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Analysing the Threats of the Failure of Visual Awareness and Cognitive Bias During a Visual Approach for Commercial Operations

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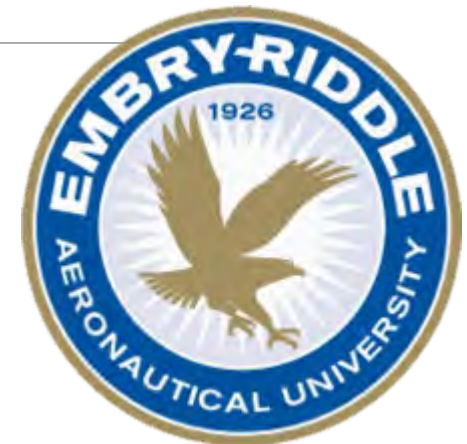
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Analyzing the Threats of the Failure of Visual Awareness and Cognitive Bias during a Visual Approach for Transport Category Aircraft

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Overview

- Research Question and Purpose

- Concepts Overview

- Method

- Results and Analysis

- Limitations and Further Research

Research Question

How does the failure of visual awareness and cognitive bias affect safety during visual approaches in transport category aircraft?

Concepts Overview

- Visual Awareness
  - Visual Scanning and Collision Avoidance

- Situational Awareness

- Task Management

- Cognitive Bias
  - Expectation Bias
  - Confirmation Bias

- Failure of Visual Awareness
  - Inattentional Blindness
  - Change Blindness
  - Visual Masking

Visual Approaches

Data Selection

Flight Safety Foundation Aviation Safety Database

- Accidents during 1998-2019

- Accidents due to human factors

- Accidents occurring during visual approaches

18 accidents identified

Limitations

- No primary data was collected which restricted a more comprehensive analysis of the accidents.

- Lack of uniformity in the reports and there were several cases where the reports lacked data that was needed for a more comprehensive analysis.

Analysis

Classification of Accidents Based on Identified Causal Factors
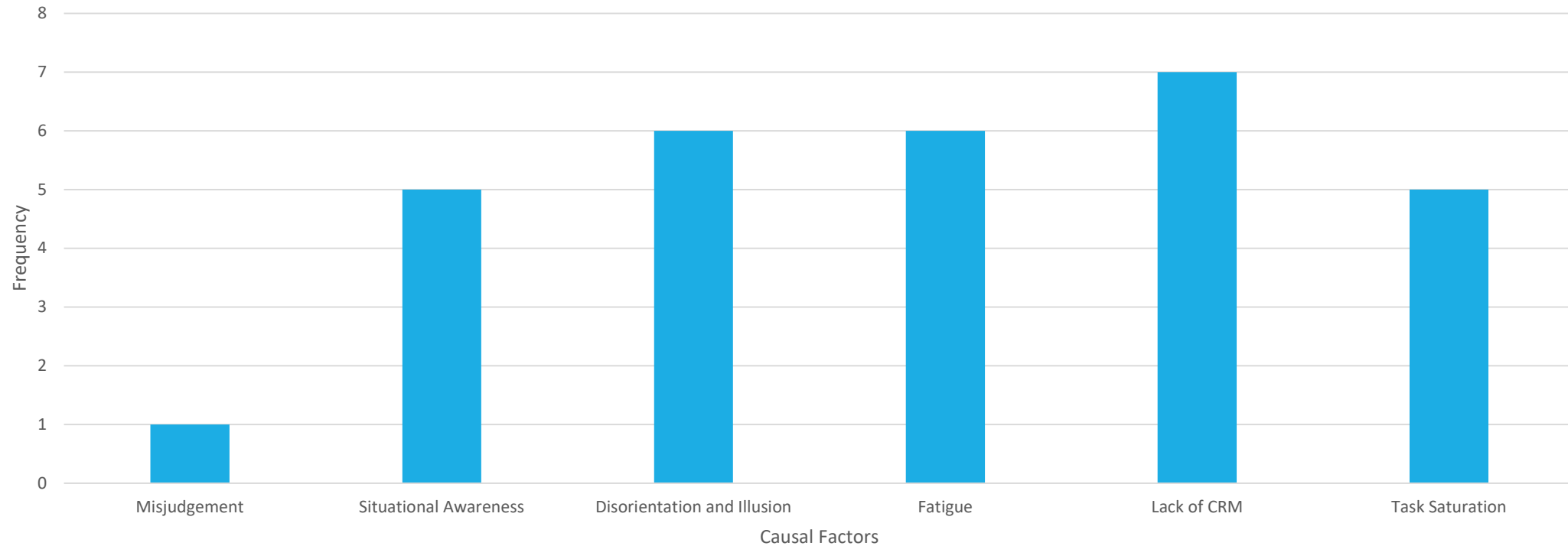
Findings

- Fatigue and situational awareness were analyzed to be the leading causes of accidents due to human errors related to visual awareness and cognitive bias.

- Two fatal accidents where loss of visual references on final led to somatogravic illusions.

- Flying a visual approach during periods of 'Low Circadian Levels' was analyzed to pose a major risk.

- Poor crew resource management (CRM) practices described as a major risk by investigating agencies.

- Lack of simulator training for visual approaches considered a factor in accidents.

- Incomplete approach briefings a major cause of errors during visual approaches.

Findings

- Geographical features around the airport play a role in illusions and misjudgment which can lead to black hole approaches.

- Lack of visual references during the visual approach (due to geographical features or environmental conditions) led to disorientation and incorrect input by pilots.

- The effect of fatigue on perceptual vision and visual attention during visual approaches was analyzed as a factor.

Recommendations

- Risk management procedures to identify 'high risk airports' and routes that consider flight duty periods, physiological factors such as 'Low Circadian Levels' during operations, and geographical features near the airport that could induce visual illusions.

- Enhanced simulator training and crew qualifications for conducting visual approaches at high risk airports.

- Fatigue risk management to study the risk of physiological factors on visual approaches.

- Enhanced crew resource management procedures during visual approaches at high risk airports.

- Improved education for pilots on the effects of cognitive bias on situational awareness.

- Improved approach briefings by flight crew to identify possible hazards to visual awareness and illusions.

Thank You