



ADVISORY CIRCULAR

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SIERRA LEONE CIVIL AVIATION AUTHORITY

Runway Incursion Prevention Measures

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1 GENERAL

The Sierra Leone Civil Aviation Authority's Advisory Circulars contains information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated Regulations.

An AMC is not intended to be the only means of compliance with a Regulation, and consideration will be given to other methods of compliance that may be presented to the Authority

Information considered directive in nature is described in this AC in terms such as "shall" and "must", indicating the actions are mandatory. Guidance information is described in terms such as "should" and "may" indicating the actions are desirable or permissive, but not mandatory

1.1 Purpose

This Advisory Circular specifically addresses the subject of runway incursion prevention as it relates to the safe operations of aircraft, air traffic management, vehicle movement on the manoeuvring area and aerodrome management. It also establishes that successful prevention of runway incursions requires the collaboration of air traffic controllers, pilots, vehicle drivers and aerodrome management.

1.2 Description of Changes

This AC is the first to be issued on this subject

1.3 References

- (a) SLCAR Part 14A – Aerodrome Design and Operations
- (b) SLCAR Part 14C – Certification of Aerodromes
- (c) SLCAR Part 19 – Safety Management System
- (d) ICAO Doc 9870 – Manual on the Prevention of Runway Incursions
- (e) ICAO Doc 4444, PANS-ATM – The Procedures for Air Navigation Services – Air Traffic Management
- (f) SLCAA-AC-AGA017-Rev.01 – Safety Management System
- (g) SLCAA-AC-AGA028-Rev.01 – Establishment of Runway Safety team
- (h) SLCAA-AC-AGA020-Rev.01 – Aerodrome Maintenance

1.4 Cancelled Documents

Not Applicable

1.5 Abbreviations

- ACFT** Aircraft
- ADP** Airside driving permit
- AIP** Aeronautical Information Publication
- ARIA** Aerodrome runway incursion assessment

ATC	Air traffic control
ATIS	Automatic terminal information service
ATM	Air traffic management
CP	Closest Proximity
FOD	Foreign Object Debris
NOTAM	Notice to airmen
PANS	Procedures for Air Navigation Services
RISC	Runway incursion severity classification
RTF	Radiotelephony
RVR	Runway visual range
RWY	Runway
SARPs	Standards and Recommended Practices
SMS	Safety management system(s)
SSR	Secondary surveillance radar
UHF	Ultra-high frequency
VHF	Very high frequency

1.6 Definitions

Hot spot —A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

Just culture —An atmosphere of trust in which people are encouraged (even rewarded) for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour.

Local runway safety team —A team comprised of representatives from aerodrome operations, air traffic services providers, airlines or aircraft operators, pilot and air traffic controllers associations and any other group with a direct involvement in runway operations that advise the appropriate management on the potential runway incursion issues and recommend mitigation strategies.

Runway incursion —Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Runway incursion severity classification (RISC) calculator —A computer programme that classifies the outcome of runway incursions.

Sterile flight deck —Any period of time when the flight crew should not be disturbed except for matters critical to the safe operation of the aircraft.

2 INTRODUCTION

- (a) Runway incursions have sometimes led to serious accidents with significant loss of lives. Although not a new problem, with increasing air traffic, runway incursions have been on the rise.
- (b) Aviation safety programmes should have a common goal; to reduce hazards and mitigate and manage residual risk in air transportation. Runway operations are an integral part of aviation; the hazards and risks associated with runway operations need to be managed in order to prevent runway incursions that may lead to accidents.
- (c) Survey data have shown that pilots, drivers and controllers consider runway incursions and the potential for collisions to be the most significant risk in aerodrome operations.

3 CONTRIBUTORY FACTORS

3.1 Background

- (a) Runway incursions can be divided into several recurring scenarios. Common scenarios include:
 - (i) an aircraft or vehicle crossing in front of a landing aircraft;
 - (ii) an aircraft or vehicle crossing in front of an aircraft taking off;
 - (iii) an aircraft or vehicle crossing the runway holding position marking;
 - (iv) an aircraft or vehicle unsure of its position and inadvertently entering an active runway;
 - (v) a breakdown of communication leading to a failure to follow an air traffic control instruction; and
 - (vi) an aircraft passing behind an aircraft or vehicle that has not vacated the runway
- (b) Statistics show that most runway incursions occur in visual meteorological conditions (VMC) during day light hours; however, most accidents occur in low visibility or at night. All runway incursions should be reported and analysed, whether or not another aircraft or vehicle is present at the time of the occurrence.

3.2 Breakdowns of Communication

A breakdown in communication between controllers and pilots or airside vehicle drivers is a common factor in runway incursions and often involves:

- (a) use of non-standardized phraseology;
- (b) a failure by the pilot or the vehicle driver to provide a correct read-back of an instruction;
- (c) the controller does not ensure that the read-back by the pilot or the vehicle driver conforms with the clearance issued;
- (d) pilot and or vehicle driver misunderstanding the controller's instructions;
- (e) pilot and or vehicle driver accepting a clearance intended for another aircraft or vehicle;
- (f) blocked and partially blocked transmissions; and
- (g) long or complex transmissions

Note: See Appendix A of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on communication best practices.

