Pre-Study Walkthrough with a Commercial Pilot for a Preliminary Single Pilot Operations Experiment

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Overview

I. Introduction
   I. Brief History of aircrew crew
   II. Single Pilot Operations
   III. Q: How do we measure what is lost in the transition from a two pilot crew to a single pilot?

II. Methods
   I. Walkthrough with commercial pilots
   II. Harsh weather flight scenario

III. Results
   I. Prototype flight scenario generated
   II. Temporal flow of events

IV. Conclusions

History of Aircraft Crew

50 years ago: 5 crew members

- 15x accident rate versus today

1980s: 3 crew members

- 10x accident rate versus today

Today: 2 crew members

- Highest traffic density

Future: 1 crew member?

Current Two Pilot Crew

Captain and Co-Pilot

- Captain retains command and leadership throughout the flight
- Both can fulfill 1 of 2 roles

Pilot Flying

- Controls aircraft

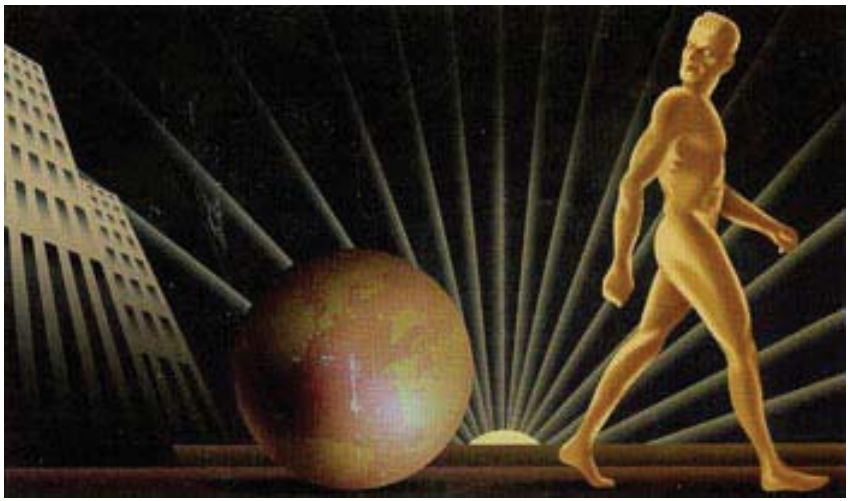
Pilot Monitoring

- Communicates with Air Traffic Controllers (ATCos)
- Operates aircraft systems
- Accomplishes checklists

Benefits and Setbacks of Automation

Benefit: Lowers operators' workload

- Can maintain more consistent and accurate performance than obtained by human operators



Benefits and Setbacks of Automation

Setback:

- Complacency

Benefits of Single Pilot Operations

- Cost of operations reduced
- Size of the cockpit reduced
- Practical, as regulations specify all aircraft must be capable of operation from one seat
- More efficient crew scheduling and better aircraft availability

Goals of Current Research

Highlight perceptual, cognitive, and social aspects of dual pilots

Illustrate how to gather the information about interactions occurring between 2 pilots

