



International Civil Aviation Organization

**Second Meeting of the Middle East Regional Aviation Safety Group
(RASG-MID/2)**

(Abu Dhabi, UAE, 12 - 14 November 2012)

Agenda Item 2: Global Developments related to Aviation Safety

INITIATIVES TO REDUCE THE RISK OF RUNWAY RELATED ACCIDENTS

(Presented by the Secretariat)

SUMMARY

Runway Safety Accidents represent 59% of all accidents accounting for 29% of all fatal accidents and 19% of all related fatalities reported between 2006 and 2010. This paper provides detailed information on the initiatives undertaken by ICAO and other organizations related to reducing the risk of a Runway Safety Accident.

Action by the meeting is at paragraph 3.

1. INTRODUCTION

1.1 Assembly Resolution 37-6 on runway safety, urges States to take measures to enhance runway safety, including the establishment of runway safety programmes using multidisciplinary approach, that includes at least regulators, aircraft operators, air navigation service providers, aerodrome operators and aircraft manufacturers to prevent and mitigate the effects of runway excursions, runway incursions and other occurrences related to runway safety.

1.2 ICAO's dedicated focus on runway safety efforts began in 2002 with an education and awareness campaign that consisted of a series of seminars in ICAO regions to disseminate information on the prevention of Runway Incursion (RI). This was followed in 2005 with the ICAO Runway Safety Toolkit CD-ROM and in 2007 with the Manual on the Prevention of Runway Incursions (Doc 9870). As the frequency and severity of runway excursion became more apparent it was considered appropriate to address all runway safety issues in a comprehensive manner. The ICAO Runway Safety Programme has evolved to include the prevention and mitigation of **Runway Incursion (RI), Runway Excursion (RE) and other occurrences related to runway safety.**

1.3 ICAO has been called upon by the international civil aviation community to exercise leadership in the effort to reduce the number of runway-related accidents and incidents worldwide. Starting with the Global Runway Safety Symposium (GRSS) convened in May 2011, ICAO aims to raise awareness and share information as a means to generate effective solutions.

*Note: Outcomes of the GRSS are attached at **Appendix A** to this working paper.*

1.4 The MID Regional Runway Safety Seminar (MID-RRSS) was successfully held in Amman, Jordan, 14-16 May 2012. More details about the MID-RRSS are provided in working paper/9.

2. DISCUSSION

Runway Incursion (RI) Initiatives

2.1 In 2005 ICAO developed the ICAO Runway Safety Toolkit CD-ROM. The CD-ROM features a comprehensive toolkit on runway safety, which includes references to relevant ICAO Standards, Recommended Practices and procedures along with guidance and documentation on runway safety programmes, educational videos and posters guidance material on the prevention of RI.

2.2 In 2007 the Manual on the Prevention of Runway Incursions (Doc 9870) was finalized by ICAO. The Manual specifically addresses the subject of runway incursion prevention as it relates to the safe operation of aircraft, air traffic management, vehicle movement on the maneuvering area and aerodrome management. The Manual also aims to provide global guidance essential for the implementation of national or local runway safety programmes.

2.3 Amendment 10-A to Annex 14, Volume I, applicable 19 November 2009 introduced SARPs to reduce the risk of runway incursion which included enhanced taxiway centre line marking (Para 5.2.8.4), mandatory instruction marking (5.2.16), mandatory instruction sign (no entry) and characteristics of taxiway edge lights (5.3.1 7.7 and 5.3.1 7.8).

2.4 Standardized controller-pilot-driver communications and standardized operations and communication phraseology were included in the PANS-ATM (Doc 4444) and in the Manual of Radiotelephony (Doc 9432).

2.5 Standardized RI terminology and improvements in the collection of RI data were developed by ICAO. Amendment 12 to Annex 13 recently included the classification of RI with severity 'A' in the list of serious incidents subject to reporting and investigation. In addition, Amendment 2 to the PANS ATM included new RI reporting forms.

2.6 **Surface Movement Guidance and Control Systems** - Annex 14, 9.8.1 outlines ICAO SARPs for surface movement guidance and control systems. It is recommended that surface movement radar should be provided at an aerodrome intended for use in runway visual range conditions less than a value of 350 m and when traffic density and operating conditions are such that regularity of traffic flow cannot be maintained by alternative procedures and facilities. Note.— Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476), the Advanced-Surface Movement Guidance and Control Systems (A-SMGCS) Manual (Doc 9830) and the Air Traffic Services Planning Manual (Doc 9426) provide guidance on the use of SMR.

