Assess the Effect of Electrical Flight Bag (EFB) on General Aviation Pilot Situation Awareness in Different Conditions

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INTRODUCTION

As GA pilots increasingly prefer using Electrical Flight Bags (EFBs) in their daily flights, concerns about the safety of EFBs also arise. Further research is needed to understand their impact on the human factor construct (Bhardwaj & Purdy, 2019; Pittorie et al., 2021). The crucial aspect of Human-Computer Interaction (HCI) plays a vital role in determining the effectiveness and safety of flight operations, particularly focusing on situation awareness (Joslin, 2013; Lopes et al., 2022).

Research Question: compare with paper-only, is any significantly difference in SA of GA pilots when they are using EFB? Is the mounting position of EFBs will affect pilots' SA?

LITERATURES REVIEW

What is the EFBs? （FAA AC 120-76D）

Any device, or combination of devices, actively displaying EFB applications, which are generally replacing paper products and tools, traditionally carried in the pilot's flight bag. EFB applications include natural extensions of traditional flight bag contents, such as replacing paper copies of weather with access to near-real-time weather information"

The benefits of EFBs.

- Substitute the traditional paper-based suitcase.
- Integrated More calculation tools: performance, weight & balance, and flight analysis.
- Present real-time information: weather radar, air traffic, runway awareness, ATC instruction, and so on.
- Substitute one or multiple instruments: AHRS, or MFD.

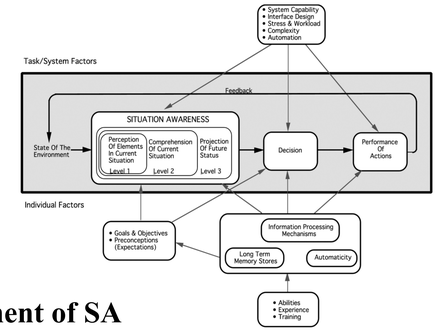
Safety concerns related to EFBs

- Reliance: Inaccuracy of the information it provided
- Mount: Fall down concerns
- Battery overheat, software/hardware freeze or app quit unexpectedly
- Cybersecurity riska
- Human Computer Interaction (HCI) design and impact on human factor constructs: Workload and Situation Awareness.

What is Situation Awareness?

According to Endsley's (1999) definition, situation awareness (SA) is the ability to be aware of the environment around the pilot and make proper and active reactions to the dynamic environment.

Four Levels of Individual's SA



Measurement of SA

SA is a complex construct; the measurement of SA could be classified into two primary methods: direct (physiological) or indirect (prob questions, self-report, evaluation performance).

SPAM Method

There are several indirect measurements of SA; the Situation Present Assessment Method (SPAM) is one of them. The SPAM method will ask participants questions while they perform task(s) in a simulator and will not require the simulator to freeze (pause). The researcher will record participants' response time to each question or correct an error/mistake (Durso & Dattel, 2004; Wickens, 2008).

METHODOLOGY

A 2 x 2 x 2 Mixed Factorial experimental design will be conducted.

Participants:

- Recruit from ERAU students/instructors/faculties/staff who hold at least private pilot.
- At least 40 participants are needed.
- Between-subject factor: *mount positions of EFB* (on panel or kneeboard).
- Counterbalancing methods will be used to eliminate order effect.

Between Subject		Different conditions (within subject)			
		Emergency Scenario	Normal Flight	Emergency Scenario	Normal Flight
EFB	On Panel	Paper-only	Paper only	EFB-only	EFB-only
	Kneeboard	Paper-only	Paper only	EFB-only	EFB-only

Materials

- A Basic Aviation Training Device (BATD) in the CERTS lab would be used.
- Simulate the visual and control feeling of an actual Cessna 172.

Procedure

- Charts, chart supplement, checklists, manuals, and other documents will be provided to both groups.
- Four scenarios: combination of emergency scenario or a normal flight scenario, use paper-only or EFB-only.
- SPAM method: prob relevant questions during experience (airspeed, altitude, RPM, airport information, etc.), and record accuracy and average response time of each participants in each question.
- Calculate average response time of each participant in each scenario.

TREATMENT OF DATA

Treatment of Data

- All data will be kept confidential and non-identifiable, will be entered into IBM SPSS to analysis.
- A two-way ANOVA would be used to test the hypophysis.

Expected Results

- A significant difference would be an expected result to reject the null hypotheses.

In-depth analysis

- Flight hours impact on the SA: will use ANCOVA to test the hypophysis.

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