3.3 Pilot Factors

- (a) Pilot factors that may result in a runway incursion include inadvertent non-compliance with ATC clearances. Often these cases result from a breakdown in communication or a loss of situational awareness in which a pilot thinks that he/she is at one location on the aerodrome (such as a specific taxiway or intersection) when they are actually elsewhere, or they believe that the clearance issued was to enter the runway, while in fact it was not.
- (b) Other common factors include:
 - (i) inadequate signage and markings (particularly the inability to see the runway holding position lines);
 - (ii) controllers issuing instructions as the aircraft is rolling out after landing (when pilot workload and cockpit noise are both very high);
 - (iii) pilots have to perform mandatory head down tasks, which reduce situational awareness;
 - (iv) pilots being pressed by complicated and/or capacity enhancement procedures, leading to rushed behaviour;
 - (v) complicated airport design where runways have to be crossed;
 - (vi) incomplete, non-standard or obsolete information about the taxi routing to expect; and
 - (vii) last minute changes by ATC in taxi or departure routings

Note: See Appendix B of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on flight crew best practices including the sterile flight deck concept.

3.4 Air Traffic Control Factors

- (a) The most common controller-related actions identified in several studies are:
 - (i) momentarily forgetting about:
 - (1) an aircraft;
 - (2) the closure of a runway;
 - (3) a vehicle on the runway, or
 - (4) a clearance that had been issued;
 - (ii) failure to anticipate the required separation or miscalculation of the impending separation;
 - (iii) inadequate coordination between controllers;
 - (iv) crossing clearance issued by a ground controller instead of air/tower controller;
 - (v) misidentifying an aircraft or its location;
 - (vi) failure by the controller to provide a correct read-back of another controller's instruction;
 - (vii) failure by the controller to ensure that read-back by the pilot or the vehicle driver conforms with the clearance issued;
 - (viii) communication errors;

- (ix) over long or complex instructions;
- (x) use of nonstandard phraseologies; and
- (xi) reduced reaction time due to on the job training

(b) Other common factors include:

- (i) distraction;
- (ii) workload;
- (iii) experience level;
- (iv) inadequate training;
- (v) lack of clear line of sight from the control tower;
- (vi) human-machine interface; and
- (vii) incorrect or inadequate handover between controllers

Note: See Appendix C of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on air traffic control best practices.

3.5 Airside Vehicle Driver Factors

The most common driver-related factors identified in several studies are:

- (a) failure to obtain clearance to enter the runway;
- (b) not complying with ATC instructions;
- (c) inaccurate reporting of position to ATC;
- (d) communication errors;
- (e) inadequate training for airside vehicle drivers;
- (f) no radiotelephony equipment;
- (g) no radiotelephony training;
- (h) lack of familiarization with the aerodrome;
- (i) lack of knowledge of aerodrome signs and markings; and
- (j) lack of aerodrome maps for reference in vehicles;

Note: See Appendix D of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on airside vehicle driver training including communication

3.6 Aerodrome Design Factors

- (a) Complex or inadequate aerodrome design significantly increases the probability of a runway incursion. The frequency of runway incursions has been shown in many studies to be related to the number of runway crossings and the characteristics of the aerodrome layout.

(b) Common factors include:

- (i) complexity of airport layout including roads and taxiways adjacent to the runway;
- (ii) not enough spacing between parallel runways;
- (iii) departure taxiways that fail to intersect active runways at right angles; and
- (iv) no end loop perimeter taxiways to avoid runway crossings.

Note: See SLCAR's part 14A and ICAO Aerodrome Design Manual (Doc 9157) for more detailed guidance on aerodrome design.

