



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
MEETING OF THE WORKING GROUP OF THE WHOLE**

Atlantic City, United States, 4 to 8 April 2011

Agenda Item 6: Other business

SAFETY MANAGEMENT SYSTEM (SMS)

(Presented by the Secretary)

SUMMARY

At the request of the Air Navigation Commission (ANC), this paper invites the working group to discuss safety management systems in relation to dangerous goods.

Action by the DGP-WG is in paragraph 2.

1. INTRODUCTION

1.1 During its fifth meeting of the 186th session, the Air Navigation Commission (ANC), when reviewing the agenda for the DGP/23 meeting, discussed the issue of safety management system (SMS) in relation to dangerous goods.

1.2 An extract from the minutes of the meeting is presented below:

...

With respect to monitoring activities in States in dealing with the transport of lithium batteries, referred to in paragraph 2.3.1 a) 2), a suggestion was put forth that the DGP look into a common database to collect and share data. TO/OPS affirmed that she would bring this idea to the attention of the panel members at the next working group meeting in Atlantic City in April 2011. She assured the Commission that information was being sought from as broad a group as possible, including manufacturers, shippers, airlines, cargo handlers, the lithium battery industry, panel members and States through the regional offices.

The discussion on a common database led into a discussion on the issue of safety management systems (SMS) in relation to dangerous goods, which was recognized as a complicated issue. A view expressed was that the introduction of some SMS elements

could be useful, particularly in relation to lithium batteries and data and safety reporting, and that this subject could be raised at DGP/23 under Agenda Item 6 (Other business). TO/OPS advised that the DGP had discussed SMS in general and had noted that the subject of dangerous goods was usually perceived as part of operations. In this regard, provisions in Annex 6 — *Operation of Aircraft* covered most SMS aspects of dangerous goods. An issue raised by the panel related to SMS for dangerous goods shippers which was felt to be beyond the scope of Annex 18 — *The Safe Transport of Dangerous Goods by Air*.

The Secretary commented that a DGP discussion on SMS could be within the context of collecting information for risk assessment. She added that in relation to work on a new Annex, careful consideration would have to be given to how the issue of dangerous goods fit within the overall context of safety management. Based on the discussion, the Commission *requested* the DGP to consider elements of SMS specifically with regard to data and safety reporting.

...

2. ACTION BY THE DGP-WG

2.1 The DGP-WG is invited to consider how SMS elements could be used in relation to dangerous goods in general and to lithium batteries, specifically. To facilitate discussion, section 9.6 **SAFETY PERFORMANCE MONITORING AND MEASUREMENT** as contained in the *Safety Management Manual (SMM)* (Doc 9859) is presented in the appendix.

APPENDIX

SAFETY MANAGEMENT MANUAL (SMM) (DOC 9859)

...

SECTION 9.6 SAFETY PERFORMANCE MONITORING AND MEASUREMENT

...

9.6.1 The primary task of safety assurance is control. This is achieved through safety performance monitoring and measurement, the process by which the safety performance of the organization is verified in comparison with the safety policy and approved safety objectives. Safety assurance control is conducted by monitoring and measuring the outcomes of activities that operational personnel must engage in for the delivery of services by the organization.

9.6.2 The international quality management standard, ISO-9000, supplies the following definition of process: "... an interrelated set of activities that transform inputs into outputs." The emphasis on "activities" as basically "the things people do" is the reason why so much emphasis is placed on human error and workplace conditions in the discussions on safety and safety management in Chapters 2 and 3, and eventually carried over to safety risk management. It is these conditions that are at the root of most hazards, and it is these conditions that are the focus of most safety risk controls. Thus, most assurance activities under safety performance and monitoring are focused on conditions in the workplace that affect how people perform necessary activities for the delivery of services. It is for this reason also that the SHELL model — a model of the systems that support accomplishment of the operational activities that make up the delivery of services — is proposed as the guide for system description and gap analysis.