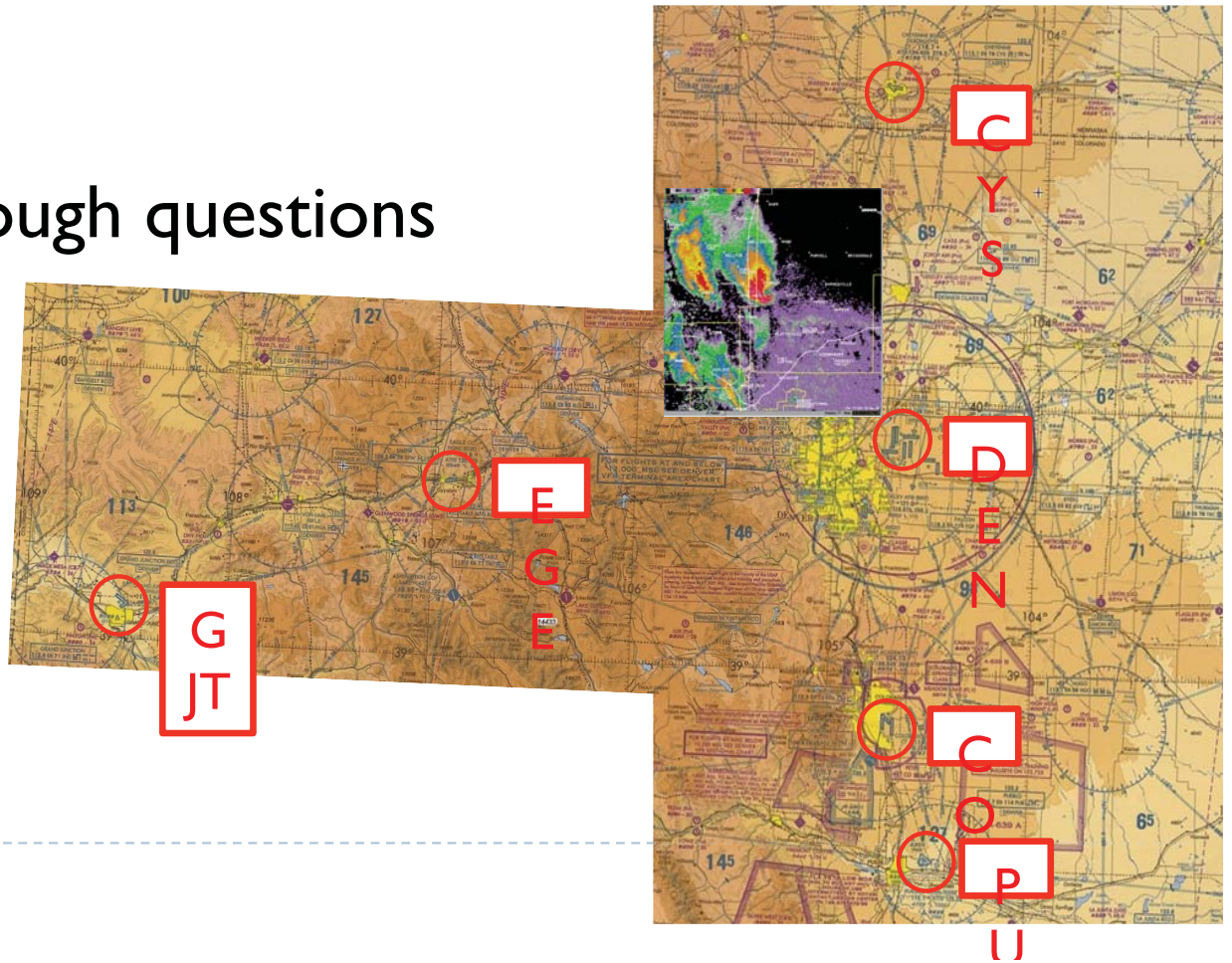
- Utilizing a Pre-Study walkthrough of non-normal flight conditions (severe weather)

Demonstrate how to best utilize the results

- Generate prototypical flight scenarios

Method

- Generic arrival path generated
  - Weather cells present
  - Failure of airborne weather system
  - Limited fuel
- Structured Walkthrough questions
  - Communication
  - Cognitive decision making
  - Physical actions