2.7 **Runway Status Lights** are a fully automated system that integrates airport lighting equipment with surveillance systems to provide a visual signal to pilots and vehicle operators when it is unsafe to enter or cross a runway. The issue of Runway Status Lights has been discussed at the ICAO Aerodrome Panel Meeting and discussions are on-going.

2.8 **End-around taxiways and Perimeter roads** - Annex 14 contains a recommended practice (9.10.9) related to the need of perimeter roads being useful for security and maintenance vehicles. The issue of end-around taxiways is being discussed by the ICAO Aerodrome Panel.

2.9 ICAO has recently developed a proposal (State Letter 41/2011) for the **amendment of Annex 14, Volume I, Annex 15 and PANS-ATM (Doc 4444) as well as related guidance material** to include, inter alia, enhanced taxiway centre line marking (update), stop bars, runway guard lights (RGLs). These initiatives are part of ICAO's initiatives to further reduce the risk of Runway Incursion. The comments received from States are under review by ICAO and it is envisioned that these provisions will become applicable by last quarter of 2013.

Runway Excursion Initiatives

2.10 As it relates to Runway Excursion the proposal for the amendment of Annex 14, Volume I, Annex 15 and PANS-ATM (Doc 4444) as well as related guidance material to include, *inter alia*, amendments to runway surface friction measurement and reporting; runway end safety areas (RESA) and arresting systems (including Engineered Material Arresting System (EMAS)). These initiatives are part of ICAO's initiatives to further reduce the risk of Runway Excursion. The comments received from States are under review by ICAO and it is envisioned that these provisions will become applicable by last quarter of 2013.

2.11 ICAO has recently developed draft Circular 329 - Runway Surface Condition Assessment, Measurement and Reporting which provides an overarching conceptual understanding of the surface friction characteristics contributing to controlling the aircraft via the critical tyre to ground contact area. The proposed amendments provide the latest information on surface friction characteristics and how they relate to aircraft performance, reporting and need for appropriate training of personnel involved.

2.12 A joint ICAO/IATA Runway Excursion Risk Reduction Toolkit (2nd Edition May 2011) is available to be downloaded from the ICAO Runway Safety Site. IATA has provided Runway Excursion Workshops to introduce the Toolkit.

Other Activities Related to Runway Safety

2.13 **Wildlife Control and Reduction** guidance material – Doc 9137 Airport Services Manual Part 3 – Wildlife Control and Reduction contains updated ICAO guidance concerning this matter. ICAO requires that procedures in the aerodrome manual relating to bird/wildlife control be developed and implemented. A Wildlife Control Programme is required to be established where wildlife hazards are identified. Guidance is also provided on emerging technologies such as Avian Radar.

2.14 **Foreign Object Debris (FOD)** - Development of provisions concerning the regular inspection, monitoring and maintenance of movement areas, including runways, so that runway pavements are kept clear of FOD has been incorporated into Annex 14 (10.2.1). ICAO is presently developing guidance material related to FOD including detection aspects.

ICAO Universal Safety Oversight Programme

2.15 Over the past six years, ICAO has conducted audits of Member States implementation of ICAO SARPs and related guidance material under the Universal Safety Oversight Audit Programme (USOAP). The data from these audits related to runway safety initiatives could be utilized to determine the priorities on the development and implementation of safety enhancements. **Appendix B** to this working paper outlines the Lack of Effective Implementation of ICAO SARPs for consideration by the meeting.

Note: The Safety Enhancement Initiatives that follow refers to initiatives of other well established safety teams in other ICAO Regions. Some examples of actions that have been taken by these safety teams to reduce safety risks are provided.

Safety Enhancement Initiative RI 1 – Runway Incursion - Air Traffic Control Training (Safety Impact Low)

2.16 The purpose of the initiative is to review ATC training and determine what programmes could be developed to updated training programs and course curriculums designed to improve the level of knowledge, skill and higher proficiency that supports and enhances system efficiency, increasing safety by fostering a higher level of situational awareness.

2.17 The ICAO Manual on the Prevention of Runway Incursion Doc 9870 does not address the aspect of air traffic controller training to improve situational awareness.

Example of Safety Team Outputs

2.18 Safety Teams have issued an Advisory Bulletin (AB) - Enhancing Situational Awareness in the Control Tower that provides information to ATM service providers to assist with the prevention of runway incursions. The guidance material discusses in detail the elements that are relevant to Situational Awareness in the Air Traffic Control environment. For each element, the relationship to the design, implementation and operation of an ATM system is also highlighted.