9.6.3 The following provides a list of generic aspects or areas to be considered to "assure safety" through safety performance monitoring and measurement:

- a) **Responsibility.** Who is accountable for management of the operational activities (planning, organizing, directing, controlling) and its ultimate accomplishment.
- b) **Authority.** Who can direct, control or change the procedures and who cannot as well as who can make key decisions such as safety risk acceptance decisions.
- c) **Procedures.** Specified ways to carry out operational activities and that translate the "what" (objectives) into "how" (practical activities).
- d) **Controls.** Elements of the system, including, hardware, software, special procedures or procedural steps, and supervisory practices designed to keep operational activities on track.
- e) **Interfaces.** An examination of such things as lines of authority between departments, lines of communication between employees, consistency of procedures, and clear delineation of responsibility between organizations, work units and employees.
- f) **Process measures.** Means of providing feedback to responsible parties that required actions are taking place, required outputs are being produced and expected outcomes are being achieved.

9.6.4 Information for safety performance and monitoring comes from a variety of sources, including formal auditing and evaluation, investigations of safety-related events, continuous monitoring of day-to-day activities related to the delivery of services, and input from employees through hazard reporting systems. Each of these types of information sources may exist to some degree in every organization. However, specifications about what these sources should be or what they should “look like” should be left at an operational level, allowing individual organizations to tailor them to the scope and scale appropriate for the size and type of organization. Information sources for safety performance monitoring and measurement include:

- a) hazard reporting;
- b) safety studies;
- c) safety reviews;
- d) audits;
- e) safety surveys; and
- f) internal safety investigations.

9.6.5 Hazard reporting and hazard reporting systems are essential elements in hazard identification. Nobody knows actual system performance better than operational personnel. An organization that wishes to know how it really operates daily, as opposed as to how it should operate as per “the book”, should ask operational personnel, hence the importance of reporting systems. There are three types of reporting systems:

- a) mandatory reporting systems;
- b) voluntary reporting systems; and
- c) confidential reporting systems.

9.6.6 In *mandatory reporting systems*, people are required to report certain types of events or hazards. This necessitates detailed regulations outlining who shall report and what shall be reported. Since mandatory systems deal mainly with “hardware” matters, they tend to collect more information on technical failures than on other aspects of operational activities. To help overcome this bias, voluntary reporting systems aim at acquiring more information on those other aspects.

9.6.7 In *voluntary reporting systems* the reporter, without any legal or administrative requirement to do so, submits voluntary event or hazard information. In these systems, regulatory agencies and/or organizations may offer an incentive to report. For example, enforcement action may be waived for events that are reported underlining errors or unintentional violations. The reported information should not be used against the reporters, i.e. such systems must be non-punitive and afford protection to the sources of the information to encourage the reporting of such information.

9.6.8 *Confidential reporting systems* aim to protect the identity of the reporter. This is one way of ensuring that voluntary reporting systems are non-punitive. Confidentiality is usually achieved by de-identification, and any identifying information about the reporter is known only to “gatekeepers” in order to allow for follow-up or “fill in voids” in the reported event(s). Confidential incident reporting systems facilitate the disclosure of hazards leading to human error, without fear of retribution or embarrassment, and enable broader acquisition of information on hazards.

9.6.9 While the basic processes underlying reporting systems are standardized, the actual reporting requirements may vary among States and organizations. It is also important to note, in order to ensure the success of the reporting systems, that there is a normal reluctance by operational personnel to report. This statement is valid for all types of reporting, and particularly applicable where self-reporting of errors is involved. There are reasons for this reluctance: retaliation, self-incrimination and embarrassment just to mention the topmost three. Education in terms of the importance of safety reporting in hazard identification systems, discussed in Chapter 2, and the protection of the sources of safety information (discussed in section 9.7) are essential strategies to circumvent reluctance to report and to ensure an effective safety reporting environment. Typical qualities of successful safety reporting systems include:

- a) the reports are easy to make;
- b) there are no disciplinary actions as a result of the reports;
- c) the reports are confidential; and
- d) feedback is rapid, accessible and informative.

