International Civil Aviation Organization
CAR/SAM Regional Planning and Implementation Group (GREPECAS)
Tenth Meeting of the GREPECAS Aeronautical Information Services Subgroup (AIS/MAP/SG/10)
Caracas, Venezuela, 26 February - 02 March 2007

Agenda Item 3: Review of Planning Aspects and the Transition towards AIM
3.4 Application of human factors approach in the AIS services and their impact on aeronautical operational safety.

INCORPORATION OF HUMAN FACTORS IN AIS

(Presented by the Secretariat)

SUMMARY

Aeronautical Information Services face a huge challenge to successfully transition to the AIM concept; this challenge relates to the fundamental part of the services, which is the human aspect (*liveware)*, since this is where decisions and errors are generated, efficiencies or deficiencies are produced, and accidents are avoided or caused.

References:

- ICAO Doc 8126 - *Aeronautical Information Services Manual*
- ICAO Doc 9683 – *Human factors training manual*
- ICAO Circular 217 – AN/131 and 132 - *Human Factors Digest No. 2 - A2*
- ICAO Circular 247 - AN/148 - *Human Factors Digest No. 10 - Human Factors, Management and Organization*
- ICAO Circular 249-AN/149 - *Human Factors Digest No. 11 - Human Factors in CNS/ATM Systems. The development of human-centred automation and advanced technology in future aviation systems*

1. Introduction

1.1 As we know, the study of human factors began with flight crews and has expanded with an ultimate affect to users. In this continuum of activities, human factors principles have gradually been applied in such a way that now many problems related to the human element have been sufficiently studied to avoid human error leading to safety risk events in the civil aviation environment. This situation has also occurred in AIS services as an essential part of the new aeronautical information/data processing and distribution technologies.

1.2 AIS professionals are now more than ever, facing great demands for information, currency and professionalism. These demands are linked to ICAO international standards, including quality and human factors. Information experts must face different scenarios where variables intervene producing changes in decision making. Therefore, the demand for information and a complete understanding of technological progress requires the analysis of variables that have an impact on the global performance of human beings. The importance of understanding human factors is aimed at achieving performance and integration of all organizational parts, meaning AIS, the pilots, the dispatch offices, air traffic control, maintenance, and management, among other fields related to aeronautical operations. Therefore, it is necessary for activities to have more quality and less risk, making them safer.

2. Discussion

2.1 It is important that the Meeting consider that currently "human factors"[1] in the aviation field may present a double authority-responsibility link; the expected responsibility of people to do the right thing is confronted with the given or available authority to act in accordance with that responsibility. Many accident investigators still use old concepts like the so called "events chain." But the "paradigm," according to Tomas Kuhn[2], has changed; the "reasonian Paradigm[3]" has been valid in the aeronautical community since 1990. According to this paradigm, there are "active failures," which in the last instance produce the incident, but inexorably, there are a multitude of "underlying" or "resident pathogenic" failures, both in the organization and in State's regulatory bodies, that should work as defense layers so that "human error does not occur." As they have "holes" like slices of gruyere cheese, an error produced at the desk of a flight planner eventually ends in an accident because, stochastically, the holes aligned.

2.2 As expressed above, an in-depth analysis of human factors in aviation allows us to understand that the possibility of an error, both in thought and administration processes, as well as the operational aspect may be the initial event leading to an accident. Stress, anxiety and fatigue are elements that contribute highly to weakness of defensive barriers in any organization and its safety culture. We all know people involved in those situations, or even worse, we discover that we experience similar situations that we cannot escape from, even though they are known, due to unawareness of the situation or the inability to stop the adverse events due to mistaken concepts.

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[1] Human factors definition: It is a multi-disciplinary field dedicated to optimize the performance of people and the reduction of error in air operations in this case. It incorporates principles and knowledge of disciplines such as psychology, behavioural sciences, bio-engineering and other social sciences: It is about the application of all knowledge in the study of the relationship between man-machine. The concept is aimed at teamwork as opposed to the human as an individual.

[2] Khun TS. (1969) *La Estructura de las Revoluciones Científicas,* F.C.E., Mexico.

[3] Reason J. (1990) *Human Error,* Cambridge University Press, New York.

2.3 At this point, it must be inferred that AIS personnel in charge of processing aeronautical information must be aware of the high responsibility and sensibility that the activity of processing aeronautical information entails. The application of human factors principles in aeronautical information services is an urgent matter, taking into account the kind of users it serves, i.e., pilots, flight planners and dispatchers, air traffic controllers, technicians of other air navigation services and organisms producing aeronautical charts and other documents related to aeronautical information.

2.4 It is important to recall that Doc 8126 – *Aeronautical Information Services Manual* - states that "the organization of an AIS, as well as the design, contents, processing and distribution of aeronautical information must take into consideration Human Factors principles which facilitate their optimum utilization." These principles strengthen AIS services as required by air navigation users.

2.5 Recently, a new concept called "human-centered automation" was introduced. It is a systems concept meaning that automation is designed for cooperative work between human operators in search of objectives. The quality and effectiveness of the human-centered systems depend on the degree on which the combined system takes advantage of both elements. Today, human-machine systems are more and more interactive and sometimes more complex. Through automatic devices, human operators perform tasks and duties where high efficiency and quality are expected. In fact, both humans and machines are responsible for navigation system operational safety, especially with regard to aeronautical information/data handling. The use of automation technology has generated significant changes in communication systems (air-ground, air-air, ground-ground), display panels, datalinks and voice interactive techniques, among others.

2.6 The trend towards more complex information and increased automation has the possibility of isolating human operators from the operation itself, and decreasing awareness of the situational status of the operating system. There are many reasons why human factors should be considered from the beginning of the information process. In the last two decades accident investigations have shown that they occur in highly technological organizations, which means that there may be an interface between human operators and technology.

2.7 Human error in accidents is normally the result of a poor design, defective procedures, unsuitable training, organizational problems or other systemic deficiencies. The key is that human error or poor human performance is induced by factors that can be avoided from the beginning.

3. Conclusion

3.1 Human factors are part of operational requirements, especially of aeronautical information/data quality requirements. Therefore, it is necessary to plan and ensure a broad margin of safety in a way that users may be sure that obtained information/data are correct. In view of the urgency to implement human factors principles in AIS/MAP services, it is essential to create guidelines to facilitate their application in the CAR/SAM States.

4. **Suggested Action**

4.1 The Meeting is invited to:

a) note the importance of this working paper;

b) approve the following draft decision:

DRAFT
DECISION 1O/X APPLICATION OF HUMAN FACTORS GUIDELINES FOR AIS

That:

a) the QM/TF develops, in coordination with the Secretariat of the AIS/MAP SG, application guidelines and an implementation plan for human factors principles within Aeronautical Information Services, based on Doc 9683-AN/950, ICAO circulars on human factors and other related ICAO documents; and

b) both the guidelines and respective plan be finalized by **25 December 2007**.

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