THE QUALITY SYSTEM OF AIR TRANSPORT PILOTS TRAINING AT THE UNIVERSITY OF PARDUBICE

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ANNOTATION:

This article contains description of quality system for airline transport pilots training at the Faculty of Transport Engineering at the University of Pardubice. This system is based on new regulations within the European Union which aims mainly to unification of personnel licensing and training procedures, increase of safety, including principles of safety culture, and support of new methods used in both integrated and modular training. Similar rules are gradually introduced to all sections of civil aviation in Europe.

Quality system as a complex according to the new rules consists of a Management System, Safety Management System and Compliance Monitoring System and has proved to be very efficient in airline transport pilots training. Functional Compliance Monitoring System guarantees conformity with all applicable laws and regulations which ensures one of the significant parts of the new quality system. The task of Safety Management System is to increase the level of safety in practical training particularly, but the theoretical part consists of basics of all knowledge acquired during the training. Management System covers all parts and joins them to an undivided unit.

Separate documents are processed for each system, the Management System (MS), Safety Management System (SMS) and Compliance Monitoring Program (CMP) at the Faculty of Transport Engineering. The article describes all aspects of Management System, including safety policy, management processes and responsibilities of each participating person, general and basic principles, operational procedures, regulations and procedures that concern ensuring the required level of safety within the Faculty of Transport Engineering. It further shows the methodology chosen to define duties and responsibilities of Accountable Manager (AM), Safety Manager (SM), Compliance Monitoring Manager (CM) and the methodology of personnel selection to Safety Review Board (SRB), Safety Action Group (SAG) and all other personnel involved in the quality system.

At the end you will find summarized current experiences and description of procedures ensuring further improvement of quality of educational process. This work was supported by the project ev. no. VH20172019027 supported by the Ministry of the Interior of the Czech Republic.

1. INTRODUCTION

From the cradle of aviation, air transport is associated with a variety of hazards due to the environment in which it is carried out. Especially air accidents, often associated with fatal consequences, create a kind of mistrust in passengers and the public.

Quality is a concept we have been meeting more and more in the last twenty years and it suggests that this trend will continue. The importance of quality has risen recently in the world so dramatically that we can talk without exaggeration about a kind of "quality revolution". The past two decades marked a significant shift in quality with accent in the field of operational safety. This was mostly because in a very short period there was a significant shift in supply and inquiry towards an oversupply over inquiry and the necessity for many subjects to make a painful transition from the producer's market to the customer's market. The concept of business based on "we need to sell what is being produced", although supported by the best marketing activities to promote sales, has no chance to survive. Clearly, the "we can only produce what can be sold" approach is preferred. The elapsed period has confirmed the guideline that the customer quickly adapts to better quality and is not very compliant to accept any concessions or errors tolerance on the supplier's side of the required product.

From the perspective of business subjects, it would be a fault to look at quality as isolated property. On the contrary, it is necessary to perceive them as part of managerial and entrepreneurial skills. Not all managers,

including government authorities, are willing to accept these dramatic changes in terms of quality, which often justify it as a fashionable, short-term business phenomenon that is simply needed to survive in businesses.

Already during the 1970s, the quality of products, especially thanks to Japanese firms, have become significant competitive factor, often equivalent, or even more important than the price itself. Nevertheless, this contesting concept is gradually overcome and time is coming as another important factor. Time represents the need to respond promptly to customer requirements and any changes in the market and to shorten response times to inquiries and the time of development of new products as well as continuous production times. The success of a business today cannot be associated with the prioritization of any of these characteristics. Prosperity implies taking into account all three current competitive factors, i.e. price, quality and time.

This article contains description of quality system for airline transport pilots training at the Faculty of Transport Engineering at the University of Pardubice. This system consists of a Management System, Safety Management System and Compliance Monitoring System and has proved to be very efficient in airline transport pilots training. Separate documents are processed for each system, the Management System (SM), Safety Management System (SMS) and Compliance Monitoring Program (CMP) at the Faculty of Transport Engineering. The article describes all aspects of Management System, including safety policy.

