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An Alternative Method of Identification of a Failed Engine in Twin-Engine Turboprop Aircraft

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INTRODUCTION

Transasia Airways Flight 235:

- Shut down wrong engine on takeoff
- Stalled and crashed into a river
- 43 Fatalities

- From 1985 to 1997, among all documented in-flight engine shutdowns, wrong engine included almost 50% for turboprop and 30% for turbojet aircraft (Sallee & Gibbons, 1999)
- In over 70% cases, other crewmembers or ATC notice errors committed by pilots (Sarter & Alexander, 2009)
- Under stress, people tend to rationalize expected outcome, even if it does not correlate with reality, thus justifying erroneous decisions (Kontigiannis & Malakis, 2008)
- When multiple events happen, expected information may have priority over other information (Strayer & Drews, 2007)

CURRENT VS ALTERNATIVE TRAINING

<u>Current Training: Identify-Verify-Feather</u>

- **Identify**: "Dead leg – Dead engine"
  - Engine failure creates asymmetric thrust, and the airplane begins to yaw. To compensate this, a pilot needs to deflect rudder in the direction opposite to the yaw. The leg not pushing the rudder pedal (*dead leg*) is on the side of the failed (*dead*) engine.
- **Verify**: Throttle back the failed engine and expect no change in engine parameters
- **Feather**: Feather the failed engine

The main disadvantage of Identify-Verify-Feather – use of haptic sensory channel:

- It takes time and mental resources to identify which leg is exerting force on a rudder pedal
- Haptic channel is used by human brain for simpler and more reactive decisions

The authors propose using visual sensory channel for identification of a failed engine. Advantages of using visual channel:

- Is the primary information channel, hence gets priority over haptic and auditory channels (Hecht & Reiner, 2008)
- People tend to rely on visual channel even if they know that it is less accurate than haptic (Xu, O'Keefe, Suzuki, Franconeri, 2012)

<u>Alternative Training:</u>

- **Identify**: Look at an engine failure indicator (in this study represented by two lightbulbs, one on each side of the screen). Confirm by looking at engine Exhaust Gas Temperature instrument (EGT will reduce significantly after failure)
- **Verify**: Throttle back the failed engine and expect no change in engine parameters
- **Feather**: Feather the failed engine

CERTS Lab Flight simulator setup will be used in this study →

METHOD

Participants:

- 50 pilots who have <u>not</u> started multi-engine training will be recruited for the study
- Two groups – Traditional and Alternative training; 25 pilots in each

Materials:

- The study will be conducted in CERTS Lab
- Two lightbulbs, one on each side of the screen, controlled manually; will represent engine failure indicator
- Training video for Traditional and Alternative training. Approximately 15 minutes long

Procedure:

- Each participant will watch a training video, then proceed to the flight simulator for practice
- During practice, the experimenter will reduce mixture on one engine to minimum as a demonstration of an engine failure
- After practice, participants will fly three test flights
- Each flight will involve a failure of either left or right engine on takeoff
- A lightbulb on corresponding side will be turned on manually by the experimenter to indicate engine failure
- Accuracy and reaction times will be recorded and compared between two groups

EXPECTED RESULTS

- Participants in the Alternative training group are expected to react to an engine failure with higher accuracy and are expected to require less time to handle an engine failure appropriately

REFERENCES:
Available on handout