PARTIAL RESULTS OF THE TESTING OF FUTURE AIRCRAFT TECHNICAL PERSONNEL IN THE FIELD OF FLIGHT SAFETY

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***Abstract**: In aviation, the number of unpredictable situations occurs that require quick reactions, theoretical knowledge and practical skills. The complex of these and other factors ultimately affect aviation safety. It is in the interest of all airport operators and aircraft manufacturers to keep the air transport well organized to meet the requirements of even the most demanding customers and to guarantee the comfort and safety. The aim of the training focuses on air specialists and provides the appropriate learning process, which is constantly adapting to current needs and time requirements.*

***Keywords**: Human Factors, Training of Technical Personnel, Aircraft Maintenance, Security, Reason Model "Swiss cheese", MEDA, SHELL, Magnificent Seven, Dirty Dozen, Aviation Legislation.*

1. INTRODUCTION TO THE HUMAN FACTOR PROBLEM

The safety of air transport plays an important role both its strongest and weakest link - person. Daily basis is influenced by the surrounding environment both social relations, as well as from external environment. Well, to be able to increase their safety and work environment and eliminate the threat, must understand the causality of a complex system in its elementary subsystems. Although practical experience is indispensable, but it is mainly essential part of theoretical training and acquisition of specific knowledge in various spheres of professional development in the form of acquiring new and existing knowledge through education and testing. The acquisition of new knowledge from the human factor in aviation and their introduction into daily practice has lead to the recognition of human error in time and then carefully avoided.

Although pilot error or pilot assistance with immediate and very noticeable effect faults technical aircraft maintenance personnel are often hidden and less noticeable. Unfortunately, they can be just as deadly. And this article is devoted to just AMT and their training and testing. It is described here the world famous models supporting the promotion of safety in aviation, which can manage AMT.

2. WORLD MODELS FOR TECHNICAL ACCIDENT REDUCTION IN AIRCRAFT MAINTENANCE

Currently, the management and representatives of the FAA are much more aware of the necessity of the human factor and to receive and consider reports on the results of knowledge of the human factor.

To emphasize the significance and importance of human factors in aviation issued air federal authority in October 2005 the operator's manual entitled "The human factor in aviation maintenance". This manual was created in response to industry requirements and guidance to simplify the list of activities in implementing the human factor in aircraft maintenance and is an excellent document for aircraft maintenance personnel. The success of the human factor chosen by the international business experts following 6 important points:
1. Incident investigation;
2. Documentation;
3. Training the human factor;
4. Shift / change in the role / responsibilities;

5. Crisis management;
6. Maintenance and justification of the human factor.

It is a matter of debate whether the events associated with maintenance of aircraft are a new phenomenon and has existed since long ago, but recent statistics reveal them. Increasing the number of accidents and incidents involving maintenance appears to be statistically significant. In the past decade, the annual percentage of such accidents has increased by more than 100%, while the number of flights has increased of less than 55%. Research on human factors in accidents clearly shows that the resolution of systemic or organizational deficiencies contributes to minimizing errors caused by human error.

2.1 Dirty Dozen. Probably the most famous figures associated with reducing the negative impact of human error is the Dirty Dozen - "Dirty Dozen" - list of factors developed by Gordon Dupont Company of Transport Canada. 12 those issues are:

1. Lack of Communication;
2. Complacency;
3. Lack of Knowledge;
4. Distraction;
5. Lack of Teamwork;
6. Fatigue;
7. Lack of Resources;
8. Pressure;
9. Lack of Assertiveness;
10. Stress;
11. Lack of Awareness;
12. Norms.

Colourful, animated pictures showing human errors are motivational and educational character and reveal the factors that significantly affect safety, quality manpower and quality of personal and professional life (Bilas *et al*., 2009:1-5).

2.2 Magnificent Seven. Following the emergence of "Dirty dozen" was a document aimed at problems of the human factor - Magnificent Seven – "magnificent seven", developed by Gordon and DuPont is focused on the positive aspects. The 7 issues are:

1. We work to accentuate the positive and eliminate the negative;
2. Safety is not a game because the price of losing is too high;
3. Just for today - Zero Error;
4. We all do our part to prevent Murphy from hitting the jackpot;
5. Our Signature is our word and more precious than gold;
6. We are all part of the team;
7. We always work with a Safety Net.

The primary goal of any airline is maintaining safety and quality. There must be no compromise. Posters of "Dirty dozen" and "Magnificent Sevens" have a clear objective to highlight the quality and safety. Society for Aviation Safety (MARSS), located in British Columbia, Canada, provides these posters for aircraft maintenance for a fee.