ATO Safety Management focuses on risk management only that combines with operational safety. Financial, legal and economic risks are only considered as part of the risk assessment in terms of their severity.

The formal process of safety risk management is the subject of a separate document that provides plain guidance and maintenance of safety information about hazard identification, risk analysis and risk management process. At the same time the structure of the document is adapted according to requirements of transparency of the safety management system for better CAA supervision based on recommendations published in ICAO Doc. 9859 eventually in ICAO Annex 19.

This document provides procedures of hazard identification and its analysis and further evaluation of the resulting risks. Then it defines corrective action if needed. The document described in paragraph 5 is used to monitor and supervise the implementation of corrective actions. Document Implementation of corrective actions monitors priorities of the safety measures date of implementation and the record of execution. This method provides a permanent overview of the performance of safety activities defined in two basic safety management processes.

ATO safety management is a combination of the following tools and processes:

- Hazard identification, risk assessment and risk management process (risk mitigation)
- Internal safety surveys, studies, and investigations
- Managing operational and organizational changes from a perspective of safety
- Continuous improving the level of safety achieved
- Keeping knowledge and verifying the organization's readiness to deal with crisis situations and efficient procedures of operation recovery within the emergency planning

2. FACTS AND CONDITIONS INFLUENCING THE IMPLEMENTATION OF SAFETY MANAGEMENT

To ensure sufficient effectiveness in hazard identification, safety risks assessments and management, all relevant input information must be provided. The communication culture is internally assured within the ATO by the reliable organizational structure and the relationships described in the Operations Manual. To obtain relevant information for safety risks assessment in part of external communication with customers, suppliers, and other partners, effective processes are described and implemented in the CMS.

To achieve the required safety management results, funds are allocated on the basis of an analysis of Safety Manager, an assessment of the Safety Review Board and the approval of the Accountable manager. One of the topics in hazard identification, risk analysis and assessment is the sufficiency of dedicated resources and their availability to ensure all major and supportive safety management processes. Safety risks associated with lack of funds for ATO operation itself are also considered.

Risk acceptance criteria and standard ALARP concept

Risk acceptance criteria are set in the ATO Safety Policy. The basis is the principle defined in ICAO Doc. 9859, which is listed below in a separate section.

ATO approach to risk management that risks are managed on the basis of both safety and economic acceptability. For this reason, risk management has been introduced in the ALARP (As Low As Reasonably Practicable) principle, which directs the risks to a level that is practically achievable from the economic point of view and is always below the minimum tolerable / permitted level.

Preparation for safety risk assessment and management

From the point of view of process outputs, the main objectives of the established system (objects, relationships, rules and processes) for safety management are the right outcomes of the risk assessment process and the risk management process which leads to the risk being reduced to the required level.

Safety risk assessment and management is performed during the initial risk analysis, the regular implementation of hazard identification and in advance of the decision-making of the Faculty of Transport Engineering managers on important operational and organizational activities, operational and organizational changes, introduction of new tools, extension of scope, etc.

For the effective and reliable implementation of the risk assessment and risk management process it is important to set up a framework for individual leaders and the level of intervention of the Safety Review Board. The Safety Manager is responsible for identifying the situations under consideration when the Safety Action Group is established or is not required. If so, the Accountable Manager is asked to approve the nomination of members, time allocation,

methods of analysis used, the input data and the SAG activity schedule.

Hazard identification - principles

Hazard is a condition, subject or activity that may potentially cause injury to persons, damage to equipment or structures, loss of substantial property, or reduced ability to perform ATO operations.

Hazard identification is one of the most important elements leading to safety improvement. Hazard identification allows ATO to identify in a timely manner conditions or situations that could directly threaten the safety and operability of the ATO.

Hazard is a common component of ATO operating processes. The hazard and its consequences manifest is triggered when a combination of unfavorable conditions, situations and states of objects and the whole system occurs. The result is the emergence of a situation with a safety impact.

Hazard identification - sources of information, specific procedures for hazard identification

Hazards are identified both reactively following the occurrence of safety-related events on the basis of internal investigations as well as proactively.

The required attributes of the ATO safety management system imply the need to proactive hazard identification before it becomes a safety event. The goal is to achieve a sufficient level of prediction of unfavorable conditions.