2.19 While the requirement for human factors training for ATC staff is an ICAO SARP, some States have yet to implement this requirement. A course on Human Factors for ATC was provided to Member States of the safety team.

Safety Enhancement Initiative RI 2 - Runway Incursion Standard Operating Procedures – Runway Incursion Prevention and Pilot Training (Safety Impact Low)

2.20 This safety enhancement substantially reduces or eliminates the risk of Runway Incursions (RI) by the incorporation of RI training into flight crew qualification, approved training, and other pilot training programs. This training will increase the pilot's ability to recognize and avoid situations leading to runway incursions. ICAO Manual on the Prevention of Runway Incursion Doc 9870 contains considerable guidance material related to flight crew procedures to reduce the risk of RI and **Appendix B** to this working paper contains Best Practices on the Flight Deck.

Example of Safety Team Outputs

2.21 Safety Teams have issued an AC - Flight Crew Procedures and Training during Taxi Operations. This Advisory Circular (AC) provides guidelines for the development and implementation of standard operating procedures for conducting safe aircraft operations during taxiing. This guidance focuses on the activities occurring within the cockpit (e.g., planning, communicating, coordinating), as opposed to the actual control of the aircraft (e.g., steering, manoeuvring).

Safety Enhancement Initiative RI 3 – Runway Safety Teams (Safety Impact High)

2.22 The ICAO Manual on the Prevention of Runway Incursions (Doc 9870) provides some guidance on the establishment of Runway Safety Teams. An outcome of the Global Runway Safety Symposium is that Runway Safety Teams should be established locally and hosted by the airports. International organizations have committed to work together to compile and promote proven solutions and endorse best practices. ICAO has established a Runway Safety Site and is establishing a Runway Safety Team Portal and Tools for use by Runway Safety Teams.

Example of Safety Team Outputs

Safety Enhancement Initiative RE 4 - Scenario Based Training for Pilots (Safety Impact High)

2.23 This safety enhancement will reduce Wrong Runway Departures by substantially reducing or eliminating the risk of wrong runway operations through the incorporation of wrong runway operations training into flight crew qualification, approved training, and other pilot training programs. This training will increase the pilot's ability to recognize and avoid situations leading to wrong runway departures.

Safety Enhancement Initiative RE 5 - Taxiway and Runway Configuration

2.24 This safety enhancement addresses hazards identified in the Wrong Runway Departure Report relating to airport construction and runway / taxiway location. The purpose of this SEI is to determine risk factors associated with airport geometry and complexity. Airports that have multiple runway thresholds in close proximity may be a hazard that could be mitigated by physically moving the runway and/or taxiway.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the initiatives undertaken by ICAO and other organizations;
- b) determine which initiatives should be examined by RASG-MID to reduce the safety risks for runway related accidents; and
- c) consider the information contained in this paper, when addressing/developing the MID Region Safety Enhancement Initiatives related to Runway Safety.

APPENDIX A

Outcomes of the last Regional Runway Safety Events

ICAO Global Runway Safety Symposium 24-26 May 2011

- One size does not fit all
 - Solutions need to account for local conditions yet be standardized and harmonized to ensure interoperability
 - Runway incursions and excursions are the main issues but other aspects such as Bird Strike, FOD should not be overlooked .

- Collaborating at multiple levels
 - International organizations have committed to work together to compile and promote proven solutions and endorse best practices
 - Runway Safety Teams – should be established locally and hosted by the airports.
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- Improve Standardization / Harmonization
 - Develop guidance to define and launch Runway Safety Teams
 - Harmonize “Runway Safety” definitions, taxonomies and reporting of runway conditions and other safety indicators
 - Standardize and improve communication procedures
 - ICAO to ensure that Standards and Guidance material are fit for purpose
 - Implementation of ICAO Standards monitored through the Continuous Monitoring Approach.

- Promote and encourage implementation of solutions, such as:
 - Training & collaboration
 - Runway & taxiway markings & signage
 - Runway End Safety Areas
 - PBN approach implementation
 - Arresting Systems
 - EFBs, on-board awareness and alerting systems
 - All partners have committed to increasing the exchange of runway safety information.

- ICAO Dedicated Runway Safety page
 - Library of downloadable toolkits and documents
 - Contributions from partner organizations
 - Links to Skybrary and other runway safety partner sites.