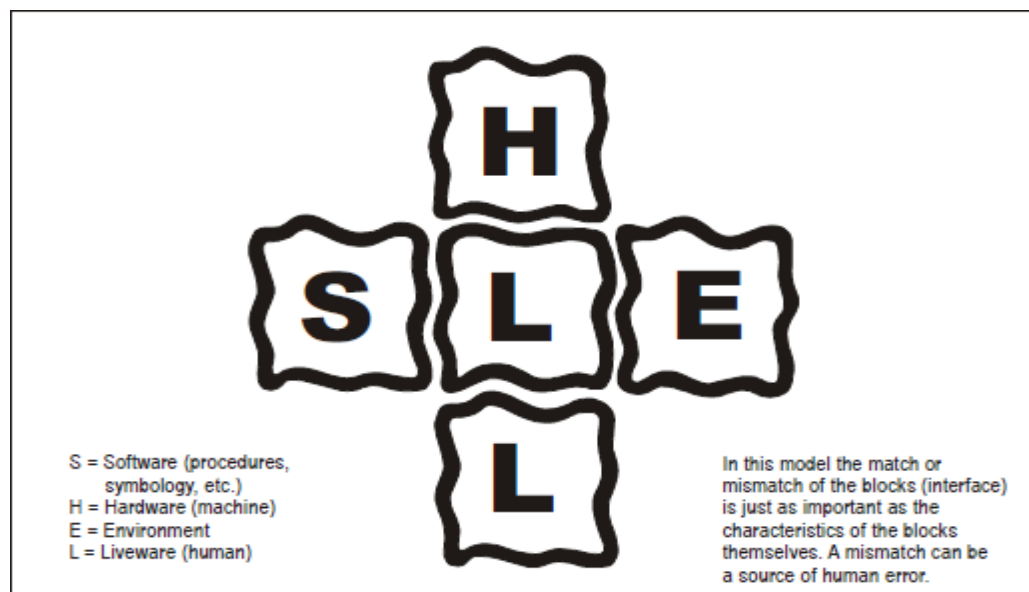
4 RECOMMENDATIONS FOR THE PREVENTION OF RUNWAY INCURSIONS

4.1 Introduction to Recommendations

- (a) The following recommendations are the result of a systemic analysis of many runway incursions. The purpose was to identify causes and contributory factors, both as active and latent failures, which led to the incidents taking place.
- (b) These recommendations will enhance the safety of runway operations by the consistent and uniform application of existing ICAO provisions and SLCAR's Part 14A, leading to predictability and greater situational awareness.

4.2 SHEL Model

As noted in section 3 above, runway incursions may be the result of many differing factors. Analysis of the occurrence can be executed using the SHEL Model (sometimes referred to as SHELL Model). Importantly, the SHEL Model draws attention not to these different components in isolation, but to the interface between the human elements and the other factors. For example, the L-L interaction would include aspects of communication, cooperation and support; the L-H interaction represents the Human/Machine Interface (HMI) issues. The contributory factors described in this chapter (normally designated as Live ware by the SHEL model) do not exclude contributions from the other aspects of organizational life, e.g. policies, procedures, environment, but which are critical factors associated with Safety Management Systems and which must be addressed to improve safety overall.



The SHEL Model

4.3 Recommendations to Enhance Communications

- (a) Use the full aircraft or vehicle call signs for all communications associated with runway operations.
- (b) Use standard phraseologies in all communication associated with runway operations.
- (c) Periodically verify the use of standard phraseologies by pilots, drivers and air traffic controllers in all communication associated with runway operations.
- (d) Use the ICAO Procedures for Air Navigation Services - Air Traffic Management (PANS ATM, Doc 4444) read-back procedure, to include communication with vehicles operating on the manoeuvring area.
- (e) Conduct all communications associated with runway operations in accordance with ICAO air-ground radiotelephony communications language requirements as stated in (SLCAR Part 10B Aeronautical Telecommunications. The use of standard aviation English at International aerodromes helps provide situation awareness of everyone listening on the frequency.
- (f) Conduct all communications associated with the operation of each runway (vehicles, crossing aircraft etc) on the same frequency as utilised for the take-off and landing of aircraft.
- (g) Use short and simple messages in ATC communications.

4.4 Recommendations to Aircraft Operators

- (a) Thoroughly train pilots on Aerodrome signage, markings and lighting.
- (b) Include in the flight deck procedures, a requirement to obtain an explicit clearance to cross any runway. This includes runways not in use.
- (c) Promote best practices for pilots planning of ground operations.

Adopt the sterile flight deck concept while taxiing. Information on this is contained in Appendix B of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion).

4.5 Recommendations to Pilots

- (a) Pilots should not accept an ATC clearance which would otherwise require them to enter or cross a runway from an obliquely angled taxiway.
- (b) If lined up on the runway and held more than 90 seconds beyond anticipated departure time, pilots should contact ATC and advise that they are holding on the runway.
- (c) Pilots should turn on aircraft landing lights when take-off or landing clearance is received, and when on approach.
- (d) Pilots should turn on strobe lights when crossing a runway.
- (e) If there is any doubt, when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.
- (f) If there is any doubt as to exact position on the surface of an aerodrome, pilots should contact ATC and follow the associated ICAO procedure (PANS ATM, Doc4444).
- (g) Pilots should be "Head up" for a continuous watch during aerodrome surface operations.

Note - see Appendix B of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on flight crew best practices including the sterile flight deck concept.

4.6 Recommendations for Air Traffic Services Providers and Air Traffic Controllers

- (a) Implement safety management systems in accordance with SLCAA-AC-AGA017-Rev.01 (SMS) and ICAO provisions.
- (b) Air traffic controllers should always use a clear and unambiguous method on the operating console to indicate that a runway is temporarily obstructed.
- (c) ATC should whenever practical give ATC en-route clearance prior to taxi.
- (d) Ensure that ATC procedures contain a requirement to issue an explicit clearance including the runway designator when authorizing a runway crossing or to hold short of any runway. This includes runways not in use.
- (e) Ensure that ATC procedures contain a requirement to include the runway designator when issuing an instruction to hold short of any runway.
- (f) Develop and utilize standard taxi routes to minimize the potential for pilot confusion.
- (g) Where applicable use progressive taxi instructions to reduce pilot workload and the potential for confusion. Progressive taxi instructions must not infer a clearance to cross a runway.
- (h) Assess existing visibility restrictions from the control tower which have a potential impact on the ability to see the runway and clearly identify any such areas on a hot spot map.
- (i) Environmental constraints should not compromise safety e.g. regular, multiple changes to runway configuration.
- (j) Ensure that runway safety issues are included in training and briefings for ATC staff.
- (k) Identify any hazards and evaluate any risks of runway capacity enhancing procedures (intersection departures, multiple line up, conditional clearances etc.) when used either individually or in combination. If necessary develop appropriate mitigation strategies.
- (l) Do not issue line up clearance to an aircraft if this aircraft will be required to hold on the runway for more than 90 seconds beyond the time it would normally be expected to depart.
- (m) When conditional clearances are used, specific training should be provided to ensure that they are used strictly according to ICAO provisions.
- (n) When using multiple or intersection departures, do not use oblique or angled taxiways that limit the ability of the flight crew to see the landing runway threshold or final approach area.
- (o) Controllers should be "Head up" for a continuous watch on aerodrome operations.

