SAFETY MANAGEMENT MANUAL (SMM), ITS MEANING AND IMPLEMENTATION OF THE PROVISION OF AIR TRAFFIC SERVICES

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This paper analyze ICAO document named Safety Management Manual (SMM) as the basic concept of safety solution, describing models and processes to ensure the safety of aviation. Attention is paid to the influenc of human factor in the processes of managing and its analyzing. Discuss about the effects that directly or indirectly affect the performance of air traffic controllers in working process and proposes suitable ergonomical design of the working place, that significantly affects the performance of air traffic controllers in the management process.

K e y w o r d s. Safety, Human factor, Air Traffic Controller, Safety Management Manual, Fatigue, Stress

1 INTRODUCTION

Compliance the security as an essential feature of all sectors and processes is closely followed in present time. Of all transport sectors, in terms the speed of development, the focus is mainly concentrate to respecting and increasing the safety in air transport. Slovak republic as an member of EU is obliged to respect and to observe international regulations and directives that increase safety of air traffic. [1]

2 SECURITY AND ITS DEVELOPMENT

Adherence and ensuring the safety in all processes and all management levels in every organizations has the highest priority. Safety means achieve the status without endangering the person or property damage. The history of the progress in aviation safety can be divided into three eras:

1. The **Technical era** dates from the early 1900s until the late 1960s. The focus of safety was placed on the investigation of air accidents and improvement of technical factors. By the 1950s, technological improvements led to gradual decline in the frequency of accidents, but people still not realize yet another connections, which could contribute to an accident. [2]

2. **Human factors era** (from 1970s until 1990s) Means significant progress in aviation. The frequency of aviation accidents was significantly reduced due to major technological advances and enhancements to safety regulations. But in 1990s, despite the investment of resources were recorded a lot of air accidents in cause of human error. [2]

3. **The organizational era** from the mid 1990 to the present day. In this period was listed as the cause of aircraft accidents an inadequate safety culture of the airlines for the first time. Was found, that operational environment intense has affects on the human work and the performance of his work can support but also limit. [2]

3 SAFETY MANAGEMENT MANUAL

Document SMM as a requirement of safety describes the safety issues of air traffic. This mandatory document serves as an information source and guide for safety managing for air traffic services in Slovakia. To eliminate mistakes and stop them from spreading, SMM present two basic models to ensure the safety the complex system as the aeronautics is.

3.1 Reason´s Model

Grafically illustrates the building blocks of defense, which the aviation is protected against errors and helps in analyzing accidents caused by organizational factors. According to this model is to initiation of accident is necessary the conjunction of factors which does not lead to accident alone. Accident is almost always based on the certain events sequences. The system failure

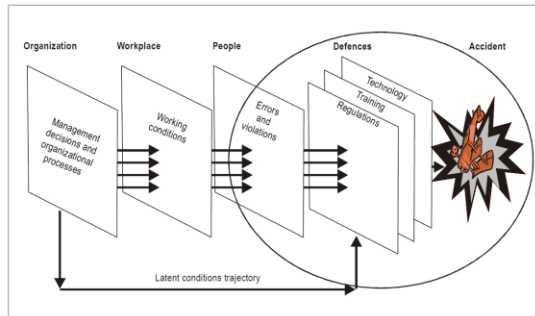occures only when the errors break through all the blocks of defense. [2]

Figure 1 Reason's model

3.2 Model SHELL

Aviation system requires the consistently evaluation of the human factor in the field of safety. It´s important to understand the impact and interactions of the operational elements to human performance. The tool for analyzing of the system components and impacts on staff is a Model SHELL. Shows the relationship between staff, components and characteristics of the aviation system. Model contains components according which is named:
a)   Software (**S**) – contains procedures, training, support,
b)   Hardware (**H**) - machines, equipment,
c)   Environment (**E**) – the working environment,
d)   Liveware (**L**) – humans in the workplace. [2]

Figure 2 SHELL model

In the centre of the SHELL Model is L element - Liveware shows humans at the front line of operations (air traffic controllers, flight crews, pilots, engineers, mechanics, managers). Humans very easily adapt to operational conditions but often commuting to fluctuation of their performance. Humans are not working standardized on the same degree as hardware, so the edges of this block are not simple and straight, on interface L - H. Other interfaces must be designed to maximum supported of the central element Liveware. Interactions each interfaces

a)   LIVEWARE – HARDWARE
Right habits of work with hardware and simple use technology with quality training is right way to eliminating errors,

b)   LIVEWARE – SOFTWARE
Presents the interaction Liveware - supporting enterprise (manuals, regulations, software) , which should be as precise and understandable,

c)   LIVEWARE – LIVEWARE
Is a central element of the organization. It´s relationship between operational staff themselves and their relations with management. That significantly affects the performance of each individual,

d)   LIVEWARE - ENVIRONMENT
It´s the influence of the internal and external working place, which is characterized by temperature, lighting, equipment, noise and has significant impact on the performance of the individual. [2]

Fault the interaction between components leads to errors and violations, that may have fatal impact to safety aviation.

