

**54th CONFERENCE OF
DIRECTORS GENERAL OF CIVIL AVIATION
ASIA AND PACIFIC REGIONS**

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AGENDA ITEM 1: THEME TOPIC

*“The Challenge of Managing Outcome Focused and Risk Based
Regulations for Asia Pacific States”*

**OUTCOMES BASED SARPS FOR ENVIRONMENTAL AND
EFFICIENCY BENEFITS**

(Presented by Kiribati)

SUMMARY

In the context of improved environmental and efficiency outcomes this paper provides discussion on the application of a performance and outcomes based approach to the wording of SARPS leveraging on the positive foundation already evident in most Annexes. The paper provides two examples in Annex 14 and proposes changes in that Annex to replace current prescriptive wording, where that approach is applicable.

OUTCOMES BASED SARPS FOR ENVIRONMENTAL AND EFFICIENCY BENEFITS

1. INTRODUCTION

1.1 Because of its size, archipelagic nature, geographic location and propensity to suffer significant impacts from global warming Kiribati places great importance on environmental issues. The current prescriptive, rather than performance based, approach to SARPS in Annex 14 reduce the options States have to apply more environmentally friendly technologies.

1.2 Initially ICAO SARPS were mainly prescriptive in nature. This was necessary to ensure consistency in standards applied across the aviation industry. The requirement remains for some standards; however, in many cases, ICAO has adopted a performance and outcomes based approach to SARPS and guidance material. This Performance Based Approach (PBA) allows States and operators to assess the best means of achieving the desired performance, based on their specific conditions and cost benefit and operational efficiency analysis.

1.3 The PBA has been applied consistently across a large percentage of ICAO SARPS. This has supported concepts and applications to the operational and economic benefit of the industry as a whole. For example, Performance Based Navigation (PBN, Doc 9613), Required Navigation Performance (RNP), Required Communications Performance (RCP, Doc 9869) and the performance approach for surveillance systems as detailed in PANS/ATM (Doc 4444) and the Aeronautical Surveillance Manual (Doc 9924) have all been universally adopted and implemented successfully by ICAO States.

1.4 During the second meeting of the OPLINK Panel, the concept of performance based communications and surveillance was endorsed. This has translated into amendments to Annex 11 and Annex 15 (State Letter AN 2/2.4-16/18 dated 1 April 2016 refers).

1.5 It is not possible to apply the PBA to all standards. This is particularly the case where specific metrics have been developed by study groups to meet minimum acceptable safety standards. For example, separation standards, declared distances, approach minima and navigation tolerances all require standards expressed in quantitative terms; however, in other cases standards can be worded to ensure minimum acceptable performance is achieved or a desired outcome occurs.

2. DISCUSSION

2.1 Performance Based Approach

2.1.1 The Performance Based Approach has been described numerous times in documents presented to meetings and conferences over the years. The extracts from C/CAR WG/7 - WP/04 dated 27/03/09 presented by the Secretariat to the Seventh Central Caribbean Working Group Meeting (C/CAR WG/7) Mexico City, Mexico, 11 to 14 May 2009 describe the approach and flow-on benefits:

2.6 The PBA is based on three principles:

a) Strong focus on desired/required results: Instead of prescribing solutions, desired/required performance is specified. It implies finding what the current situation is, what the most appropriate result should be, as well as clarifying who is accountable for achieving those results;

b) Informed decision making, driven by desired/required results: working backwards from the “what (result)”– the primary focus – to decisions about “how” and

c) Reliance on facts and data for decision making: Desired/required results, drivers, constraints, shortcomings, options expressed in quantitative terms (not in qualitative terms).