See Appendix C of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on air traffic control best practices.

4.7 Recommendations for Aerodrome Operators and Vehicle Drivers

- (a) An important factor in preventing runway incursions is to limit the physical possibilities for pilots and vehicle drivers to mistakenly enter runways. This basic principle includes, but is not limited to, the optimal use of perimeter taxiways, the avoidance of runway crossings, the simplicity and logic of taxi/runway lay-out in order to make the aerodrome instinctive, logical and user friendly for vehicle drivers, air traffic controllers and pilots. Therefore, aerodrome operators shall include those elements in the design and location of aerodrome infrastructure.
- (b) Implement safety management systems in accordance with provisions of the SLCAR's Part14A, and SLCAA-AC-AGA017-Rev.01 (SMS) and then ensure a continued focus on runway safety.

- (c) Confirm the implementation of the relevant provisions in the SLCAR's Part 14A, SLCAA-AC-AGA020-Rev01 Aerodrome maintenance, provisions and implement maintenance programmes relating to runway operations e.g. markings, lighting, and signage. Ensure that signs and markings are maintained and clearly visible, adequate and unambiguous in all operating conditions.
- (d) During construction or maintenance ensure that information about temporary work areas is adequately disseminated and that temporary signs and markings are clearly visible, adequate and unambiguous in all operating conditions in compliance with SLCAR's Part 14A.
- (e) Introduce a formal driver training and assessment programme in accordance with driver training guidelines contained in *Appendix D of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion)*, or where already in place review these guidelines.
- (f) Introduce formal communications training and assessment for drivers and other personnel who operate on or near the runway.
- (g) Name taxiways as required by the SLCAR's Part 14A.
- (h) If there is any doubt in the mind of a vehicle driver when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.
- (i) Vehicle drivers should immediately contact ATC, when uncertain of their exact position on an aerodrome; if the driver realizes he/she is on the runway he/she immediately vacates.
- (j) Vehicle driver should be "Heads up" for a continuous watch during aerodrome operations.

Note: See Appendix D of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for more detailed guidance on airside vehicle driver best practices including communication training for drivers.

4.8 General and Regulatory Recommendations

- (a) The Authority shall focus on runway incursion risk reduction in its oversight activities.
- (b) At each aerodrome, a runway safety team shall be established and maintained in accordance with the terms of reference described in 5.1 and 5.2 below.
- (c) A local runway incursion prevention awareness campaign shall be initiated at each aerodrome for air traffic controllers, pilots and drivers and other personnel who are involved in runway operations. The awareness campaign should be periodically updated to maintain interest and operational impact.
- (d) All infrastructure and procedures relating to runway operations shall be in compliance with the SLCAR's Part 14A and other relevant ICAO provisions. Where differences are made, appropriate publications should be made in the Sierra Leone AIP and notification sent to the Authority.
- (e) Aerodromes shall be certified in accordance with the SLCARs, Part 14C.
- (f) Joint cross training and familiarization (such as the aerodrome resource management training course – see Appendix E of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion)) should be provided to pilots, air traffic controllers and vehicle drivers, to increase understanding of the roles and difficulties of personnel working in other areas. Where possible, visits to the manoeuvring area by all parties should take place for familiarisation of signs, markings and aerodrome layout.

4.9 Recommendations Relating to Incident Reporting and Investigation

- (a) Ensure all runway incursions are reported and investigated in sufficient detail to identify specific causal and contributory factors (See appendices 1 and 2 of this AC).
- (b) To enhance learning, share related runway safety data with other aviation safety organizations both nationally and internationally.

4.10 Recommendations Related to Aeronautical Information

- (a) Time critical aerodrome information which may affect operations on or near the runway should be provided to pilots in "real-time" using radiotelephony communication.
- (b) The collection, provision and dissemination of aeronautical information should be in accordance with AIS established procedures.
- (c) Providers of aeronautical databases and charts should establish a process with AIS with the objective of ensuring the accuracy, timeliness, and integrity of the data.
- (d) Ensure a process is put in place to allow users to provide feedback on the accuracy of aeronautical information.

5 HOW TO ESTABLISH A RUNWAY INCURSION PREVENTION PROGRAMME

5.1 Local Runway Safety Teams

- (a) A runway incursion prevention programme should start with the establishment of local runway safety teams at individual aerodromes. The primary role of a local runway safety team, which may be coordinated by a Safety Manager responsible for the Safety Management System, should be to develop an action plan for runway safety, advise the appropriate management on the potential runway incursion issues and to recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed as a result of local occurrences or combined with information collected elsewhere.
- (b) The team could comprise representatives from aerodrome operations, air traffic service providers, airlines or aircraft operators, pilot and air traffic controller associations and any other groups with a direct involvement in runway operations. The team should meet on a regular basis. Frequency of meetings should be determined by the individual groups. At some aerodromes, other groups may already exist that could carry out the functions of a runway safety team.

