ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 2: Safety and security in air traffic management (ATM)
2.1 Safety management systems and programmes
:
Agenda Item 3: Air traffic management (ATM) performance targets for safety, efficiency and regularity and the role of required total system performance (RTSP) in this respect
3.2 The concept of RTSP
:

A MORE COHERENT GLOBAL FRAMEWORK FOR SAFETY AND PERFORMANCE

(Presented by Australia)

SUMMARY

This paper advocates the establishment of a safety framework that is globally standardised and logically unified while remaining closely and rationally linked to developments in the area of total system performance.

1. INTRODUCTION

1.1 This paper supports AN-Conf/11-WP/5 presented by the Secretariat and proposes an additional recommendation.

1.2 A number of initiatives are being progressed by ICAO in the related areas of safety and performance. Some of them are:

a) Separation and Air Safety Panel's (SASP) tasks related to risk management – including reduced vertical separation minima (RVSM) safety monitoring agencies;

b) Air Traffic Management Operational Concept Panel's (ATMCP) developments on system safety approach, required total system performance (RTSP) and suggestions related to levels of safety;

c) Operational Data Link Panel's (OPLINKP) developments on required communication performance (RCP);

d) Surveillance and Conflict Resolution Systems Panel's (SCRSP) developments on required surveillance performance;

e) the requirement that States implement safety management programmes, establish the acceptable level of safety and establish the safety objectives applicable to the provision of ATS (Annex 11, Amendment 40);

f) the requirement for States to ensure that certified aerodromes have in operation a safety management system (Annex 14, Amendment 4);

g) *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), Chapter 2 on ATS safety management;

h) Air Navigation Bureau's development of documentation related to safety management systems;

i) expansion of the Universal Safety Oversight Audit Programme (USOAP); and

j) recognition of the importance of "safety" and "performance" for particular consideration by the States as specific agenda items at the Eleventh Air Navigation Conference (AN-Conf/11).

1.3 At the same time, some States and international organisations are:

a) attempting to develop performance frameworks with their related metrics (e.g. Key Performance Indicators, etc.), as well as

b) considering the establishment of "safety monitoring agencies".

2. DISCUSSION

2.1 The above initiatives have to do with the topic of performance, of which safety is the aspect the world is most experienced in. Without an overarching framework, the potential is real for these parallel streams to repeat analysis of common problems, or to exclude consideration of a critical issue, or to even be contradictory. The streams require effort of various kinds (e.g. economic, political, professional, administrative, mutual understanding) but their relative independence invites the disorder of bottom-up approaches, and detracts from their efficiency and effectiveness by denying the coherence of top-down methods. By way of analogy, the character of a piece of music for various instruments, is determined by its composer well before the orchestra's finest interpretation is enabled by a conductor.

2.2 The signatory States to the Chicago Convention are in a **unique** position to ensure that these streams fit into a logically unified safety framework that can be applied worldwide, thus maximising the return

to the international community. They have a long tradition of being able to develop solutions which are integrated around the world while respecting regional particularities. They are the only global group of legitimate public authorities in aviation.

2.3 Crucially, the logically unified safety framework can be made an ICAO Standard in parts or totally, since the definition of the latter is so judiciously wide ranging, including processes[1], objects and their attributes of various kinds:

> "Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention..."[2]

2.4 Four examples of the crucial need for this framework are now briefly discussed.

2.5 There should be total alignment between (1) safety management programmes required by ICAO whereby data is being collected showing how the ATM system actually performs and (2) theoretical, and possibly predictive, models being used by ICAO and its member States to describe the ATM system and potential contributors to accidents. They should work in tandem: the former collecting the data, the latter driving the design of the former. There is no point in collecting data that will not bear any relationship to any model(s) being used, as there is no point in using a model for which data cannot be collected. Moreover, the emphasis should shift to the collection of data having preventive value (sometimes called "lead indicators").

2.6 The above argument leads to a more general one. To continually improve, to continually ensure that we understand reality, the programme must require formal feedback learning/control loops at various organisational levels: e.g. operations, company management, industry and professional associations, regulatory agencies and other State institutions, groups of Sates and, finally, globally. (The ICAO Universal Safety Oversight Programme is just one example of such loops.) After all, the view is gaining momentum that accidents also result from the migration of organisations toward unsafe behaviour and not just from the mere coincidental occurrence of multiple undefended failures.