Hazard identification and consequences of hazards - resources to identify the consequences of hazards

Hazard identification still does not ensure the expression of the consequences of hazard. Every hazard has more consequences of hazard. In further work with the hazard, the consequences are obtained on the basis of queries as to how the specific hazard concerns the ATO in particular.

The consequences of the hazards are perceived as hazardous situations that have already occurred (information is obtained and assessed from reactive sources) or hazardous situations that may arise (information is provided through proactive sources – e.g. audits, safety assessment of operational processes).

The consequences are described on the basis of a logical refinement that specifies instead of a possible hazardous event, time related to different periods of economic cycles, characteristic seasons, day and night times, the specific nature of operational events and various other events.

3. RISK ASSESSMENT - DETERMINATION OF PROBABILITY AND SEVERITY

We define safety risks for the needs of management as the consequences of the assessed hazards based on their probability and severity.

Probability analysis

The likelihood of safety risk is defined as the probability of occurrence of a hazardous event.

Probability analysis is based on:

- Impact assessment for direct causes, contributing factors and existing barriers
- The nature of reasons, contributing factors and barriers subsequently determines the likelihood of a safety event occurring

In the framework of the implementation of the causal analysis (analysis of reasons, contributing factors and existing barriers) the direct reasons are taken into account, namely the incorrect execution of required operations, hazardous behavior and violation of established rules, the human factor, etc. The contributing factors are the organizational factors, environmental factors etc.

For barriers that reduce probability, we consider:

- CAA Certification Requirements
- Established operating procedures
- Principles of ATO operation
- Instructor training

Additional questions to determine the likelihood of risk:

- Are similar events from the past recorded, or is this occurring separately?
- How many employees work according to the assessed procedure?
- For what proportion of the time is the equipment or procedure considered?

We determine the probability of the consequences of the hazard based on 5 degrees:

Probability of occurrence		
Qualitative definition	**Explanation**	**Value**
Probable	*Occurs many times (occurred repeatedly)*	**5**
Occasional	*Occurs sometimes*	**4**
Rare	*Unlikely, but possible occurrence (occurred rarely)*	**3**
Very Unlikely	*Very unlikely occurrence (occurrence not recorded)*	**2**
Almost Impossible	*Inconceivably occurrence*	**1**

Table 1: Probability of occurrence

Severity analysis

For all the consequences of the hazard, their severity is analyzed for the needs of risk management. Analysis includes both short and long-term consequences, impacts to the natural and working environment.

Questions to determine the severity of the consequences of hazard:

- What kind of damage can arise?
- What can be the extent of the damage?
- What significant impact on the environment can arise?

We determine the severity of the consequences of the hazard based on 5 degrees:

Severity of occurrence		
Aviation definition	**Significance**	**Value**
Catastrophic	*Significant loss of equipment, multiple life loss.*	**A**
Dangerous	*Equipment loss, damage to health, life loss.*	**B**
Significant	*Serious incident or person injury.*	**C**

Less Significant	*Inconvenience, operational limitations, usage of emergency procedures, less significant incident.*	**D**
Insignificant	*Small or no consequences.*	**E**

Table 2: Severity of occurrence

4. DESCRIPTION AND DETERMINATION OF RISK ACCEPTABILITY

Safety risks are already evaluated for probability and seriousness, and the next step is to determine the acceptability of the consequences of the hazard.
At the start of the risk acceptance process, the combination of an alphanumeric expression of the likelihood and severity of the underlying hazard is examined. Based on the location in the risk matrix, determination of acceptability and decision-making on further risk management steps is under way. Risk management means reducing it to a permissible limit.