5.2 Objectives and Terms of Reference

Once the overall number, type and severity of runway incursions have been determined, the team should establish goals that will improve safety of runway operations. Examples of possible goals are:

- (a) improve runway safety data collection, analysis, and dissemination;
- (b) check that signage and marking are compliant with SLCAR's Part 14A, and are visible for pilots and drivers;
- (c) develop initiatives for improving the standard of communications;
- (d) identify potential new technologies that may reduce the possibility of a runway incursion;
- (e) ensure procedures are compliant with SLCAR's Part 14A, and

- (f) initiate local awareness by developing and distributing runway safety education and training materials to controllers, pilots and personnel driving vehicles on the aerodromes

5.3 Generic Terms of Reference for the Team are as follows:

The local runway safety team will assist in enhancing runway safety by:

- (a) determining the number, type and if available the severity of runway incursions;
- (b) considering the outcome of investigation reports to establish local hot spots or problem areas at the aerodrome;
- (c) working as a combined team to better understand the operating difficulties of those working in other areas, and suggest areas for improvement;
- (d) ensuring the recommendations contained in this Advisory Circular have been implemented;
- (e) identifying any local problem areas and suggest improvements;
- (f) conducting a runway safety awareness campaign, that focuses on local issues, for example by producing and distributing local hot spot maps or other guidance material as considered necessary, and
- (g) regularly reviewing the airfield to ensure adequacy and compliance with SLCAR's Part 14A

5.4 Hot Spots

Note 1 - the criteria used to establish and chart a hot spot are contained in the PANS- ATM and Aeronautical Information Services.

Note2 - Hazards associated with hot spots should be mitigated as soon as possible and so far as is reasonable practicable.

- (a) Hot spot charts should be produced locally. These charts should be checked regularly for accuracy, revised as needed, distributed locally, and published in the Aeronautical Information Publication(AIP)
- (b) Once hot spots have been identified, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, manage and mitigate risk. These strategies may include:
 - (i) Awareness campaigns;
 - (ii) additional visual aids (signs, markings and lights);
 - (iii) use of alternative routings;
 - (iv) construction of new taxiways; and
 - (v) mitigating against blind spots in the Aerodrome Control Tower

5.5 Identification of Action Items Associated With Mitigating Runway Safety Deficiencies

A plan containing action items should be developed. Action items should be aerodrome specific and linked to a runway safety concern, issue or problem at that aerodrome. Action items may include suggested changes to the physical features/facilities of the aerodrome, air traffic control procedures, airfield access requirements, pilot and vehicle operator awareness and production of a hot spot map.

5.6 Persons or Organizations Responsible for Completing the Tasks Associated With Action Items

Each action item should have a person or organization responsible for completing the relevant tasks. There may be more than one organization affected by an action item however, one person or organization should take the lead and be responsible for completion. A realistic time frame to accomplish the work should be associated with each action item.

5.7 Effectiveness of Activities Associated With Completing the Task

Periodically assess the effectiveness of implemented and or completed action items. This can be accomplished by comparing the results of the initial analysis and the current runway incursion status. For example, if an action item was to provide training for controllers, pilots or vehicle drivers, the effectiveness of such training should be evaluated by the team. If the analysis shows little or no improvement in the number, type or severity of runway incursions, the team should re-evaluate the implementation of the action item.

5.8 Runway Incursion Prevention Education and Awareness Material

Awareness material can be used as a successful tool for reducing risk of runway incursions. These materials can include newsletters, posters, stickers and other educational information.

6 INCIDENT REPORTING AND DATA COLLECTION

6.1 A Standard Approach to Runway Incursion Incident Reporting and Data Collection

- (a) The SLAAIIB shall establish and maintain an accident and incident database to facilitate the effective analysis of information on actual or potential safety deficiencies and to determine any preventive actions required.
- (b) Use of standard definitions, reporting formats, and error taxonomy will help to facilitate data sharing among stakeholders. The larger the data pool the more robust the analysis of common causal factors and thus a better understanding of the nature of the problem.
- (c) The initial runway incursion notification form (see Appendix 1 of this AC) requires inclusion of data to describe the event and to classify its severity.
- (d) The runway incursion causal factor identification form (see Appendix 2 of this AC) contains the how, what and why the event took place and is completed once the detail investigation into the event is complete.
- (e) However, since there are few reported runway incursions per thousand aircraft movements, these incidents may appear to be unique to a particular aerodrome. It is only by pooling data that patterns of common causal factors can emerge.
- (f) Pooling data requires that all participating organizations adopt a common, reliable, and robust method of data collection. Furthermore, methods used to analyze the results should be harmonized to ensure a comparability of results of assessments.
- (g) the quality of the investigations has a direct impact on the assessment of risk of collision, severity of the outcome, and identification of causal and contributory factors.

