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Examining 'Inattentional Deafness' in Error Hazard Assessment of Cockpit Design in Utility Aircraft

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INTRODUCTION

- Due to its capability, demand of **utility aircraft** is increasing, but it also will face various topography challenges: various air pressure, wind direction, humidity, and weather → it will influence human factor aspect and its effect on air safety
- Cockpit interface design tends to examine the error by system, not error by pilot → **EHA is introduced** [1], but this assessment has not been accommodating all cognitive behaviors, one of these: inattentional deafness
- Research has been conducted involving various scenarios [2,3,4]. The findings support the claim that **inattentional deafness** is a crucial factor in air safety

OBJECTIVE

To introduce the importance of inattentional deafness in minimizing the probability of failure, therefore, the safety level of utility aircraft could be enhanced

WHAT IS INATTENTIONAL DEAFNESS?

The failure to perceive the auditory stimuli under high visual perceptual weight [5]

Figure 1 *Illustration of failure to perceive landing gear auditory alarm under wind shear [6]*

WHAT IS EHA?

EHA is an assessment introduced by Gideon Singer (2002) which focused on measuring cognitive behavior aspect on pilot and their effects on the probability of failure [7]

It is applied after the system has complied with **FHA** and **PSSA** based on FAA AC 23.1309-IE [8]

① **Functional Hazard Assessment** [8]	② **Preliminary System Safety Assessment** [8]
Calculating the probability of failure of **each failure mode** which might appear	Calculating the probability of failure of **software and hardware component** which might appear

What are the failure modes and their acceptable level of safety?
- Catastrophic → should have $<10^{-9}$ probability of failure per FH
- Hazardous → should have $<10^{-7}$ probability of failure per FH
- Major → should have $<10^{-5}$ probability of failure per FH
- Minor → should have $<10^{-3}$ probability of failure per FH
- No safety effect

How it is calculated? **Fault tree analysis, Markov analysis** [8]

③ Error Hazard Assessment

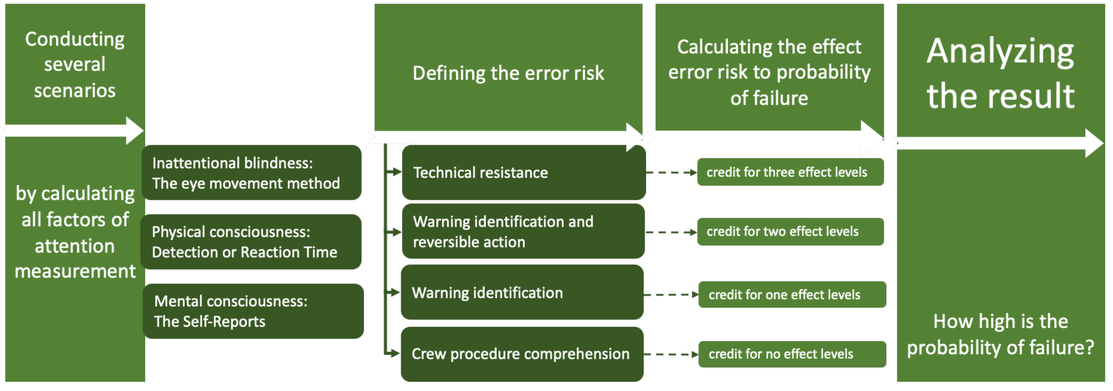

Figure 2 *Flow chart of Error Hazard Assessment*

METHOD

1) Conducting experiment by EEG/Electroencephalography

(1 scenario, associated with 1 visual warning & 1 auditory alarm)

Figure 3 *Illustration of flight simulator experiment by EEG [3]*

2) Analyzing the result

Defining the significant credit of 'inattentional deafness'

3) Reconstructing the warning loop on the scenario

a. by modifying the features of the distractor

b. by modifying the features of the target

the sound in dB, how it is alerting (repetitive/continuous), or the moment It occurs

4) Reconducting the experiment

5) Analyzing the result

How this method could decrease the probability of failure

RECOMMENDATION

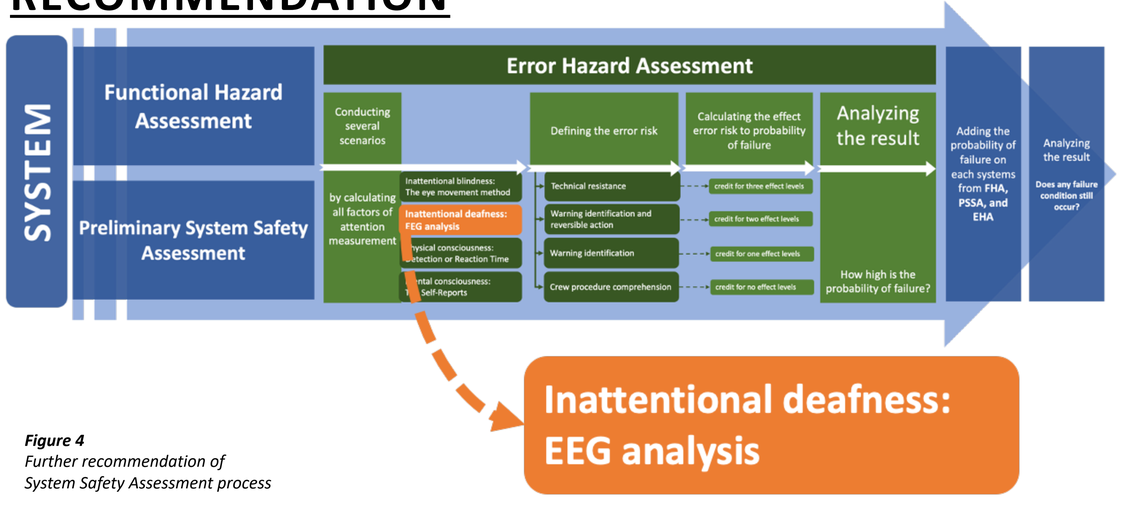

Figure 4
Further recommendation of System Safety Assessment process

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