



The Effect of Electronic Flight Bags in Flight Training on Preflight Skill Development and Aeronautical Decision Making

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Abstract

This study was designed to evaluate the effects of utilizing Electronic Flight Bags (EFBs) in flight training with emphasis on skill development and Aeronautical Decision Making (ADM) in the preflight section of a flight. The use of EFBs give pilots enhanced capabilities with simplified weather products, superimposed radar images, abridged AF/D and NOTAM information, and graphic information of TFRs, Special Use Airspaces, flight conditions, flight path, etc. This study was carried out using a triangulation method where we derived our conclusion and results through multiple tests obtaining both quantitative and qualitative data. The participants of this study were student pilots or private pilots who used EFBs in their flight training and had not logged more than 100 total flight hours. The study utilized a simulation of the preflight process of a VFR cross country flight in which the participants had to answer 25 questions related to the flight preparation. 50% of the population could take this survey with the information provided through an EFB and the other 50% (who used EFBs in their flight training as well) had to answer the questions without an EFB through traditional, unabridged raw data. A comparative analysis of the data collected from both groups was carried out. The data collected from the scenario survey included responses on Likert scales to measure decisions and reactions to certain factors in flight and responses to situation-based objective questions that tested interpretation of data and fundamental skills of flight planning. The participants also completed an anonymous survey that collected data about their dependence on EFBs during flights, their thought-process and decision making when an EFB is not available, and their ability to comprehend data when they had to work with data that was not simplified and abridged through external tools such as EFBs.

Introduction

It is well known that most accidents in flight are initiated from a chain of events that originate from poor preflight preparation. The FAA has placed considerable emphasis on the preflight portion of a flight. This is reflected in the pilot training curriculum and in Advisory Circular 60-22 which contains a detailed discussion on the "Poor Judgement Chain"(FAA, 1991). The introduction of Electronic Flight Bags has been readily accepted by pilots as a means to decrease workload and increase pilot efficiency. Electronic Flight Bags (EFBs) are used in the flight training environment from a student pilot's first flight hour as well as by commercial pilots throughout their careers. While the introduction of EFBs in flight training can be seen as a positive step to develop technologically-enabled and resourceful pilots, it is important to successfully carry out long term risk analyses. Complacency and over-reliance has been a rising issue with pilots using EFBs which give way to "automation dependency" that ultimately results in "loss of situation awareness" and "task saturation" when not using EFBs. (SkyBrary, May 2018)

Method

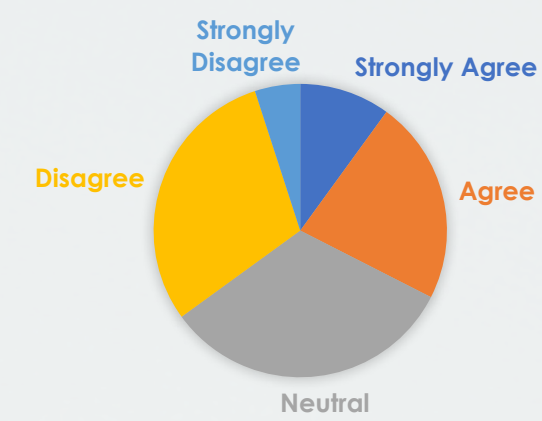
To derive the results, a triangulation method was used that allowed us to evaluate a result after it was tested through multiple methods and references in the study. This gave us both quantitative and qualitative data to evaluate. As this study was supposed to test skill development and ADM in a flight training environment, student pilots and private pilots with under 100 flight hours who used EFBs in their flight training was the population for our study with a sample size of 40 participants. To achieve optimum results through the triangulation method, we had to design a two-fold survey for the participants. The study composed of a general opinion survey and a scenario-based simulation survey.

	General Opinion Survey	Scenario Survey
Purpose	Obtain Qualitative Data	Obtain Quantitative Data
Process	Responses through Likert Scales to statements regarding preflight planning methods and the reliance on EFBs for it.	VFR cross country scenario from KTYS to KDOV on 18 th March 2018 to 0100Z. The population was divided into two halves where 50% of the population responded to all the questions on the scenario with EFBs and the other 50% could not use EFBs to respond.
Result	Data analyzed to draw out trends and identify behavioral characteristics of EFB users on various cases presented through the questions.	Carry out a comparative analysis of pilot preflight performance with and without an EFB.

