United Arab Emirates

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

SAFETY ALERT 06/2014

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SUBJECT: Human Factors in Air Navigation Services

REFERENCE PUBLICATION: CAR Part VIII

CATEGORY: Attention

REASON: Deficiencies observed in implementation of Human Factors principles among ANSPs.

APPLICABILITY: All Certified ANSPs

Description:

The overall safety and efficiency of the civil aviation system depends on human operators. This dependence is unlikely to decrease, and may even increase in unanticipated ways, as additional advanced technology is implemented. To a greater extent, understanding and accounting for the role of humans, including their positive and negative contributions, will be important to maintaining and improving safety while improving efficiency. Making a cognitive support and work environment to any personnel conducting critical activities is necessary to achieve this goal.

ICAO Circular 241 introduces the concept model of HF called SHEL that allows a gradual approach to comprehension of the interaction between:

a) People and people
b) People and equipment
c) People and the environment
d) People and procedures

During the first half of 2014, the GCAA had observed and requested some ATS units to undertake a review of their exposition and manuals as the Human Factors (HF) principles were inappropriately or inconsistently applied in the development of policy and procedures.

In audits of ATS units over the past few years, a number of findings had been identified which had involved HF causal factors. Whilst the corrective actions for some of these findings require a long period before they can be closed, there remains a need for ANSPs to ensure they are working towards reducing the HF risks involved in all aspects of their operations.

Three key concepts are involved in HF understanding and eventual implementation. These are; Human-centred Automation, Situational Awareness and Error Management.

Human-centred Automation

The goal of human-centred automation is to influence the design of human-machine systems in advanced technology so that human capabilities and limitations are considered from the early stages of the design process, and are accounted for in the final design. A design that does not consider HFissues cannot result in an optimal system that enhances productivity, safety and job satisfaction. Lack of recognition of the unique benefits to be derived from human-centred automation may perhaps be the main reason why HF technology has seldom been applied early enough or integrated routinely into the system design process. There are, however, several very important payoffs for early investment in HF:

- Human-centred technology (automation) prevents disasters and accidents
- Human-centred technology (automation) reduces costs

Therefore it is essential that ANSPs, when planning new equipment or displays, ensure that human-centered automation principles are applied in the preliminary and final specifications for automated systems in highly advanced technologies.

Situational Awareness

Situational awareness can be defined as the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. Thus, the most important HF issue in regards to human-technology interface is the ability of the human operator to maintain situational/system awareness. It is an established fact that human-technology interfaces have not always been intuitive. Non-intuitive, opaque interfaces lead to operational complexity which often forces the operator to allocate increased attention to maintaining an adequate mental model of the situation/system status. This becomes the breeding ground for loss of situational awareness, decreased system performance and eventually human error and safety breakdowns.

Some of the factors that the controller must continuously integrate to maintain a valid mental picture include:

- Air traffic;
- Current and forecast weather, including local effects;
- Terrain, including obstacles and altitude restrictions;
- Performance capabilities of different aircraft types;
- Operating characteristics of particular operators;
- Availability and limitations of navigation aids;
- Aerodrome conditions;
- Airport services available;
- ATC equipment capabilities;
- Current operating procedures, restrictions, and accepted practices; and
- Current capabilities of immediate colleagues and adjacent sectors.

Error Management

It has always been considered that human error was an individual trait that could be prevented by the right training, establishing and maintaining the right attitude or by automating as many human tasks as possible. However this has not been able to eliminate error. The aviation industry thus shifted its focus from *eliminating* error to *preventing* and *managing* error. Human error is recognized as an inevitable component of human performance. Complex socio-technological systems therefore should take this into account by design. The concepts of *error tolerance* and *error resistance* in technology design explain this new focus. The following are some of the causes of error:

- Lack of Communication
- Lack of Knowledge
- Distraction
- Lack of Teamwork
- Fatigue
- Lack of Resources
- Pressure
- Lack of Assertiveness
- Stress
- Lack of Awareness
- Norms

Error management has two components: *error reduction* and *error containment*. Error reduction comprises measures designed to limit the occurrence of errors. Since this will never be wholly successful, there is also a need for error containment measures designed to limit the adverse consequences of the errors that still occur. Error management includes measures to:

- Minimize the error liability of the individual or team;
- Reduce the error vulnerability of particular tasks or task elements;
- Discover, assess and then eliminate error factors within the workplace;
- Diagnose organizational factors that create error-producing factors within the individual, the team, the task or the workplace;
- Enhance error detection;
- Increase the error tolerance of the workplace or system;
- Make latent conditions more visible to those who operate and manage the system;

It is then important that ANSPs:

- Provide training on HF principles to ATS personnel; and
- Ensure that HF principles are taken into consideration when developing operational policies, procedures and guidelines.

The ANA Department therefore reminds all ANSPs of the following points:

a) Review their manuals and other documents which support their Exposition to ensure that the documents adequately cover Human Factor requirements in the Regulations; and
b) Review their processes related to the affected Regulations to ensure that Human Factor requirements are incorporated where necessary.

As ANA has identified that adequate and effective implementation of requirements and processes relating to Human Factors need to be further addressed by ANSPs, more focus on Human Factors will be included in future audits of ANSPs.

For further information on the above, please contact:
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