How Automation Distrust Leads to Pilot Deaths

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A Multi-Causal Phenomenon

- **Approximately 33% of aviation mishaps are due to loss of situation awareness (SA) and spatial disorientation (SD)**

- **Degraded visual environments (e.g., brownout) contribute to loss of SA**

- **Other causes of mishaps include cognitive/perceptual factors (e.g., inattentional blindness or cognitive tunneling) or physiological factors (e.g., G-induced loss of consciousness – G-LOC)**

Solutions

- **Three categories of interventions:**

  - **Training**

  - **Signaling/Displays**

  - **Automation**

The Promise of Automation

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The Reality…

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Should we judge automation so harshly?

- In many cases, human *distrust of automation* is the killer!

- Two case studies:
  - UH-60M mishap in Gulf of Mexico (June 2015)
  - Long-delayed implementation of the Automatic Ground Collision Avoidance System (AGCAS)

- **DVE (fog + night)**

- **Actual conditions offered lower ceilings/less visibility than originally briefed**

- **Clearly disoriented shortly after takeoff, never gained accurate SA**

- **Setup "autohover" but failed to engage until far too late**

- **7 U.S. Marines and 4 Louisiana Guardsmen killed**

- **Why the reluctance to use automation?**

"Old School" Culture

Inexperience as a Function of Culture

Story of Auto-GCAS

- **Installed on USAF F-16 fleet**

- **Designed as countermeasure to Controlled Flight Into Terrain (CFIT)**

- **In development since 1983 (or earlier)**

- **Met fierce resistance from the pilot community, despite potential life-saving benefits**

Auto-GCAS Video

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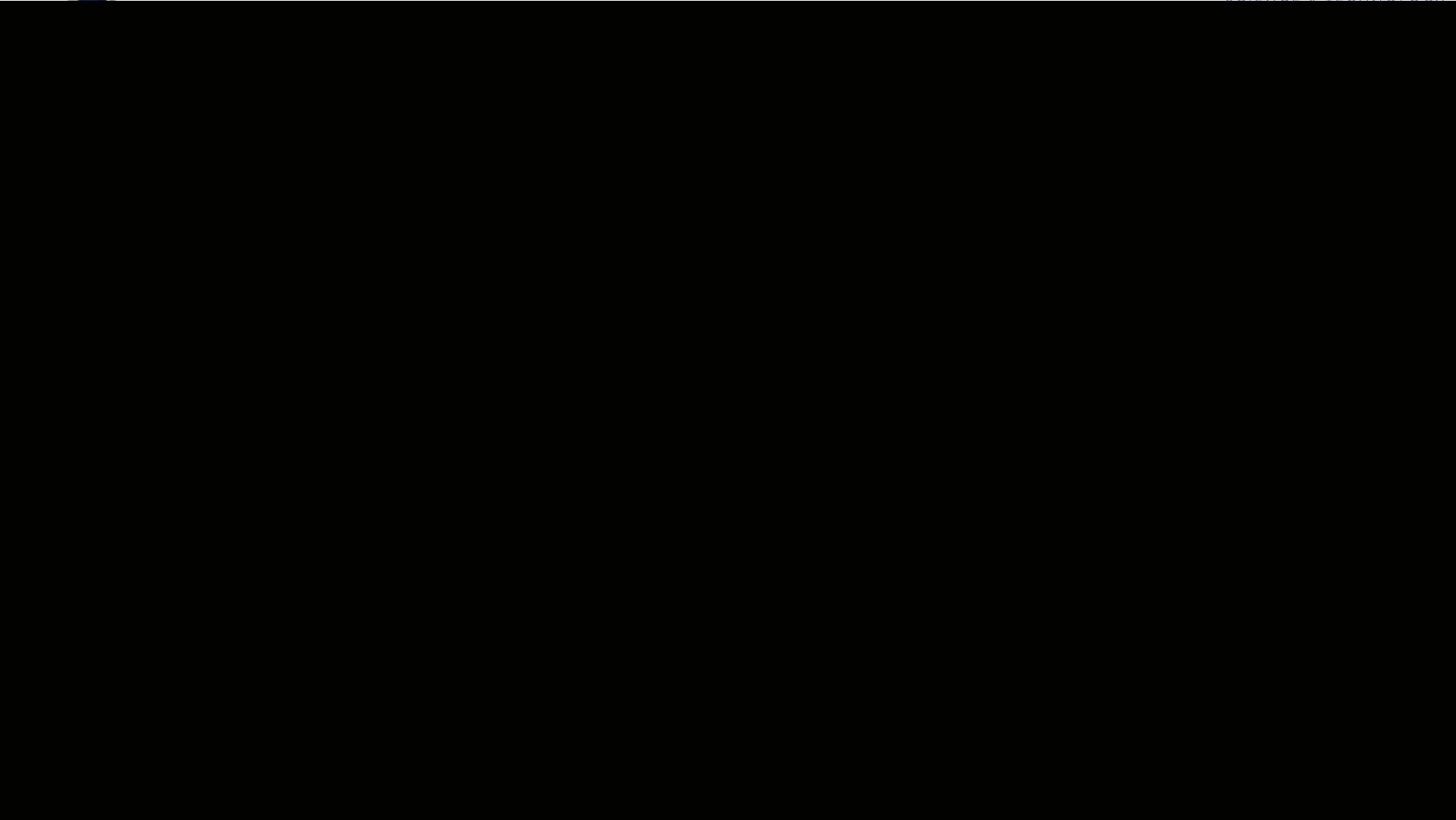
Auto-GCAS