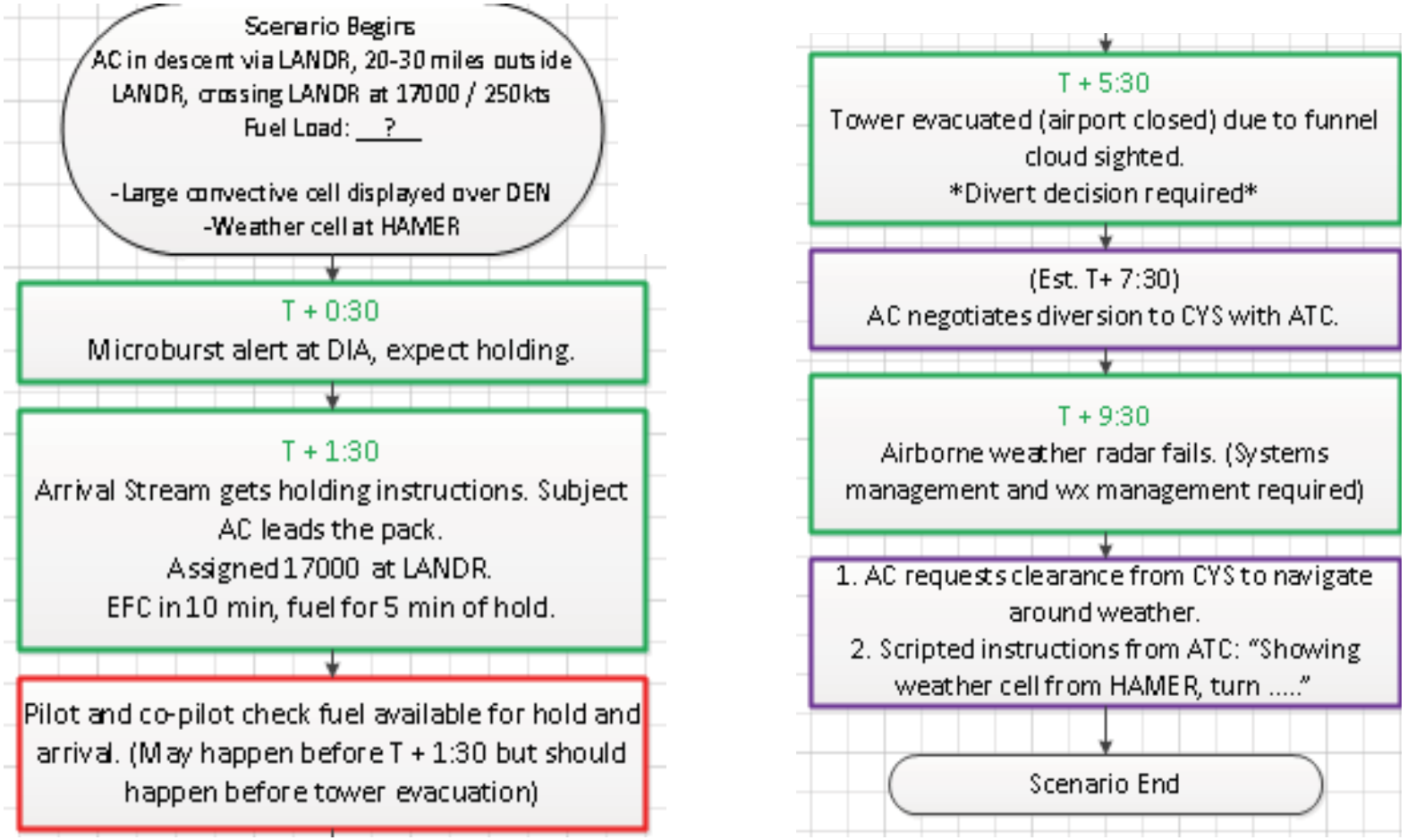


Example Questions

- For what would you rely on your co-pilot before and after receiving holding pattern instructions?
- What was the first thing you did when the airborne weather system failed?
- What would be your expectations of the ATCos during each phase of flight?