7 CLASSIFICATION OF THE SEVERITY OF RUNWAY INCURSIONS

7.1 Severity Classification for Runway Incursions

- (a) For the purpose of national or even global harmonization and effective data sharing, when classifying the severity of runway incursions, the following severity classification scheme should be applied:

Table 7-1: Severity Classification Scheme

Severity Classification	Description
A	A serious incident in which a collision was narrowly avoided.
B	An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision.
C	An incident characterized by ample time and/or distance to avoid a collision.
D	Incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.
E	Insufficient information, inconclusive or conflicting evidence precludes severity assessment.

Refer to Annex 13 for the definition of Accident and Incident

7.2 Factors That Influence Runway Incursion Severity

To properly classify the severity of a runway incursion the following information is required:

- (a) Proximity of aircraft and/or vehicle – This distance is usually approximated by the controller or from the aerodrome diagram. If the aircraft flew directly over the other aircraft or vehicle, then the closest vertical proximity should be used. When both aircraft are on the ground, the proximity that is used to classify the severity of the runway incursion is the closest horizontal proximity. When aircraft are separated in both horizontal and vertical planes, the proximity that best represents the probability of collision should be used. In incidents in which the aircraft are on intersecting runways, the distance from each aircraft to the intersection is used.
- (b) Geometry of the encounter – Certain encounters are inherently more severe than others. For example, encounters with two aircraft on the same runway are more severe than incidents with one aircraft on the runway and one aircraft approaching the runway. Similarly, head-on encounters are more severe than aircraft moving in the same direction.
- (c) Evasive or corrective action – When an aircraft takes evasive action to avoid a collision, the magnitude of the manoeuvre is an important consideration in classifying the severity. This includes, but is not limited to, hard braking action, swerve, rejected take-off, early rotation on take-off, and go-around. The more severe the manoeuvre, the higher the contribution to

the severity rating. For example, encounters involving a rejected take-off in which the distance rolled were 300 meters would be more severe than those in which the distance rolled was less than 30meters.

- (d) Available reaction time – Encounters that allow the pilot little time to react to avoid a collision are more severe than encounters in which the pilot had ample time to respond. For example, in incidents involving a go-around, the approach speed of the aircraft and the distance to the runway at which the go-around was initiated needs to be considered in the severity classification. This means that an incident involving a heavy aircraft aborting the landing and initiating a go-around at the runway threshold would be more severe than one that involved a light aircraft initiating a go-around on a one-mile final.
- (e) Environmental conditions such as weather, visibility and surface condition – Conditions that degrade the quality of the visual information available to the pilot and controller, such as poor visibility increase the variability of the pilot and controller response, and as such, may increase the severity of the incursion. Similarly, conditions that degrade the aircraft or vehicle stopping performance, such as wet runways should also be considered.
- (f) Factors that affect system performance such as communication failures (e.g. "open mike"), communication errors (e.g. the controller's failure to correct an error in the pilot's read-back) also contribute to the severity of the incident.

7.3 Runway Incursion Severity Classification Calculator

A runway incursion severity classification (RISC) calculator is available (see Appendix H of ICAO Doc 9870 (Manual on the Prevention of Runway Incursion) for a description). The calculator was developed to assist States in assessing the severity of runway incursion events. Use of the RISC calculator should also enable a consistent assessment to be made. Alternatively, the severity of runway incursions can be classified manually using the guidance contained in 7.1 and 7.2.