2.3 MEDA. Another major human factors tool for use in investigation of maintenance problems is the Boeing developed Maintenance Error Decision Aid (MEDA). This is based on the idea that errors result from a series of factors or incidents. The goal of using MEDA is to investigate errors, understand root causes, and prevent accidents, instead of simply placing blame on the maintenance personnel for the errors. Traditional efforts to investigate errors are often designed to identify the employee who made the error. In this situation, the actual factors that contributed to the errors or accident remain unchanged, and the mistake is likely to recur. In an effort to break this "blame and train" cycle, MEDA investigators learn to look for the factors that contributed to the error, instead of the employee who made the error. The MEDA concept is based on the following three principles:

- Positive employee intent (In other words, maintenance technicians want to do the best job possible and do not make intentional errors.)
- Contribution of multiple factors (There is often a series of factors that contribute to an error.)
- Manageability of errors (Most of the factors that contribute to an error can be managed.)

When a company is willing to adopt these principles, then the MEDA process can be implemented to help the maintenance organization achieve the dual goals of identifying those factors that contribute to existing errors, and avoiding future errors. In creating this five-step process, Boeing initially worked with British Airways, Continental Airlines, United Airlines, a maintenance worker labour union, and the FAA.

The five steps are:

1. **Event:** the maintenance organization must select which error that caused events will be investigated.
2. **Decision:** was the event maintenance related? If the answer is yes, then the MEDA investigation continues.
3. **Investigation:** using the MEDA results form, the operator conducts an investigation to record general information about the airplane - when the maintenance and the event occurred, what event initiated the investigation, the error that caused the event, the factors contributing to the error, and a list of possible presentation strategies.
4. **Prevention strategies:** the operator reviews, prioritizes, implements, and then tracks the process improvements (prevention strategies) in order to avoid or reduce the likelihood of similar errors in the future.
5. **Feedback:** the operator provides feedback to the maintenance workplace so technicians know that changes have been made to the maintenance system as a result of this MEDA process.

The implantation and continuous use of MEDA is a long-term commitment and not a "quick fix." However, airline operators and maintenance facilities frequently decide to use the MEDA approach to investigate serious, high visibility events which have caused significant cost to the company.

The desire to do this is based upon the potential "payback" of such an investigation. This may ultimately be counterproductive because a highly visible event may not really be the best opportunity to investigate errors. Those involved in the process may be intimidated by the attention coming from upper management and various regulatory authorities. By using the MEDA process properly, the organization can investigate the factors that contributed to an error, discover exactly what led to that error, and fix those factors. Successful implementation of MEDA will allow the organization to avoid rework, lost revenue, and potentially dangerous situations related to events caused by maintenance errors (Čekan *et al.*, 2009: 310-315).

2.4 Reason model "SWISS CHEESE". Figure 1 shows a modified version of the model Reason model of the causes of accidents which shows the different human involvement leading to degradation of a complex system.

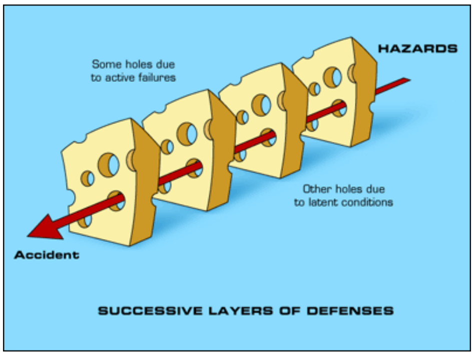

Fig. 1 Reason model "Swiss cheese"

Professor Reason saw the airline industry as a complex productive system. One of the basic elements of the referee (high level of control, corporate or regulatory authority), which is responsible for setting targets and for a message available means to achieve equality, two different aims: the objective of security and purpose of efficient movement of passengers and cargo (Shappell, 2000). The second key element is the segmental management - those who carry out decisions by senior management. Decisions of senior management and departmental management measures leading to effective and productive activities by participating employees, which must be some assumptions. For example, must be available equipment, manpower must be qualified, well informed and motivated and environmental conditions must be safe. Another, equally important element of the defense and security measures, which are usually in place to prevent injury, damage or costly service disruption is to achieve this objective which may also contribute to the conceptual model SHELL, referred to in the next chapter.