2.7 The safety monitoring of RVSM is a third case in point. It usually makes sense to use an already established capability for a variety of safety related purposes[3]. Thus, whatever is established globally to monitor RVSM, could, potentially, be used for a broader purpose — such as satisfying the monitoring requirements of safety management programmes required by ICAO.

2.8 Fourthly, a very strong argument can also be made — and indeed is — to broaden the current ICAO requirement for safety management programmes/systems beyond the activities of one or two Annexes in isolation (whether Annexes 11, 14 and/or any other one). After all, safety is a property of the system and thus it emerges from people, procedures, technologies and information interacting to perform a task. In the aviation case, as the titles of the Annexes suggest, the system includes personnel, rules of the air,

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1 A process is considered here as the actual performing of a documented procedure.

2 This ICAO definition can be found in any Annex's Foreword, section: "Status of Annex components", paragraph 1.a).

3 Potentially, its monitoring could also be expanded to encompass other performance variables under the framework being spearheaded by ATMCP.

meteorology, aeronautical charts, uniformity of measurement units, aircraft operations, aircraft itself, ground facilities, air traffic services, search and rescue, aerodromes, aeronautical information, environmental requirements, dangerous goods. Therefore, to be most effective, a safety management programme must have a core which is shared by all parts of the aviation system and brings them together interactively, and must also acknowledge what is specific about each part. For instance, the development of standards by totally independent groups and/or specialist streams has the real potential to establish requirements that are, safety wise, stricter than necessary. As a final point, it should be noted that this "systems" way of thinking is not new and has been espoused by leading safety experts for some time now[4] as well as being adopted by many States[5].

2.9 The cases just discussed are what the ATMCP aimed at by requiring that developments and implementations deriving from the operational concept be based on the System Safety Approach, where the latter is defined as:

> "System safety approach: A systematic and explicit approach defining all activities and resources (people, organizations, policies, procedures, time spans, milestones, etc.) devoted to the management of safety. This approach starts before the fact, is documented, planned and explicitly supported by documented organizational policies and procedures endorsed by the highest executive levels. The System Safety Approach uses systems theory, systems engineering and management tools to manage risk formally, in an integrated manner across all organizational levels, across all disciplines and all system life cycle phases."

2.10 This is not an ideal, but visible now in the consensus among international aviation and safety experts[6]: that in today's integrated and complex world, a holistic approach, an approach that considers the "whole made of interacting parts", is the best way to maximise effectiveness and efficiency, and to fast track development without losing the assurances provided by certification and lag/lead indicators.

2.11 In summary, the characteristics of the current approach to safety are the natural outcome of historical development and could be enhanced considerably, were ICAO to lay solid foundations for a logically unified safety framework. This can be done by adopting the spirit of this paper and the following recommendations which, on account of the recognized maturity already achieved in the world by the system safety approach, go beyond the recommendation in AN-Conf/11-WP/5 by a small incremental step and ask the conference to explicitly adopt a system safety approach to safety management.

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4 Normal Accidents by Charles Perrow (1984), System Safety 2000 by J. Stephenson (1991), Safeware by Nancy Leveson (1995).

5 For example, the Australian ATM Strategic Management Plan (2003) and the EUROCONTROL Safety Regulatory Requirements (ESARR 2 and 4) advocate a total and integrated systems approach.

6 e.g. Final Report of RTCA Task Force 4 Certification (1999), Safeware (1995).

3. ACTION BY THE CONFERENCE

3.1 The conference is invited to:

a) request ICAO to adopt a set of standards for safety management programmes:

1) that is based on the system safety approach as defined by ATMCP and transcribed in this paper;

2) that has a core that is shared by all parts of the aviation system and brings them together interactively while also acknowledging what is specific about each part[7];

3) that encompasses all Annexes; and

4) that remains closely and logically linked to developments in the area of total system performance.

b) request ICAO to consider changing the name of such safety management programmes to System Safety Approach Programmes in order to highlight the new emphasis;

c) request ICAO to adopt the recommendation a) above for its own processes, e.g. SARPs development, in so far as practicable; and

d) request ICAO to implement the necessary arrangements to ensure that the above programmes, as implemented by the various States and ICAO itself, are in harmony.

— END —

[7] For example, the set would include requirements for processes at various hierarchical levels and in varying situations (system safety approach being its most general). It would also include results such as particular safety risk models, risk acceptability criteria, etc. Of course the set of standards would be supported by recommended practices, guidance material, manuals, etc.