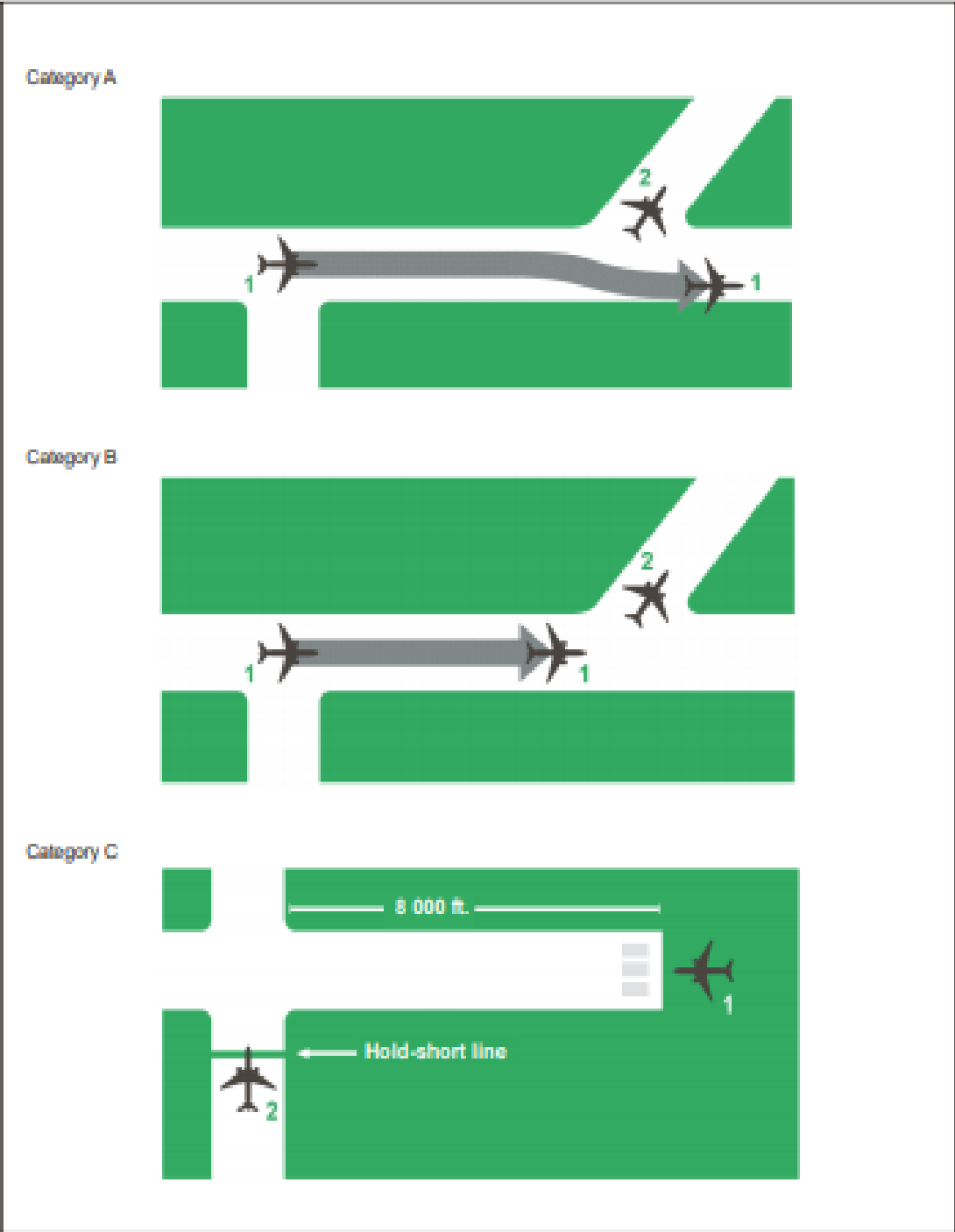


Figure 7-1: Severity Classification Examples

APPENDIX 1 – RUNWAY INCURSION INITIAL REPORT FORM

1 Form Sample

	SIERRA LEONE CIVIL AVIATION AUTHORITY <i>AERODROME SAFETY STANDARDS DIVISION</i> RUNWAY INCURSION INITIAL REPORT FORM	Form No: AC-AGA033A-Rev00
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Report No: _____

A. Date/Time of runway incursion (in UTC) Day Night
(YYYYMMDDhhmm) _____

B. Person submitting the report

Name: _____

Job Title: _____

Telephone No: _____

Facility/Unit: _____

Date/Time/Place of completion
of form: _____

C. ICAO aerodrome designator _____

D. Surface conditions (Braking) _____

E. Aircraft, vehicle or person involved in the runway incursion (indicate all those involved in the occurrence)

Aircraft 1: _____

Aircraft 2: _____

Aircraft 3: _____

Vehicle: _____

Person: _____

F. Weather conditions

Wind: _____ Visibility/RVR: _____

Runway Incursion Prevention Measures

Temperature (Celsius): _____ Ceiling/cloud: _____

Additional Information:

G. Evasive action – Aircraft 1

No

Yes Select from the list below as appropriate:

Cancelled take-off clearance

Rejected take-off distance rolled: _____

Rotated early

Delayed rotation

Abrupt stop

Swerved

Missed approach distance to runway threshold: _____

Other

H. Evasive action – Aircraft 2

No

Yes Select from the list below as appropriate:

Cancelled take-off clearance

Rejected take-off distance rolled: _____

Rotated early

Delayed rotation

Abrupt stop

Swerved

Runway Incursion Prevention Measures

Missed approach distance to runway threshold: _____
Other

I. Evasive action – Aircraft 1

No

Yes Select from the list below as appropriate:

Abrupt stop
Swerved
Other

J. Closest proximity

Vertical (ft): _____ Horizontal (m): _____

K. Communication difficulties

No

Yes Select from the list below as appropriate:

Readback/hearback
Blocked communication
Confused call signs
Aircraft on wrong frequency/no radio
Non-standard phraseology

L. ATC

Did ATC Forget about:	Yes	No
An aircraft/person/vehicle cleared onto or to cross a runway?	<input type="checkbox"/>	<input type="checkbox"/>
An aircraft on approach to land?	<input type="checkbox"/>	<input type="checkbox"/>
A runway closure?	<input type="checkbox"/>	<input type="checkbox"/>

M. Description of the incident and relevant circumstances

1. A description or diagram of the geometry of the incident scenario:

Decription:

Diagram:



2. A description of any evasive or corrective action taken to avoid a collision:

Runway Incursion Prevention Measures

3. An assessment of the available reaction time and the effectiveness of the evasive or corrective action:

4. An indication of whether a review of voice communication has been completed and the results of the review:

5. Initial assessment of severity:

N. Aircraft details – Aircraft 1

Registration No: _____ Call sign: _____ SSR code (if applicable): _____
 Flight No: _____ Owner/operator: _____
 Aircraft 1 type: _____

Flight details (select from the list below as appropriate):

<i>Type of Flight</i>		<i>Flight rules</i>	
General aviation	<input type="checkbox"/>	IFR	<input type="checkbox"/>
Military	<input type="checkbox"/>	VFR	<input type="checkbox"/>
Non-scheduled	<input type="checkbox"/>		
Scheduled	<input type="checkbox"/>		
Other	<input type="checkbox"/>		
Not applicable	<input type="checkbox"/>		