- **Four confirmed "saves"**
- **Trust fostered through:**
  - **Extensive interviews and surveys of pilot community**
  - **Visibility**
  - **Design elements, such as system transparency**
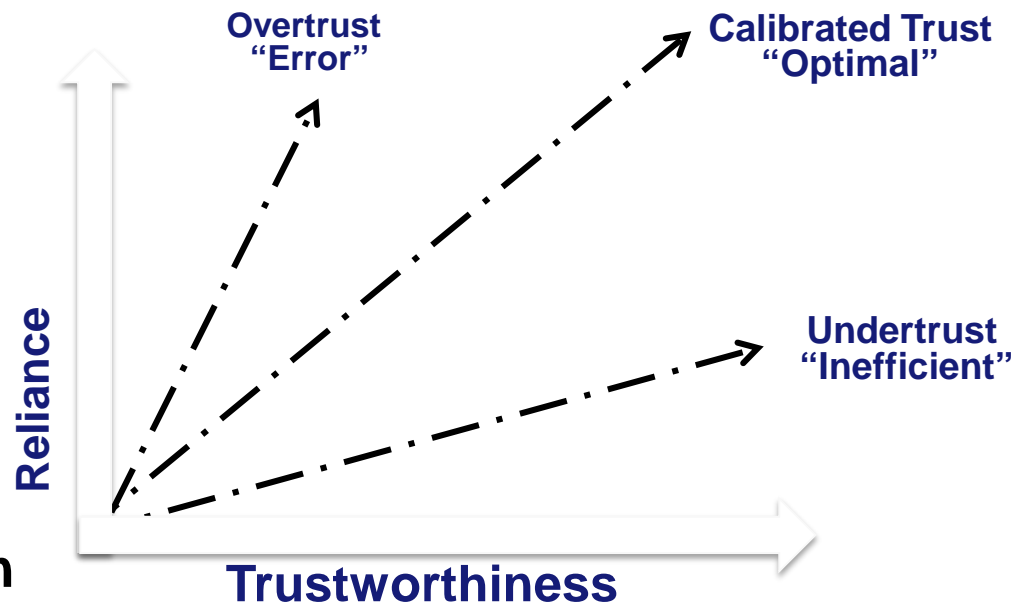 - **Iterative design approach**

Should automation be the go-to savior for mishap prevention?

- **Absolutely not!**
  - **Enduring problems:**
    - **Complacency**
    - **Deskilling**
    - **Difficult to keep pilot in the loop (maintaining SA)**
    - **Imperfect systems can erode trust**

- **Our goal should be to implement automation where it makes sense and foster _appropriate_ levels of trust**

Overtrust "Error"

Calibrated Trust "Optimal"

Undertrust "Inefficient"

Reliance

Trustworthiness

From Lee and See (2004)

Summary

- **Distrust in automation costs lives and millions of dollars**

- **The UH-60 gulf mishap and long history of Auto-GCAS highlight**

- **Automation is not, and never will be, a panacea**

- **However, human-centered design techniques can foster useful systems with appropriate levels of user trust**

Thank you!

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