Human Error Reduction in ATM (HERA)

Submitted by superadmin on Mon, 10/22/2012 - 14:45
HP Activity Categories:
Identification of potential human error and assessment of human error
Resource Type:
Method
Abstract:

Based on narrative descriptions of airspace incidents, a HERA analysis examines the human error event in relation to contextual factors (e.g. task, equipment). HERA is a method of human error identification developed by EUROCONTROL for the retrospective diagnosis of airspace incidents and for prospective analysis during ATM system development. Activities undertaken to explore the possibility of harmonization depended on input from two groups of air traffic control subject matter experts (SMEs). The first group analyzed incident cases using each technique and identified the useful elements from each technique for these cases. The second group evaluated the elements identified by the first group. Based on these activities, harmonization proceeded, and the techniques were deemed to be compatible. Elements from both techniques were retained and many were elaborated based on the SMEs' feedback. The integrated approach, called JANUS, is currently undergoing beta testing by seven European nations and the FAA.

References

Developer and source:


Download at
http://www.eurocontrol.int/humanfactors/public/site_preferences/display_library_list_public.html


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General Description

Purpose:
HERA context is identified through use of appropriate keywords. Human performance is conceptualized as a consequence of mental operations based on information that is perceived from the environment. Mental operations are considered sequences of information processing stages such as perception, decision making, response selection, etc. The information processing stages guide the identification and classification of errors and their further analysis and breakdown into potential causal factors.

The HERA analysis examines the human error event in relation to contextual factors such as the task engaged in at the time of the error and equipment being used. HERA allows the analyst to explain the context by assigning of appropriate information keywords. The analysis identifies which of the cognitive dimensions of perception and vigilance, working memory, long-term memory, or judgment, planning, and decision making are being relied upon when the human error occurs.

HERA uses Cognitive Domains (CDs; e.g., sensory reception, perception, working memory) to provide a structure to organize the errors. Each CD is further analyzed in terms of the Internal Error Modes (IEMs) and Psychological Error Mechanism (PEMs) with which it is associated. IEMs represent the internal outcome of an error (e.g., misidentification, late detection, misjudgement) and PEMs describe the psychological mechanism (e.g., perceptual tunnelling) associated with the IEMs. Analysis of each error also includes the identification of Performance Shaping Factors (PSFs) (variables like organizational influences, supervision, team and personal issues, and traffic characteristics) and External Error Mode (EEM) - the expression of the error - such as action performed too late.

Type (e.g. observation, questionnaire, interview, checklist, measurement instrument, etc.):

Post-hoc analysis

**Technical description of method or tool etc**

Description of the content/study:

HERA has developed tools and methods for the prediction, detection and management of human error in ATM. As such, Human error is seen as a potential weak link in the ATM system and, therefore, measures must be taken to prevent errors and their impact, and to maximise other human qualities such as error detection and recovery.

HERA analysts work primarily from the incident narrative and use the HERA process to identify and classify causal factors. The HERA process permits analysts to elaborate on the results of the original investigation. HERA analysis of an airspace incident can result in a set of categories, psychological mechanisms, and performance-shaping factors for each human error analyzed in the incident as it unfolded over time. For example, HERA analysis of one incident can result in data from multiple human errors, multiple types of tasks, etc. For the analyst, this creates a description of how human errors cascade and propagate through time and result in an incident. Three related tools are available to predict the possibility of human error in the system (HERA-PREDICT), observe errors and their management (HERA-OBSERVE), and to support the management of safety (HERA-SMART).

Technical requirements for using the method, tool, etc:

HERA has developed a concept for the classification of Human Error in the operational air traffic management environment. This project initially developed a model, methodology and technique to assist incident investigators in the accurate assessment of human error in ATM occurrences. This included joint research and development work with the FAA to harmonise a common approach to this problem known as HERA-JANUS.

Measure/Response Type:
Evaluation

Advantages:

Identifies significant substandard and flawed human performance, the mechanisms and processes that underlie, and the context in which such performance occurs.
Post hoc method.
Designed specifically for application in the ATC environment.

Disadvantages:

Does not allow for the quantification of human risk.
Requires team specialists to apply.
Can be labour intensive.

Alternative Methods:

SOAM - Systemic Occurrence Analysis Methodology.

Usability (ease of use, efficiency, effectiveness)

The advantages of HERA such as convenience, efficiency, and ease of use are:

Ease of use:
medium
Efficiency:
high
Effectiveness:
high

Constraints concerning conditions of use:

n/a

Reliability:

n/a

Validity:

n/a

Required effort (to conduct & to analyse):
Low effort

**Level of HF expertise needed (required user qualification)**

Medium: limited level of expertise required, some training required
Other expertise needed (required user qualification):

The tools and methods are dedicated to incident investigators, safety managers and human factor specialists and engineers involved in ATM.

**Cost Information**

There is no purchase price.

Low: (<1000 €) low costs to purchase, no special devices necessary

Experiences of use by SESAR partners (including references):

HERA-JANUS is now used in several European countries and training is available

Reported and/or published experiences of use (including references):

ENAV

Applicability to lifecycle phase (E-OCVM):

V3-V4-V6

Application Area:

HERA is dedicated to the human factors perspective in incident/accident investigation, safety management and prediction of potential new forms of errors arising from new technology. In aviation, as in any industry, statistics indicate that human error is a contributing factor of the majority of incidents and accidents. The HERA method is also part of the suite of tools used by the Safety Unit in its development of investigation activities and is being implemented within the TOKAI toolkit.

Keywords:

Human Error

Short Description:

HERA is a method of human error identification developed by EUROCONTROL for the retrospective diagnosis of airspace incidents and for prospective analysis during ATM system development. Based on narrative descriptions of airspace incidents, a HERA analysis examines the human error event in relation to contextual factors (e.g. task, equipment).

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Links