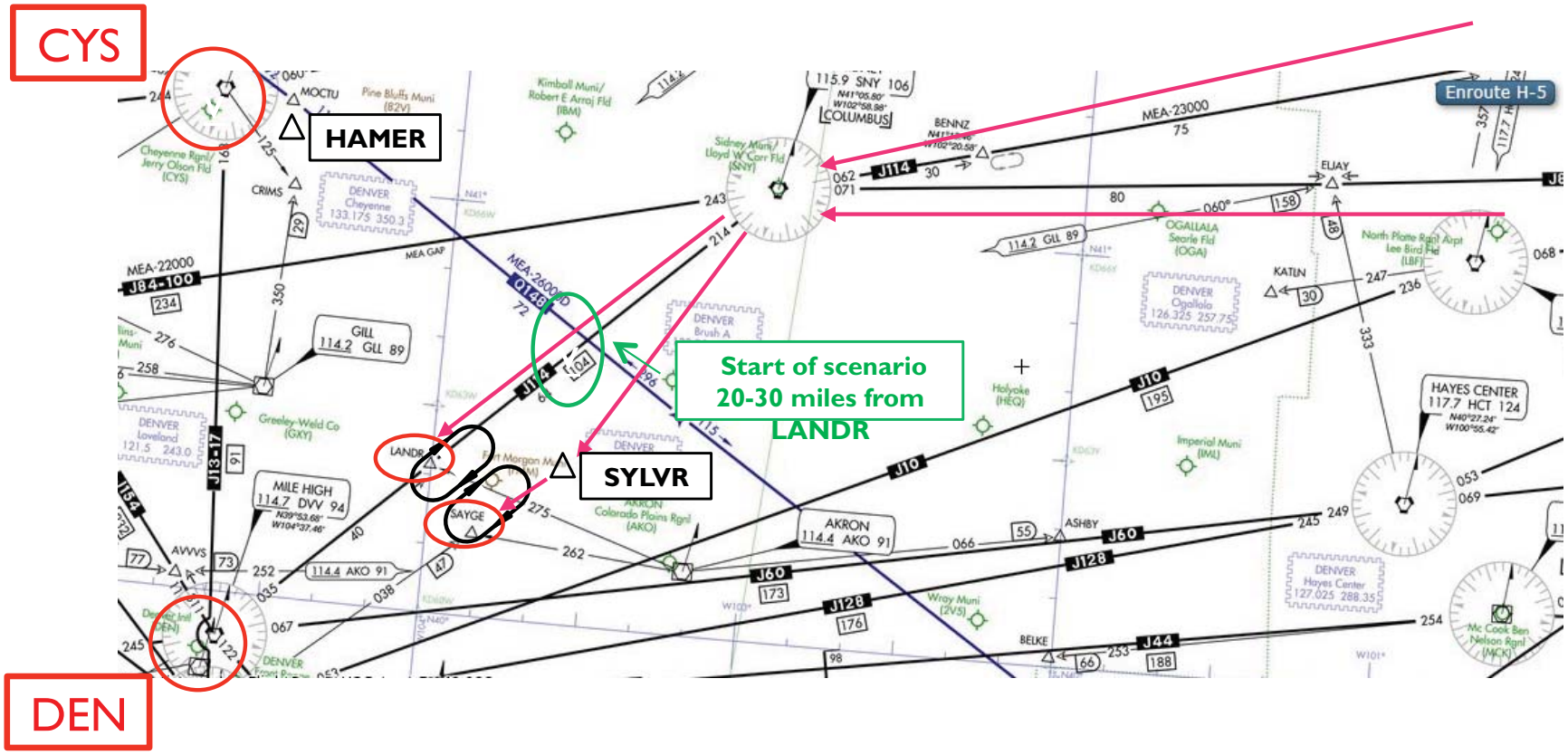
Results

- Temporal Flow Chart of Events + critical communication and decision-making slots



Results

- Prototypical scenario created that will be utilized for future SPO experiments



Discussion

- Utilize pre-study walkthroughs to generate a database of template scenarios
- Provides knowledge of when to look for:
  - Key decision-making points
  - Essential communication between pilots
- Allows researchers to:
  - Better design SPO experiments
  - Where to test specific concepts and technologies
  - Pinpoint where errors, faulty decision-making, and poor communication may arise

Thank you!

- Center for Human Factors in Advanced Aeronautic Technologies
  - Z. Roberts, J. Ziccardi, K-P. L. Vu, T. Strybel
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