students created higher expectations in the FIs.

- Six of the FIs stated that FSTD-trained students were quicker in understanding and performing almost every task given by FIs.

- Six of the FIs stated that, FSTD-trained students were more advanced in communication and had a better familiarization with the flight instrument and checklist procedure. Therefore, students were likely to ask more, had greater self-confidence and consequently learned more.

- Seven of the FIs stated that, FSTD-trained students created work for them, which the FIs were happy, by asking detailed questions.

- All of the FIs stated that with the perspective of visual flight rules, FSTD-trained students can be even more qualified when FSTD training is reformed and improved.

This survey indicates students have not prioritized POH-SOP knowledge when it comes to flight training. Retakes of FTSD lessons oblige students to comprehend a given aircraft‘s manual. Still, there was no specified feedback from FIs concerning the kind of POH-SOP knowledge expected. The reason for this may be the belief held by FIs that learning manuals are part of their job description.

The procedure (such as checklist utilization), on the other hand, is a complex activity for a student in the first stages. As it is a student‘s first attempt to use the checklist, it is often perceived as heavily distractive” extra work”.

In fact, even in the advanced hours of flights, checklist utilization by student pilots during a flight training process may complicate the development of trainees' flight control skills due to distractions generated by checklists (Risukhin, 2005). It is identified as distractive since the student has no familiarization with it. This fact, when it occurs in an inflight training‘s first hours, creates a great disadvantage. It is agreed that such a complex checklist can even be a factor that threatens student pilots’ aviation safety (Lee et al., 2019). It also makes it impracticable for a student to learn flying due to a bombardment with unknown procedures. This survey examined and concluded this disadvantage can undoubtedly be eliminated with FSTD training.

It is essential for students to think ahead of the aircraft and the checklist procedure familiarization is one of the keys to achieve that.

Based on the data, FSTD training implementation in the pilot training program in our institute is a fundamental scenario-based component of EBT. Further research is needed in developing a guidance framework in the standardization of EBT as recommended by EASA (EASA,2016).

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REFERENCES

DGCA (2017, June 8). *Flight Crew Licensing Instructions (SHT-FCL).* Retrieved from https://web.shgm.gov.tr/documents/sivilhavacilik/files/mevzuat/sektorel/talimatlar/2017/SHT-FCL.pdf

EASA (2106, May 2). *Evidence-based and competency-based training.* Retrieved from https://www.easa.europa.eu/sites/default/files/dfu/ToR%20%26%20Concept%20Paper%20RMT.0599%20Issue%201.pdf

IATA (2013, July). *Evidence-Based Training Implementation Guide.* Retrieved from https://www.iata.org/contentassets/632cceb91d1f41d18cec52e375f38e73/ebt-implementation-guide.pdf

IATA (2019, May 17). *Pilot Training & Licensing.* Retrieved from https://iata.org.xy2401.com/whatwedo/ops-infra/training-licensing/Pages/index.aspx.html

ICAO (2013, May). *Manual of Evidence-based Training.* Retrieved from https://skybrary.aero/sites/default/files/bookshelf/3177.pdf

Lee, G., Son, B. W., & Park, S. (2019). A Exploratory Case Study to Improve Student Pilots 'Checklist Training with Correlation Analysis between Normal Checklist and Pilot Human Error. *Journal of Advanced Navigation Technology.* 23(1), 8-19. doi:10.12673/jant.2019.23.1.8

Risukhin, D. N. (2005). Checklist Usage as an Independent Variable in Student Pilot Task Performance
Assessment. 2005 *International Symposium on Aviation Psychology,* 635-641.