

Development of a Common Taxonomy for Hazards



20 April 2010

This paper was prepared by the Standardization Workgroup of the Safety Management International Group (SM ICG). The purpose of the SM ICG is to promote a common understanding of Safety Management System (SMS)/State Safety Program (SSP) principles and requirements, facilitating their application across the international aviation community.

The current core membership of the SM ICG includes the National Civil Aviation Agency (ANAC) of Brazil, the Civil Aviation Safety Authority (CASA) of Australia, the European Aviation Safety Agency (EASA), the Federal Office of Civil Aviation (FOCA) of Switzerland, the United States Federal Aviation Administration (FAA) Aviation Safety Organization, the International Civil Aviation Organization (ICAO), Transport Canada Civil Aviation (TCCA) and the Civil Aviation Authority of United Kingdom.

Members of the SM ICG:

- Collaborate on common SMS/SSP topics of interest
- Share lessons learned
- Encourage the progression of a harmonized SMS
- Share products with the aviation community
- Collaborate with international organizations such as ICAO and civil aviation authorities that have implemented or are implementing SMS

For further information regarding the SM ICG please contact:

Amer M. Younossi, SM ICG Chair
Federal Aviation Administration
Aviation Safety
(202) 267-5164
Amer.M.Younossi@faa.gov

Charles Huber, Alternate SM ICG Chair
Federal Aviation Administration
Aviation Safety
(425) 917-6732
Charles.Huber@faa.gov

SUMMARY

Safety Management System (SMS) is becoming the standard for aviation safety worldwide. Safety risk management is one of the main components of an SMS; and the key element of an effective safety risk management process is identification of hazards that exist in the system. This paper will propose a process for the development of a common taxonomy for hazards. The proposal entails developing a clear and concise definition of a hazard as well suggested categories and a categorization process. This recommendation can serve as the foundation for the tasking undertaken by the CAST/ICAO Common Taxonomy Team (CICTT) Hazard Taxonomy Workgroup.

1. BACKGROUND:

The Safety Management International Collaboration Group (SM ICG) was initiated by the European Aviation Safety Agency (EASA), the United States Federal Aviation Administration Aviation Safety Organization, the International Civil Aviation Organization (ICAO) and Transport Canada Civil Aviation (TCCA). The purpose of this group is to promote a common understanding of SMS principles and requirements, facilitating their application across the aviation community.

Thus far three workgroups have been established by the SM ICG: Measurements, Documentation, and Standardization. The Standardization Workgroup (WG) supports the development of a common taxonomy for hazards to be utilized for data categorization and analytical purposes, processes for analysis and sharing of the aforementioned data, and a comparison of international SMS and SSP terminology and alignment where possible.

The first task for the SM ICG Standardization WG is to develop a proposal for a common hazard taxonomy to be utilized for data categorization and analytical purposes. This effort links to the work undertaken by the CAST/ICAO Common Taxonomy Team (CICTT). The SM ICG Standardization WG does not want to duplicate the efforts undertaken by CICTT and hence will serve in an advisory capacity to the CICTT Common Hazard Taxonomy Workgroup.

2. INTRODUCTION:

According to ICAO annexes regarding SMS, States shall require, as part of their State Safety Program, that a service/product provider implement a safety management system acceptable to the State that, as a minimum:

- a) identifies safety hazards;
- b) ensures the implementation of remedial action necessary to maintain agreed safety performance;
- c) provides for continuous monitoring and regular assessment of the safety performance; and
- d) aims at a continuous improvement of the overall performance of the safety management system.

Hazard identification is the key element of the safety risk management component of SMS. As such, the SM ICG realized that a common hazard taxonomy could provide great benefit to the aviation industry. Not only will it allow for effective analysis of hazards within an organization, it may also facilitate future sharing of hazard information among organizations and ultimately the aviation community.

The SM ICG Standardization WG met in October 2009 and developed a terms of reference document that included products and milestones for this workgroup. The first product is to develop a common taxonomy for hazards. It includes developing a clear and concise definition of a hazard as well as suggested categories and a categorization process.