Probability	**Severity**				
	Catastrophic (A)	**Dangerous (B)**	**Significant (C)**	**Less Significant**	**Insignificant (E)**
Probable (5)	**5 A**	**5 B**	**5 C**	**5 D**	**5 E**
Occasional (4)	**4 A**	**4 B**	**4 C**	**4 D**	**4 E**
Rare (3)	**3 A**	**3 B**	**3 C**	**3 D**	**3 E**
Very Unlikely (2)	**2 A**	**2 B**	**2 C**	**2 D**	**2 E**
Almost Impossible (1)	**1 A**	**1 B**	**1 C**	**1 D**	**1 E**

Table 3: Risk acceptability

Risk values marked in red (5A, 5B, 5C, 4A, 4B, 3A) are defined as unacceptable. The yellow values (5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C) are tolerable. The green values (3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E) are acceptable.

5. SAFETY RISK MANAGEMENT - PRINCIPLES OF DEFENSE SELECTION

The safety manager is responsible of the safety risk management process. The responsibility of the Accountable Manager is ensuring this process from the point of view of allocating the relevant resources.
Based on the assessment of the acceptability of risk according to its competence within the three defined areas within the risk matrix the following procedures are set for the ATO.
Safety recommendations are used to manage safety risks (reduction, mitigation) in the ATO. Applying safety recommendations is the responsibility of the employees assigned by the Safety Management. For the implementation of the safety recommendations, the date of fulfillment is determined, which must be observed. The Safety Manager must be informed about the implementation / non-implementation of the safety measure. In case of non-compliance with the safety recommendation, the Safety Manager defines steps to ensure that the required level of safety is maintained.

Unacceptable risks

As unacceptable we refer to the risks that are in the red zone of the risk matrix. The risks in this area are too high to be able to carry out the operational processes involved in these risks.
Safety recommendations are proposed by the Safety Manager and approved by the Accountable Manager.

Tolerable risks

As tolerable risks we refer to the risks in the yellow zone of the risk matrix. Risks in this area are tolerable under the assumption of a regular check according to established safety recommendations.
Safety Manager is responsible for determining the safety recommendation.

Acceptable risks

As acceptable risks we refer to risks in the green zone of the risk matrix. Such risks are controlled by the ATO and can be operated without any obligation to manage them.
Safety Manager is responsible for the risk assessment.

Safety Risk Management - Strategy for Management - Defense Selection Strategy

The last step is to use mitigation strategies (Defense Selection Strategy) for mitigation and risk management. The entire process, including the hazard identification process, is described in the Figure 1.

Three basic strategies for establishing safety recommendations are available for mitigation and risk management:

- Cancellation - operation or operation is terminated, safety risks are higher than the benefits that are generated during use.
- Reduction - Frequency of use or activity is reduced or action is taken to reduce the consequences of the risk.
- Exclusion of threats - The consequences of the hazardous operation are isolated or a backup is created in the system.

Possible alternatives for safety risks mitigation do not have the same potential for mitigation. Before deciding on their use Safety Manager considers the effectiveness of design, management and personnel measures, performs a cost-benefit analysis. The Safety Manager assesses the feasibility of the proposed measures, acceptability for each of the stakeholders, enforceability and persistence. The Safety Manager analyzes the safety issues that remain in the system after mitigating the original risks. Realizing that new safety issues of a different nature may arise.
Safety recommendations can be made as follows:

- Implementation of new technologies
- Application or change of procedures and regulations
- Performing training (focusing on the problem area)

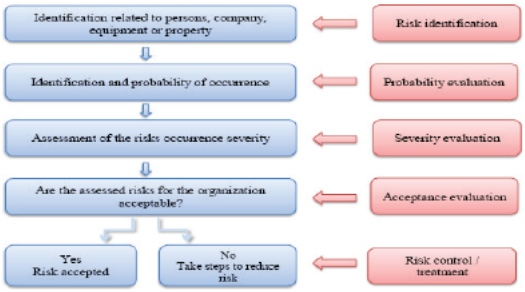

Figure 1: risk management process

6. CONCLUSION

Approved training organizations must set up, maintain and continually improve the quality management system of its operations as one of the necessary certification conditions. The quality system is generally based on the strategy and internal philosophy of a specific organization, so each quality system is original in its own way and there is no universal model of such a system. There are only recommendations and expressions of smallest quality system requirements. The aim of the article was to show one of the possible forms of the quality system of a training organization, to describe and explain the role of all its components and to emphasize the importance of its key parts, such as feedback systems and audits.

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