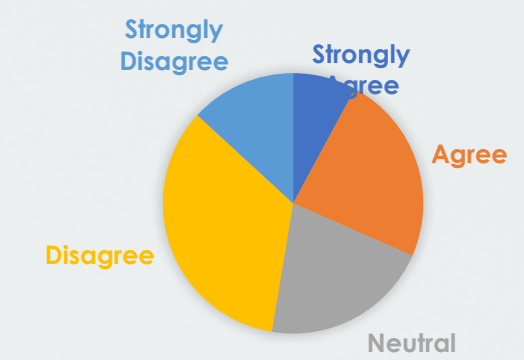
Results

General Survey

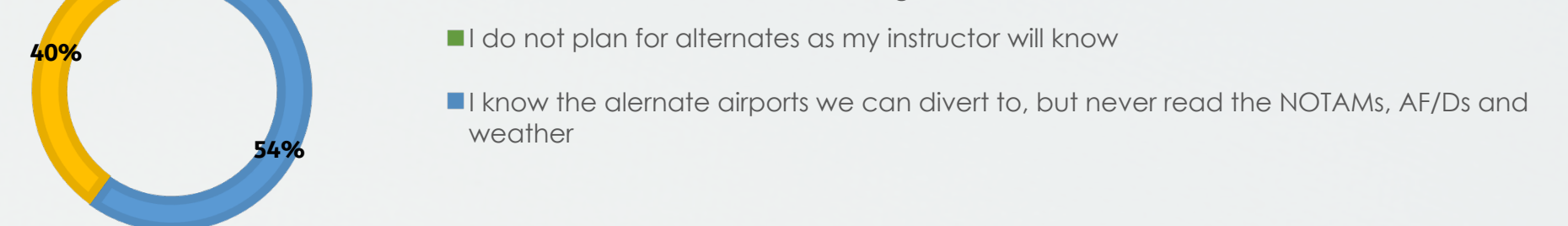
I Feel Confident Reading Raw Weather Products Without The EFB Illustrations



I always carry printed copies of NOTAMS, AF/Ds, and weather briefings to my flight when I am not using an EFB



How Do You Plan On Your Alternatives When You Plan Your VFR Cross Country Flight While Not Using An EFB



Scenario Survey

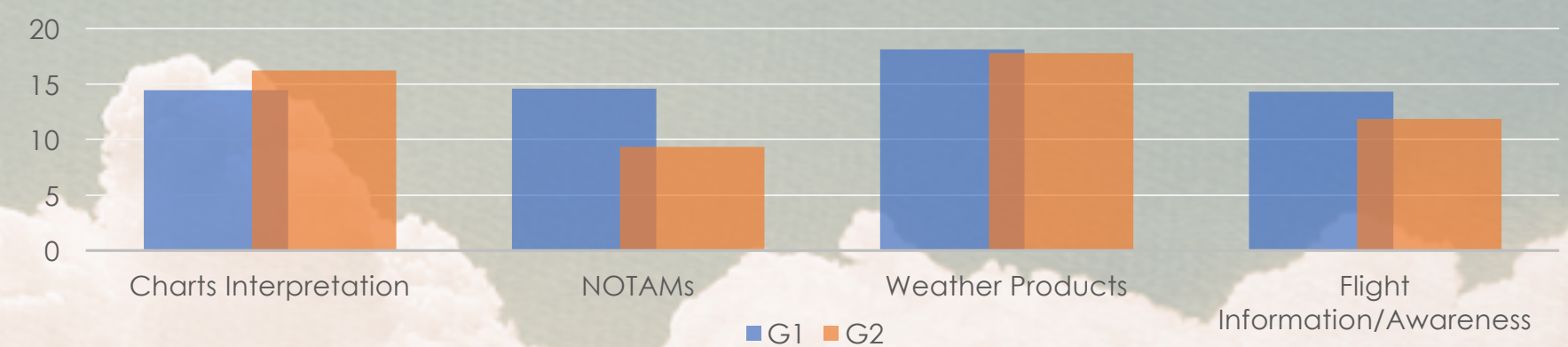
For the purpose of non-wordiness, the groups will be referred as the following

G1: Participants that did not use an EFB for the scenario

G2: Participants that used an EFB for the scenario

- 85% of G2 were able to detect the Washington TFR in comparison to 65% of G1
- 75% of G2 were able to determine a runway closure at the destination airport in comparison to 55% of G1
- 70% of G2 were able to determine the status of a restricted airspace in comparison to 60% of G1
- 65% of G2 were able to detect the change in radio frequencies at the destination airport in comparison to 35% of G1

For a broader analysis, we divided the questions in the scenario in accordance to the proficiency area that was being tested. There were multiple questions that tested a single proficiency area, hence the figures represent the average scores of participants of the two groups in each area.



Discussion

While 88% of the participants felt more "proactive" while planning their flights with EFBs, there was a large degradation in preflight performance of the G1 participants that were not allowed to use an EFB in the scenario survey. The least degradation was observed when participants were asked to make decisions based on weather scenarios. This can be credited to the graphical weather products that are even available to non-EFB users through websites like Aviationweather.gov and the conservative approach that trainee pilots are coached into. The largest degradation was seen in NOTAMS interpretation. It can be concluded that while the introduction of EFBs is a welcome addition to flight training, considerable emphasis needs to be placed by flight training administrators to ensure that students are well trained to sustain fine ADM and data interpretation without EFBs as well. Student pilots who begin their flight training with EFBs are likely to lose awareness and technical expertise in planning flights without the help of EFBs.

References

- Federal Aviation Administration, "Aeronautical Decision Making", Advisory Circular 60-22, 1991
- SkyBrary, "Cockpit Automation-Advantages and Safety Challenges", May 2018. www.skybrary.aero/index.php/Cockpit_Automation__Advantages_and_Safety_Challenges