2.7 The PBA is expected to provide following advantages:

- it is result oriented, allows customer focus and promotes accountability;*
- policy making becomes much more transparent when the goals to be reached are publicly stated in terms of performance outcome (rather than solutions);*
- shift from prescribing solutions to specifying desired/required performance gives more freedom and flexibility in selecting suitable solutions;*
- “Technology Driven Approach” and “Solutions searching for a problem to solve” can be avoided;*
- stress on rigorous scientific approach in place of anecdotal evidence;*
- focus on desired/required results helps decision makers to set right priorities, make most appropriate trade offs, choose optimum solution and resource allocation;*
- provides more predictability of benefits; and*
- typically results in cost savings, which often is much more than the investment made in applying the approach.*

2.9 In the long run, implementation of PBA is expected to result in:

- Efficient system through identified cost savings.*
- Reduction in waste of resources.*
- More equitable charging practices.*
- More efficient provision of services.*

2.2 Generic Example

2.2.1 It is possible to specify a requirement in ways which severely restrict the means of meeting that requirement. For example: if a writing instrument is required it may be specified in a prescriptive manner, such as “ball point pen” or “silver fountain pen”. In those cases meeting the requirement is limited to the prescriptive description; however, if a performance based requirement such as “an instrument which can be used by hand to make a mark on paper, cardboard, matt painted white walls and cotton sheets” is used the ways of meeting the requirement are increased to include pencils, crayons, marker pens and the like.

2.2.2 Having a wider choice of ways to meet a requirement means a State can take account of local cost efficiencies, availability of goods and environmental considerations. Such an approach may also allow a State to take earlier advantage of technology advances; rather than waiting for the amendment of prescriptive SARPS.

2.3 **Specific Example – Runway Guard Lights: Human Factors and Safety**

In Chapter 1 of Annex 14, the purpose of runway guard lights is given as:

“A light system intended to caution pilots or vehicle drivers that they are about to enter an active runway.”

2.3.1 This description provides a basis for a performance based standard; however, the standards given in Chapter 5 (5.3.23) and accompanying notes are increasingly prescriptive. The preamble note confines use of runway guard lights to taxiways and the standard (5.3.23.1) potentially places RVR limits and restrictions where stop bars are installed:

“ ...shall be provided at each taxiway/runway intersection associated with a runway intended for use in:

a) runway visual range conditions less than a value of 550 m where a stop bar is not installed; and

b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is heavy.

2.3.2 Would runway guard lights not also be effective at road entry points and in all visibility conditions with or without associated stop bars? Certainly, from a human factors perspective having a common lighting system warning drivers of imminent runway entry would be a safety benefit.

2.4 **Specific Example – Extinguishing Agents: Environmental, Operational and Cost Effectiveness and Safety**

2.4.1 The current wording of Annex 14 SARPs relating to extinguishing agents is inconsistent, in that 9.2.9 is given as a recommendation but supporting statements in 9.2.11 are given as a standard. Effectively this requires States to accept the recommendation in 9.2.9 as a standard, despite the heading of “recommendation”.

2.4.2 Currently the recommendation in Annex 14 (9.2.9) specifies a particular technology extinguishing agent, and guidance material in Doc 9137 follows on with extensive detail on the specific technology, to the extent that the practical test is focused on proving the agent performs in accordance with its technological design and not for the desired outcome of extinguishing a typical three-dimensional aircraft fire.

2.4.3 Rewording the SARP in performance and outcomes based terms would allow it to be stated as a standard rather than the current recommendation.

2.4.4 Additionally, a performance and outcomes based standard for extinguishing agents could be adopted by States in consideration of specific conditions relevant to their use of an agent, taking full account of economic and environmental considerations. For example, although it has been proven in field trial to be 6-10 times more efficient in extinguishing three dimensional fires such as are evident in aircraft accidents and is approved by several Environmental Protection Agencies for introduction into natural waterways a micelle encapsulator technology extinguishing agent cannot be used by aviation RFFS as the Annex 14 SARPs specifically prescribe “foam” as the approved agent.

2.4.5 Changing the Annex 14 SARPs for extinguishing agents to a performance and outcomes based wording would enable States to make a decision on the technology to be employed based on their environmental, efficiency and budgetary objectives without the need to lodge a “difference” should that decision be a technology other than “foam”.

