Spatial Disorientation: A Study of Aircraft Simulation Systems

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Ph.D. in AVIATION

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INTRODUCTION

Pilot error is the leading cause of aircraft accidents and incidents in the aviation industry. Specifically, spatial disorientation contributes to more of those accidents than any other physiological issue in flight (Estrada, Adam, & Leduc, 2002). Spatial disorientation occurs when the pilot "fails to sense correctly the position, motion or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the earth and gravitational vertical" (Benson, 1978, p. 419).

Problem Statement

Many of the scenarios leading to spatial disorientation are not safe to replicate in actual flight, and are instead practiced using simulation systems. However, varying factors impact the effectiveness of the transfer of learning in during training.

Purpose Statement

The purpose of the study is to determine whether aircraft simulation systems can effectively replicate spatial disorientation scenarios during flight to train pilots to detect and respond appropriately.

BACKGROUND

- Spatial disorientation is a major factor in aviation accidents related to pilot error.
- Hazardous scenarios that contribute to pilot spatial disorientation are dangerous to replicate in actual flight.

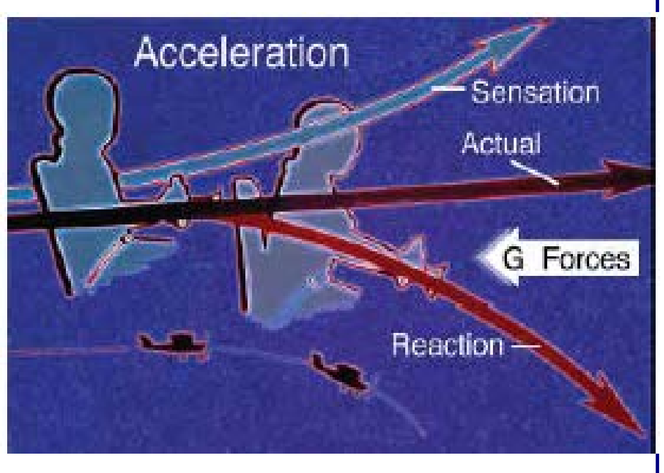

Fig 1. Head-Down Illusion.

- Simulation systems are used as training aids for flight scenarios that lead to spatial disorientation.

RESEARCH QUESTION

Are full motion aircraft simulation systems an effective tool for training pilots to detect and respond to spatial disorientation situations?

RESEARCH APPROACH

Using the flight laboratories and simulation systems available from ERAU, and approval by the IRB, three groups of student pilots will receive varying methods of training. Each group will then be evaluated in a full motion simulation system for detection and reaction to spatial disorientation scenarios.

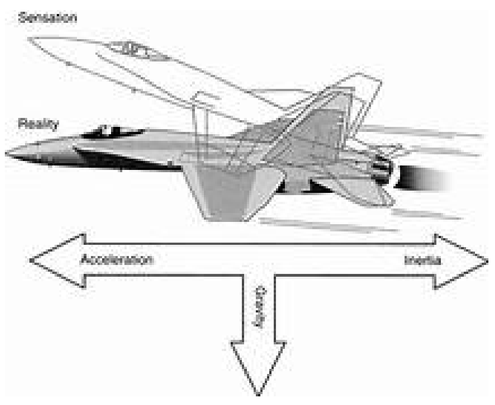

Fig 2. Oculogravic illusion.

METHODOLOGY

- Between subjects factorial design
- Three test groups
  - Group 1: video instruction of spatial disorientation
  - Group 2: high fidelity flight training device (FTD) instruction of spatial disorientation
  - Group 3: general aviation trainer (GAT) with full six-degrees of freedom instruction of spatial disorientation
- ANOVA analysis of training effectiveness

Fig 3. Demonstration in aircraft simulation system.

CONCLUSION

- Spatial disorientation is a significant physiological contributor to aviation accidents related to pilot error.
- Aircraft simulation systems have the potential to replicate spatial disorientation scenarios to effectively train pilots.

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Remaining references available upon request.