



WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE B

- Agenda Item 8: Emerging safety issues**
8.1: Measures to proactively address emerging issues

**TARGET RISK ASSESSMENT APPROACH FOR THE DEVELOPMENT OF STANDARDS
AND RECOMMENDED PRACTICES (SARPs)**

(Presented by Australia and New Zealand)

EXECUTIVE SUMMARY

The development and implementation of Standards and Recommended Practices (SARPs) has an impact on both national aviation authorities and the industry. This paper proposes that ICAO include a target risk assessment approach, incorporated in the SARP development process, to determine the feasibility and justification of a SARP to balance the regulatory burden, associated regulatory outcomes and cost benefit for the target level of safety.

Action: The Conference is invited to agree to the recommendation in paragraph 3.1.

1. INTRODUCTION

1.1 Emerging issues, such as accelerated technological advancement, in many disciplines within the aviation domain are causing considerable regulatory burden for States. Identifying and assessing the safety risk to be mitigated by the relevant Standards and Recommended Practices (SARPs) using a target risk assessment process would assist in ensuring balanced and justifiable SARPs developments. A target risk level, being an assessment of the acceptable level of safety for the continuity of function and/or design, serves as an objective measure to support data driven decision making. It is in this way, for example, that an aeronautical engineer implements the “fail safe design concept” to specify the correct dimensions of a wing spar, not too small such as to compromising structural integrity, or conversely, not too large which could compromise weight considerations and material wastage.

1.2 Providing clarity on an acceptable target level of risk during SARPs development, while considering ICAO’s strategic initiatives such as safety, security, environment and efficiency, in conjunction with consideration of the impact on resources required of the regulator and industry would allow the appropriate level of safety to be built into the SARPs, avoiding inadequate SARP development, or a SARP that is unnecessarily conservative.

1.3 The level of risk exposure to the aviation community and the level of risk mitigation intended by the development of an appropriate SARP, should reflect consistent application of an acceptable level of safety. A target risk assessment considers evidence to determine the appetite and tolerances of an activity against a pre-determined target safety level. The current development process of SARPs does not consider an acceptable target level of risk.

2. DISCUSSION

2.1 State regulators are under increasing external pressure to reduce the cost burden to industry. States are required to substantiate the implementation of new SARPs into State regulations, not only from a resources perspective, but also address the required level of safety. A method to achieve this is through a target risk assessment provided as evidence for States and industry, justifying the need for new or changed regulation, whilst balancing the regulatory burden with an acceptable level of safety.

2.2 Current SARPs development requires an impact assessment to be carried out considering the four ICAO strategic objectives, which includes safety, security, efficiency and environmental considerations, referred to in the SARPs impact assessment tool, ICAO *Impact Assessment and Implementation Plan*. The requirement for an impact assessment is becoming common practice in many States, including Australia where, in the process of development of regulations, a regulatory impact assessment must be conducted to ensure new requirements imposed on industry are proportional to the safety outcomes being sought.

2.3 The impact assessment tool is a guidance tool that provides ICAO with a measure of reassurance that States will be able to justify and implement the SARPs under development, however the impact assessment tool does not consider a target risk assessment. Including a target risk assessment in this tool and ensuring consistent application of the tool during SARPs development, will provide the balance of the required level of safety while meeting ICAO's strategic objectives.

2.4 Emerging technological advancement across aviation domains, such as the implementation of performance-based navigation (PBN), can positively contribute towards aviation safety initiatives and improve the efficient use of scarce and valuable operational, capital and environmental resources.

2.5 However, the rate at which these technologies are developing presents notable challenges for ICAO to anticipate and establish regulatory foundations for States to respond through regulatory settings, particularly where the field is novel such as the integration of unmanned operations into navigable airspace or the future reliance on synthetic vision systems for operational credit.

2.6 In addition to the challenges presented by emerging technologies, there are also ongoing challenges of the global aviation community reacting to unexpected catastrophic events. Addressing unexpected issues affecting aviation safety which may not be under consideration is necessary but should avoid being reactive and remain evidence based.

2.7 These events are difficult to predict, are unexpected, have a major impact, and after the first recorded instance of the event are rationalised in hindsight. They cause significant challenges to the aviation community where conflicting priorities of public perception and the requirement of SARPs development are not quantified against a fully developed safety risk target-based on evidence.

Acceptable safety target levels

2.8 Acceptable level of safety is dependent on the specific Annex for which the SARPs are being developed. In some cases, the acceptable level of safety may be established by a statement while in other cases such as in Annex 6 — *Operation of Aircraft* and Annex 8 — *Airworthiness of Aircraft* the acceptable level of safety is established by a numerical target risk value.

2.9 In Annex 8 SARPs, the fundamental level of target risk for aircraft system failure is 1×10^{-7} per flight hour with the risk allocation of not greater than 1×10^{-9} per flight hour for each separate system or structural design case, the *Airworthiness Manual* (Doc 9760) Part V Section 2.6.3 refers.

2.10 This same target risk barrier is carried through in areas of Annex 6 SARPs such as Extended Diversion Time Operations (EDTO). Certification of system design is required to meet a specific safety target risk considering mitigating strategies, such as in-flight engine shut down rates, so that it is highly improbable that a catastrophic loss of thrust on both engines, within the EDTO segment, the target safety risk is set at 1×10^{-9} per flight hour.

2.11 A target safety risk is applied to many components of specific SARPs such as PBN where signal in space (SIS) alerts are required to be provided where a lateral error, when operating in accordance to required navigation performance (RNP) 1 Navigation Specification, exceeds $2 \times \text{RNP}$ is 1×10^{-7} per hour.

2.12 In addition, target risk assessment strategies are referenced in fuel, alternate aerodrome SARPs and are currently being implemented within the SARPs for the carriage of dangerous air cargo on passenger flights.

Incorporating safety target levels in SARPs development

2.13 The current development of SARPs is predominantly carried out without a specific requirement to determine the fundamental level of safety intended to be achieved by implementation of the SARPs. In many cases this results in SARPs, which if subjected to a risk assessment, would fall outside the level of risk required by the fundamental barrier set within SARP domains such as airworthiness and flight operations. Imposing a target safety risk assessment will assist in triaging ICAO's focus on important SARPs and build in balanced risk assessment considerations so safety requirements are not overstated, while maintaining the ICAO strategic objectives.

2.14 As such, considering the specific Annex domain, the level of risk exposure required to be mitigated by a SARP under development should be identified and appropriately built into the SARP development process and reflected in an acceptable level of risk.

3. CONCLUSION

3.1 As outlined above the challenges of developing SARPs specifically to address emerging safety issues, including those related to emerging technologies and unexpected catastrophic events, should consider, as part of the SARP development, a target risk assessment. Therefore, the Conference is invited to agree on the following recommendation:

Recommendation 8.1/x – SARPs development - Target risk assessment

That the Conference:

- a) note the limitations of the current Standards and Recommended Practices (SARPs) development process and that this process does not currently consider a target safety risk assessment;
- b) note that specific Annex domains require a different approach to a target risk assessment profile;
- c) request that ICAO considers updating the process for the development of new SARPs and the amendment of current SARPs to include, where appropriate for the specific Annex domain, a target risk assessment; and
- d) request that ICAO considers updating the *Impact Assessment and Implementation Plan* template tool to include a target risk assessment as part of the SARPs impact assessment process, where appropriate, for the specific Annex domain.

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