2.4.6 To demonstrate the means of engaging performance and outcomes based SARPs for extinguishing agents, a draft amendment to Annex 14 is shown at **Attachment 1**.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

- a) note the information contained in this Paper;
- b) review and adopt the concept of performance and outcomes based approach to SARPS where practicable; and
- c) recommend to the ICAO Secretariat that the ADOP propose amendment of Annex 14 as shown in Attachment 1.

**Attachment 1
Proposed Amendment to Annex 14 Chapters 1 and 9**

Chapter 1 insert

Approved Extinguishing Agent. A generic term meaning a chemical agent which is used in isolation or in combination with one or more other agents and mixed with water to produce a solution which is to be used to extinguish a three dimensional aircraft fire.

Note.— An extinguishing agent may be approved by an appropriate State regulatory organisation or aviation safety regulator as meeting the requirements for an approved extinguishing agent if it has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance in extinguishing a three dimensional aircraft fire equal to or better than:

- a) a foam meeting the minimum performance level B; or*
- b) a foam meeting the minimum performance level C; or*
- c) a combination of these agents;*

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B or C rating is given in the Airport Services Manual (Doc 9137), Part 1.

Chapter 9

9.2.3 ...

Note.— ~~Either~~ Each take-off or landing constitutes a single movement.

~~9.2.9 **Recommendation.**— The principal extinguishing agent should be:~~

- ~~a) a foam meeting the minimum performance level A; or~~
- ~~b) a foam meeting the minimum performance level B; or~~
- ~~c) a foam meeting the minimum performance level C; or~~
- ~~d) a combination of these agents;~~

~~except that the principal extinguishing agent for aerodromes in categories 1 to 3 should preferably meet a performance level B or C foam.~~

~~*Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level A, B or C rating is given in the Airport Services Manual (Doc 9137), Part 1.*~~

The principal extinguishing agent shall be an approved extinguishing agent.

9.2.11 The amounts of water for ~~foam~~ extinguishing agent production and the complementary agents to be provided on the rescue and fire fighting vehicles shall be in accordance with the aerodrome category determined under 9.2.3, 9.2.4, 9.2.5, 9.2.6 and Table 9-2, except that for aerodrome categories 1 and 2 up to 100 per cent of the water may be substituted with complementary agent.

...

Note 2.— When any other extinguishing or complementary agent is used, the substitution ratios need to be checked.

9.2.12 **Recommendation.**— At aerodromes where operations by aeroplanes larger than the average size in a given category are planned, the quantities of water should be recalculated and the amount of water for ~~foam~~ production of extinguishing agent solution and the discharge rates for ~~foam~~ solution should be increased accordingly.

9.2.13 From 1 January 2015, at aerodromes where operations by aeroplanes larger than the average size in a given category are planned, the quantities of water shall be recalculated and the amount of water for ~~foam~~ extinguishing agent solution production and the discharge rates for ~~foam~~ solution shall be increased accordingly.

9.2.14 The quantity of ~~extinguishing agent~~ concentrates separately provided on vehicles for ~~extinguishing agent~~ production shall be in proportion to the quantity of water provided and the ~~extinguishing agent~~ concentrate selected.

9.2.15 **Recommendation.**— *The amount of ~~foam~~ extinguishing agent concentrate provided on a vehicle should be sufficient to produce at least two loads of foam solution.*

9.2.17 **Recommendation.**— *When a combination of different performance level ~~foam~~ extinguishing agents are provided at an aerodrome, the total amount of water to be provided for ~~foam~~ extinguishing agent production should be calculated for each ~~foam~~ extinguishing agent type and the distribution of these quantities should be documented for each vehicle and applied to the overall rescue and fire fighting requirement.*

9.2.18 The discharge rate of the ~~foam~~ extinguishing agent solution shall not be less than the rates shown in Table 9-2.

9.2.22 **Recommendation.**— *A reserve supply of ~~foam~~ extinguishing agent concentrate, equivalent to 200 per cent of the quantities identified in Table 9-2, should be maintained on the aerodrome for vehicle replenishment purposes.*

Note.— ~~Foam~~ Extinguishing agent concentrate carried on fire vehicles in excess of the quantity identified in Table 9-2 can contribute to the reserve.

— END —