- Regional Runway Safety Seminars
 - All Runway Safety Programme Partners have committed to deliver Regional Runway Safety Seminars
 - RRSS events will result in action plans to create runway safety teams and provide support to those already in place
 - Progress will be monitored with updates provided to all partners through RASGs and other appropriate means
 - Reduction of risks will be monitored on a regular basis, with follow-up actions taken as required
 - Communication and outreach plans are being established.

APPENDIX B

USOAP Results Related to Runway Safety

Note: The following USOAP protocol questions have linkages to Runway Safety. Included at the end of the question is the Lack of Effective Implementation (LEI) in %. The first number represents the average LEI based on the audit results 180 States. (66% LEI). The second number represents LEI based on the audit results of the MID Region States (61% LEI).

Air Traffic Management

7.033 Has the State established and implemented a safety oversight system for ensuring the effective implementation of safety-related policy and procedures in the air navigation fields? ANS Doc 9734, Part A, C2- LEI 68/54

7.169 Does the State ensure that the ATS provider implemented a safety management system acceptable to the State? ANS STD A11, 2.26 - LEI 71/83

7.189 Has the State promulgated a regulation to require the establishment and implementation of a runway safety programme? ANS PANS Doc 4444, 2.5.2 - LEI 65/62

Aerodromes

8.083 Has the State established a process for the certification of aerodromes? AGA CC Art. 15; STD A14, Vol. I, 1.4.1 & 1.4.3; RP A14, Vol. I, 1.4.2; Doc 9774, 3B.3.2 - LEI 54/69/

8.099 Does the State's aerodrome certification process include procedures for accepting a non-compliance with the established requirements, including a risk assessment mechanism and notification procedure? AGA Doc 9734, Part A, 3.3.7; Doc 9774, App. 3 - LEI 67/54

8.147 Does the State ensure that aerodrome operators have a process for determining and providing relevant information that a runway, or part of, may be slippery when wet, including the minimum friction level for reporting of slippery runway conditions and the type of friction measuring device used? AGA STD A14, Vol. I, 2.9.5, 2.9.6, 2.9.7 & 10.2.3, RP, 2.9.8 - LEI 66/69

8.163 Has the State promulgated a regulation for the provision of runway end safety areas (RESA) at aerodromes? AGA STD A14, Vol. I, 3.5.1, 3.5.2 & 3.5.4, RP A14, Vol. I, 3.5.3 & 3.5.5 - LEI 49/31

8.165 If the requirements for RESAs have not been implemented at all aerodromes open to public use, how does the State satisfy itself that the runway surroundings are safe for use by aircraft in the event of an aircraft overrunning or undershooting the runway? AGA STD A14, Vol. I, 3.5.1, 3.5.2 & 3.5.4; RP A14, Vol. I, 3.5.3 & 3.5.5 - LEI 70/50

8.205 Has the State established a process to ensure that an aerodrome operator's plan for lighting, signs and markings is integrated as a whole into the aerodrome's runway incursion and collision avoidance strategy, taking account of different traffic intensities and visibility conditions? AGA Doc 9734, Part A, 2.4.7 & 3.9.4; Doc 9476, C2 - LEI 66/62

8.221 Does the State ensure that an aerodrome's SMGCS is designed to prevent inadvertent incursions of aircraft and vehicles onto an active runway or taxiway, taking into account the elements listed in Annex 14, Vol. I? AGA STD & RP A14, Vol. I, 7.1.7 & 9.8; Doc 9734, Part A, 2.4.7 b) iv); Doc 9476; Doc 9380; Doc 9157, Part 4 - LEI 54/31

8.363 Has the requirement for certified aerodromes to have a SMS in operation been implemented for all aerodromes receiving international flights? AGA SARPs A14, Vol. I, 1.4.4, 1.4.5 & 1.4.6; Doc 9774, 1.2.3, C3, 3B.3.2 e) & 3D.4 - LEI 80/85

8.369 Has the State developed and issued guidance for aerodrome operators and regulatory staff on the use of aeronautical studies/risk assessments and their evaluation? AGA Doc 9774, C3, Sect. E, App. 3; Doc 9734, Part A, 3.3.7 & 3.6 - LEI 79/85

8.371 Is the regulatory technical staff trained in the development, use and evaluation of SMS, including aeronautical studies and risk assessments? AGA Doc 9774, C 3, Sect. E, 4.4.3 & App. 3; Doc 9734 Part A, 3.5 - LEI 67/69

8.407 How does the State ensure that, as part of their SMS, aerodrome operators monitor and analyse accident and incident occurrences and trends and take appropriate action? AGA Doc 9734, 3.9.8; Doc 9774, Part 5 f) – LEI 67/46

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