Aviation Weather and Decision Making: A Human Factors Perspective

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Overview

• A History of Decision Making Research
• Pilot Decision Making
• Future Research Directions
History of Decision Making Research

- Simon & Chase (1973)
- Tversky & Kahneman (1974)
- Klein (1993)
History of Decision Making Research

- Simon & Chase (1973)
  - Experts recall more domain specific knowledge than novices.
  - Expert pilots may not be expert decision-makers.
History of Decision Making

Research

- Klein (1993)
  - How experts make decisions under time pressure.
- Studied Expert Firefighters
- Recognitional decision making over analytical

\[ 9x + 5x(7) + 14 \]

\[ 2x + 3y + 15 \]

\[ 9x + 5x(7) + 14 \]

\[ 3y(2) - 4b + 3a \]
History of Decision Making Research

- Tversky & Kahneman
  - Framing Effect
  - Anchoring Effect
  - Better understanding of biases and heuristics can help with decision making.
Pilot Decision-Making

Anchoring Bias
Motivational influences/pressures
Usability of Weather Information
Anchoring Example

- You plan to attend a reunion in Burlington, Iowa and TAF’s indicate cloudy but VFR weather at the scheduled ETA
Anchoring (cont.)

- 2 Hours into the flight, data link NEXRAD indicates a line of thunderstorms just outside of Burlington
Anchoring (cont.)

TAFs
KFSD XX1830Z XX19/XX19 33005KT P6SM BKN090
        FMXX2000 33006KT P6SM SCT090
        FMXX2200 33008KT P6SM SKC
        FMXX0000 35010KT P6SM SKC
            TEMPO XX03/XX06 SCT070
        FMXX0800 02006KT P6SM SKC=
KBRL XX1835Z XX19/XX19 22006KT P6SM SCT100 SCT250
        FMXX2300 25008KT P6SM SCT035
        FMXX0200 29006KT 6SM HZ VCTS
BKN040CB
            TEMPO XX02/XX06 4SM SHRA BR OVC030
        FMXX0600 32008KT P6SM BKN050=
Motivational Pressures

● Possible External Pressures:
  – Passenger pressure to make the reunion on time.
  – Management pressure to return

● Possible Internal Pressures:
  – Not wanting to admit defeat
  – Wanting to live up to own reputation
Weather Information: Usability

• **Where is the information?**
  - Users can’t find the information.

• **Information Comprehension**
  - Difficulty understanding the information with confusing displays
  - Display design doesn't mesh with decision making process.

• **Information Availability**
  - Information users want is not readily available.

• **Information overload**
Where to go from here...

- Multidisciplinary approach
- The role of Human Factors
- Research needs
Multidisciplinary Approach

- Working together, meteorologists, domain experts, and human factors professionals can develop research driven solutions.
Human Factors: Methods and Tools

- Vast literature on human performance
- Established methods for behavioral research
- User analysis
  - Cognitive Task Analysis (CTA)
  - User interviews
  - Observation based user analysis
Research Needs

• Display Design (what & how)

• Training
  – Scenario-based training practice
  – Tools and technology enabling pilots to practice and receive feedback.

• Measuring/Assessing effectiveness of aviation weather products

★ human-machine system
References


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