The following sections present general hazard definitions based on the ICAO references and recommended categorization processes.

2. GENERAL DEFINITIONS:

The Standardization WG of the SM ICG did not want to create a new definition for a hazard since the ICAO definition is sufficient. However, this group proposes further clarification and boundaries to the ICAO definition as stated below.

a) Definition of a hazard

A hazard, as defined by ICAO, is an object or condition with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function

- a. A hazard has to be clearly identifiable,
- b. It has no judgmental adjectives (e.g., poor, deficient)
- c. No scenarios are required for its articulation
- d. It has no negative meanings or descriptions of absence (e.g., lack of...)

b) Generic or High Level Hazard:

A hazard as defined above

c) Specific Hazards:

Components of a generic or high level hazard

3. PROPOSED CATEGORIZATION PROCESS:

The SM ICG Standardization WG considered various potential processes for identification of hazards. After careful analysis, this workgroup proposes that the CICTT Common Hazard Taxonomy WG utilize a near term and far term categorization approach for this effort.

a) Near Term Approach

In recent years the aviation industry has called for hazards to be closely examined as precursors to incidents and accidents. As part of this effort, a standardized taxonomy of hazards appears to be the first step in a process that will include hazard collection and analysis. However, even at this first stage caution is needed on the adoption of the best possible process.

Hazards can be perceived as such depending on the current activity, but also on an individual's background or bias. For a ground handling organization, an ice patch on the ramp could be a hazard, while the airline crew on board the aircraft might not be affected by its presence. Hazards can be specific to an organization, such as an aerodrome or Air Navigation Service Provider, or can even be specific to a sub group in the organization (e.g., flight crew vs. cabin crew). Therefore, creating an exhaustive list of hazards would seem a utopian task, as it would include almost everything present or related to the aviation system.

To this end, the SM ICG Standardization WG decided to begin the taxonomy development process by creating high-level categories of hazards. Authorities, operators, service providers and other organizations will be able to use these broad categories as taxonomies for the specific hazards they have identified. These categories aim to capture the nature of a hazard rather than the particular impact it may have on the aviation system.

The SM ICG Standardization WG proposes the categories listed below. These high level categories represent the areas in which potential hazards exist for any organization in the aviation system.

Hazard Categories

- i. Environmental
- ii. Technical
 - Aerodrome
 - Air Navigation
 - Operations
 - Maintenance
 - Design and Manufacture
- iii. Economic
- iv. Organizational
- v. Human – Limitation of the human which in the system has the potential for causing harm
 - Medical condition
 - Handicap
 - Psychology of person

Hence, in the near term the SM ICG recommends that the CICTT Common Hazard Taxonomy WG accept the hazard categories above as the basis of its near term effort. It is also recommended that the CICTT utilize subject-matter expert knowledge and judgment to further refine and develop these hazard categories.

b) Far Term Approach

Hazard taxonomy development can be based on subject-matter expert knowledge and judgment, with the aim of providing a standardized hazard identification and information exchange system. However, given the current disparate perspectives on hazards among the aviation community, the necessary knowledge and consensus to define a comprehensive hazard taxonomy may not be available at this stage. Therefore, to support the CICTT Hazard Taxonomy WG and to provide a practical way forward until further knowledge and consensus about hazards is developed, SM ICG recommends that as a far term approach the CICTT Common Hazard Taxonomy WG consider alternative approaches. Methods to be considered by CICTT may include allowing the industry and regulators to provide information regarding the hazards in their systems. This maybe accomplished through surveys or data gathering via a specific platform developed to gather such data. This type of approach may enable the aviation community to gather better hazard data in the long term.

4. THE WAY FORWARD:

The members of the SM ICG Standardization WG recommend that the CICTT Hazard Taxonomy WG utilize a near term and far term categorization approach for this effort as proposed in this paper. This workgroup would also like to continue to collaborate with the CICTT Hazard Taxonomy WG to further refine and enhance common hazard taxonomy efforts for the aviation industry. Furthermore, SM ICG Standardization WG recommends that workgroups created as an outcome of the 2010 ICAO High Level Safety Conference utilize that proposed processes.