2.5 SHELL model. SHEL model first advocated Professor Elwyn Edwards in 1972 and modified diagram to illustrate the model was later proposed by Captain Frank Hawkins in 1975 (Fig. 2). Component block SHEL model are shown with appropriate alignment pictorial impression components. These interpretations are proposed as follows:

- liveware (man);
- hardware (computer);
- software (procedures, symbols etc.);
- environment (the conditions under which the LHS system must function).

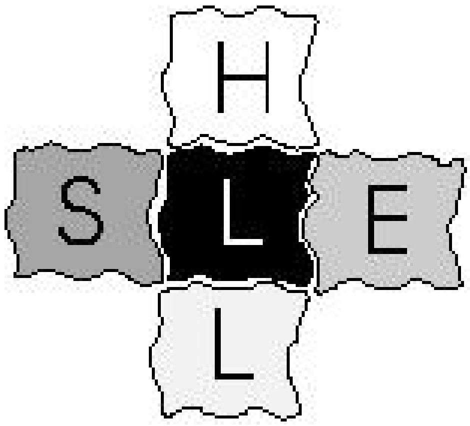

Fig. 2 The structure of the SHELL model

This block diagram does not cover interfaces, which are outside the human factor (e.g., the hardware - hardware, hardware - the environment, software-hardware) and is intended only as an aid to understanding the human factor (Blajev, 2009; Sulc, 2004.

3. PARTIAL RESEARCH FINDINGS AMT

As mentioned at the beginning of the document, testing AMT is an essential part of their profession. To check their knowledge and especially the quality of their information about world models, helping to increase safety and prevent accidents, was the dissertation prepared questionnaire. It was developed for Czech and Slovak AMT separately, to compare information in two different countries. The questionnaire was made available to the respondent to submit the letter, i.e. 3.1.2011 to 15.2.2011.

Although in the present questionnaire is not yet completed and evaluated, one can assume that awareness of personnel is much weaker than I originally anticipated. Surprisingly, up to 100% of Czech engineers said they are not aware of any program described in the questionnaire. Only 18% by Slovak engineers heard about the model SHELL, 18% had heard of the “Magnificent Seven”. MEDA, model “Swiss cheese” and “Dirty Dozen” are not known to anyone. It would probably be fair to point out ignorance AMT, where up to 72% of respondents said that these things are not known, therefore, that they were not before testing the M 9 - (Module 9: Human Factors) mentioned during the lectures. It is difficult to assess the need for the inclusion of these, the new information to test questions for the AMT and all aviation personnel testing of M 9 must go, but it must be at least highlight the need to include information on existing and relatively successful programs, newsletters and passwords, which contribute to safety and traffic into the curriculum already in school for all aviation professionals and courses in M 9 also.

Excluding the foreign models and passwords, I assumed that the mechanics are in addition to the standard of workplace safety standards drawn up their passwords principles in the workplace. Nowadays it is not unusual, but 55% of Slovak respondents I my assumption confirmed. They have developed their passwords or codes of conduct in the workplace. As regards the Czech colleagues, the models have not heard, because they were not in taught in courses have their own security rules, but nevertheless considered the testing of M 9 is important and necessary. For Slovak engineers need the inclusion of human factors and lecturing on the rung 55%, it is absolutely unnecessary to be considered 18% respondents and 27% of respondents did not know.

Finally, I wonder whether respondents prior to testing some time off provided by the employer and whether the M 9 tested regularly (according to regulations of the SR is a once in 5 years). Striking is that only 36% of Slovak AMT is tested regularly and to 64% test is not. It seems to me unlikely that aircraft manufacturers and operators deliberately breaking the law, so this response will be considered only as indicative, and I assumed that respondents understood the question correctly. With regard to study leave, only 27% can be in peace prepare for the exams to a 73% to the catch, besides the work. Their Czech colleagues also have study leave and also are not regularly tested. However, as already mentioned above, probably misunderstood the question (Čekanová, 2010).

4. CONCLUSION

Whatever the final results will be any, from past responses can be assumed that even after almost 5 years, inclusion of human error in the Slovakian air legislation and the curriculum as we do to strengthen the knowledge base and on to the next level. The Czech Republic is similar and in the future, I propose to revise or supplement teaching materials on the new findings, which are a normal part of international education and information AMT.

If we want to be air traffic has also still statistically the safest, if we want clients to worry about having to board the aircraft, if we want to be aviation workers credit for safety, we should offer them in first place with sufficient information, quality education and motivation to do their job 110%. If we understand that the Air Force does not begin to train a pilot, but the education drive, then we will be two steps ahead of a crash.

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