4 PERFORMANCE OF AIR TRAFFIC CONTROLLERS

The performance of air traffic controller ATC requires high demands on personal characteristics, knowledge and skills. ATC is a central element of air traffic management system ensuring the safety and fluidity of civil aviation. His performance during the day varies and decreases due to fatigue and strain. This can lead to occur the errors and threats the life and property. Not all errors leads the tragic consequences. Some

will require changes to standards and regulations, that also help to improving the system. The ideal state is to understand, why errors occured and to use this knowledge to introduce the strategies to minimize and eliminate them. The most serious factors of errors include:

- **Fatigue** is a condition reflecting inadequate rest and disruption of biological human rhythms. On the rate of fatigue affect several factors (temperature, humidity, noise, oxygen content in the room, lighting, color scheme of workplace, work procedures, etc..). Fatigue is a warning sign that it is time to relax. If the ATC overcomes it and continues in activities, reducing his ability of the concentration, becomes less powerful and gets himself into stress. [3]

- **Stress** defined as a result of disagreements between work and private life and the individual's ability to cope with all the requirements placed on it. Not all stress is detrimental. In certain cases, it may also affect positively and can streamline performance of an individual. [3]

The most serious errors initiator and trigger is stress:

Be on top:
- know the symptoms and sources of stress, work actively to eliminate and reducing them,
- assess the skills and in difficult situations ask for help from colleagues,
- set priorities,
- know the working practices of the workplace and to perform the duties,
- regular and sufficient sleep before and after work,
- regularly take leave,
- avoiding harmful substances (alcohol, drugs), etc.
Working place, the conditions (equipment, facilities) as well as the culture of the working place are other factors significantly impact on performance and motivation of ATC.

5 SOLUTION OF THE WORKPLACE TO REDUCE ERRORS ATC

Human is factor affecting the performance, quality and safety processes of the organization. His reliability is viewed as an integral part of the assessment of risks. Assessment of the reliability and human error is complicated process that requires knowledge of the system, which includes all buildings, equipment, identification of risks, work positions and of course the personal characteristics of individuals. Due to the high complexity of the ATC work is necessary to create an working interior that maximally supports the performance of their activities. It should bring a sense of well-being, encourage the concentration, thereby reducing the possibility of errors. [3]

Temperature conditions of the workplace
Affects the human performance, which begins to decline sharply already at 26 ° C. Therefore It´s necessary to ensure the workplace temperature lower, but not recommended during the hot summer months to adjust the temperature in the room which is more than 6 ° C as the temperature outside.

Lightning
Daylight creates ideal working conditions. But timely morning, afternoon and evening is of course necessary to provide appropriate lighting in the room, placed so that ATC was not dazzle and didn´t reflect the displays and monitors.

Oxygen and Silence
Amount of computing technology in a smaller space adversely affects on air quality, therefore, it is necessary to ventilate the room regularly. Factor affecting the ATC welfare IS noise, too. Can be reduced by installing the appropriate windows and noise insulation of walls, ceilings.

Another important factor affecting the performance of ATC and contributes to the elimination of errors and violations, is suitably tidy workspace.

ATC place should to:

- be arranged ergonomically,
- have secured a healthy and quality seating,
- have created conditions and space for regular relaxation during labour time.

Radar screens
Should be sufficiently clear, legible, large enough and doesn´t damage eyesight.

Controls systems and equipment, technical facilities:
- positioned relative to the natural ATC working position near his hands,
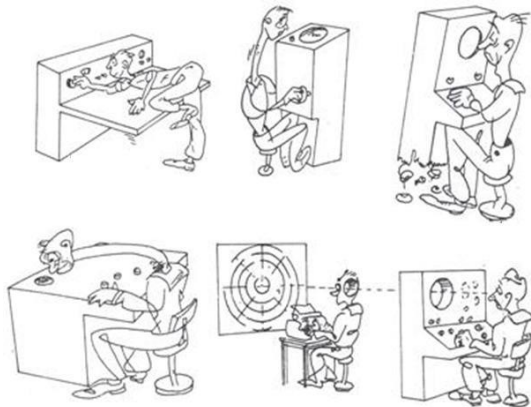- positioned as not to create confusion or to actuating at once.

Figure 3 Bad ergonomics of controls systems and equipment

Better work area, adapted to the work of air traffic controllers, ensures the higher culture and productivity of their work.

5 CONCLUSION

Eliminate accidents and serious incidents in aviation is the ultimate goal of every airline. size letters. Keeping the air system completely without risk and associated risks is almost impossible. Neither human activity and human-made introduced advanced systems can not guarantee absolute immunity against operating errors and their consequences. For this reason, security is constantly changing feature air transport system, which requires constantly keep security risks to an acceptable level, when it is possible to maintain a balance between production and protection even in dynamic systems such as aviation.

BIBLIOGRAPHY

[1] GABONÁS, Štefan: SAFETY MANAGEMENT MANUAL (SMM), Jeho význam a realizácia pri poskytovaní služieb riadenia letovej prevádzky : Diplomová práca. Košice: TU LF, 2014. 81 s.
[2] ICAO: Safety Management Manual (SMM). Doc. 9859, Montreal, Third edition 2013
[3] Učebné texty LPS: Ľudský faktor. LPS SR, š.p., 59 s.

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