9.6.10 *Safety studies* are rather large analyses encompassing broad safety concerns. Some pervasive safety issues can best be understood through an examination in the broadest possible context. An organization might experience a safety concern which is of a global nature, and which may have been addressed on an industry- or State-wide scale. For example, an airline may experience an increase in approach and landing related events (unstable approaches, deep landings, landings with excessive airspeed and so forth). At a global level, the industry has been concerned with the frequency and severity of approach and landing accidents (ALA) and has undertaken major studies, produced many safety recommendations and implemented global measures to reduce such events during the critical approach and landing phases of flight. Thus, the airline in question can find in these global recommendations and studies convincing arguments for its own, in-house safety analysis. Such arguments are necessary to achieve large-scale changes requiring significant data, appropriate analysis, and effective communication. Safety arguments based on isolated occurrences and anecdotal information may not be enough. Because of their nature, safety studies are more appropriate to address system safety deficiencies rather than identify specific, individual hazards.

9.6.11 *Safety reviews* are conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of a structural change in operations. Safety reviews are a fundamental component of the management of change, discussed in section 9.8. They have a clearly defined objective that is linked to the change under consideration. For example, an airport is considering implementing airport surface detection equipment (ASDE). Therefore, the objective of the safety review would be to assess the safety risks associated with implementing an ASDE at XYZ airport by evaluating the appropriateness and effectiveness of the safety management activities related to the project. Safety reviews are conducted by Safety Action Groups (SAG), which look for effective performance of the following safety management activities under the proposed changes:

- a) hazard identification and safety risk assessment/mitigation;
- b) safety measurement;
- c) management accountabilities;
- d) operational personnel skills;
- e) technical systems; and
- f) abnormal operations.

9.6.12 Once performance of each safety management activity under the proposed changes is reviewed, the SAG produces a list of hazard concerns for each activity, the response/mitigation proposed by the line manager, and an assessment of the appropriateness and effectiveness of the mitigations to address the hazards. The mitigation will be appropriate if it actually addresses the hazard. The mitigation will be effective if it consistently manages the safety risks under normal operating conditions in order to reduce the safety risks to ALARP. The SAG also proposes a prioritization of the responses/mitigations, by allocating importance and urgency to each hazard. Safety reviews thus ensure safety performance during periods of change, by providing a roadmap to safe and effective change.

9.6.13 *Audits* focus on the integrity of the organization's SMS and periodically assess the status of safety risk controls. As with other requirements, the auditing requirements are left at a functional level, allowing for a broad range of complexity, commensurate with the complexity of the organization. While audits are "external" to the units involved in activities directly related to the provision of services, they are still "internal" to the organization as a whole. Audits are not intended to be in-depth audits of the technical processes but rather they are intended to provide assurance of the safety management functions, activities and resources of line units. Audits are used to ensure that the structure of the SMS is sound in terms of staffing, compliance with approved procedures and instructions, levels of competency and training to operate equipment and facilities and maintain required levels of performance, etc.

9.6.14 *Safety surveys* examine particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel and areas of dissent or confusion. Safety surveys may involve the use of checklists, questionnaires and informal confidential interviews. Since surveys are subjective, verification may be needed before corrective action can be taken. Surveys may provide an inexpensive source of significant safety information.

9.6.15 *Internal safety investigations* include occurrences or events that are not required to be investigated or reported to the State, although in some instances organizations may conduct internal investigations notwithstanding the fact that the event in question is being investigated by the State. Examples of occurrences or events that fall within the scope of internal safety investigations include: in-flight turbulence (flight operations); frequency congestion (ATC); material failure (maintenance), and ramp vehicle operations (aerodrome).

9.6.16 In conclusion, the contribution of safety performance and monitoring information sources to an organization's SMS can be summarized as follows:

- a) hazard reporting is a primary source of information on hazards in operations;
- b) safety studies are a source of information on generic safety concerns and/or systemic safety deficiencies;
- c) safety reviews are linked to the management of change and ensure safety performance under changing operational conditions;
- d) audits ensure the integrity of SMS structures and processes;
- e) safety surveys sample expert opinion and perceptions on specific problem areas in daily operations;
and
- f) internal safety investigations address outcomes of minor magnitude that are not required to be investigated by the State.