O. Aircraft details – Aircraft 2

Registration No: _____ Call sign: _____ SSR code (if applicable): _____

Runway Incursion Prevention Measures

Flight No: _____ Owner/operator: _____

Aircraft 2 type: _____

Flight details (select from the list below as appropriate):

<i>Type of Flight</i>	<i>Flight rules</i>
General aviation <input type="checkbox"/>	IFR <input type="checkbox"/>
Military <input type="checkbox"/>	VFR <input type="checkbox"/>
Non-scheduled <input type="checkbox"/>	
Scheduled <input type="checkbox"/>	
Other <input type="checkbox"/>	
Not applicable <input type="checkbox"/>	

P. Vehicle details – Vehicle 1

Registration No: _____ Call sign: _____

Mobile No: _____ Owner/operator: _____

Vehicle 1 type: _____

Other details (select from the list below as appropriate):

<i>Type of Vehicle</i>	<i>Other:</i>
Runway inspection <input type="checkbox"/>	
Bird Control <input type="checkbox"/>	
Tugging/towing <input type="checkbox"/>	
Fire brigade <input type="checkbox"/>	
Maintenance <input type="checkbox"/>	
Snow clearing <input type="checkbox"/>	
Military <input type="checkbox"/>	

Q. Vehicle details – Vehicle 2

Registration No: _____ Call sign: _____

Mobile No: _____ Owner/operator: _____

Vehicle 2 type: _____

Other details (select from the list below as appropriate):

<i>Type of Vehicle</i>	<i>Other:</i>
Runway inspection <input type="checkbox"/>	
Bird Control <input type="checkbox"/>	
Tugging/towing <input type="checkbox"/>	
Fire brigade <input type="checkbox"/>	
Maintenance <input type="checkbox"/>	
Snow clearing <input type="checkbox"/>	
Military <input type="checkbox"/>	

R. Report received by _____
(name of person) (date)

S. Date when detailed investigation will commence _____

2 Instructions for Completing the Runway Incursion Initial Report Form

Item

- A Indicate the date/time (in UTC) and conditions (day or night) of the runway incursion.
- B Provide details about the person submitting the report.
- C Provide the aerodrome designator as indicated in Location Indicators (Doc 7910).
- D Supply information regarding the runway condition at the time of the runway incursion, which affected the braking action of the aircraft.
- E Identify the aircraft, vehicles or persons involved in the runway incursion. More details should be provided in N, O, P and Q.
- F Provide information on weather conditions such as wind, visibility, RVR, temperature, ceiling, cloud and additional information as required.
- G, H, I Provide information regarding evasive action taken by the aircraft and/or vehicles.
- J Provide information regarding the closest proximity or distance, horizontally and/or vertically, between both parties during the runway incursion or at the point at which both parties were aware of the situation and the aircraft was under control at taxi speed or less.
- K, L Provide information regarding communication difficulties and ATC memory lapses.
- M Describe the runway incursion, by providing the information requested. Attach additional pages as required.
- N, O, P, Q Supply detailed information regarding the aircraft and vehicles involved in the runway incursion.
- R Provide the name of the person receiving the report and date.
- S Indicate the date when the detailed investigation of the runway incursion will commence.

Runway Incursion Prevention Measures

- 1.1.1 Transmission was completely blocked
- 1.1.2 Transmitted instructions were long, complex, spoken rapidly or not in accordance with ICAO language requirements for air-ground radiotelephony communications (language normally used by the station on the ground or the English language)
- 1.1.3 Did not obtain readbacks for clearance, instructions and coordination as required by ICAO
- 1.1.4 Did not correct an error in a readback
- 1.1.5 Issued a clearance to the wrong aircraft
- 1.1.6 Confused similar call signs
- 1.1.7 Deviation from established ICAO standard phraseologies
- 1.1.8 Other (please specify). If not an ICAO procedure, please briefly describe the procedure used and where.

1.2 *Situational awareness*

- 1.2.1 Head-down time due to equipment/displays; duties other than traffic processing such as inputting flight data
- 1.2.2 Forgot:
 - Aircraft on an active runway
 - Aircraft cleared to cross a runway
 - Aircraft in the lined-up position
 - Aircraft on approach to land
 - To issue a clearance
 - That a clearance had already been issued
 - Closed runways
 - A vehicle on an active runway
 - A vehicle cleared to cross a runway
- 1.2.3 Distractions due to:
 - Performing other assigned duties, such as conducting operational telephone calls, weather observations and recording, issuing NOTAM and other operational information
 - Engaging in non-operational activities such as a personal telephone call extraneous conversation, reading materials and radios.
- 1.2.4 Used a language not in accordance with ICAO language requirements for air-ground radiotelephony communications

Runway Incursion Prevention Measures

- 1.2.5 Misidentified the aircraft or the aircrafts position due to:
 - Incorrect position report
 - An incorrect expectation (e.g. expected the aircraft to be clear of the runway)
- 1.2.6 Lack of visual scanning of ground movements
- 1.2.7 Limitations on the view of the manoeuvring area from the ATC tower
- 1.2.8 Recent runway configuration change
- 1.2.9 Unused runway configuration
- 1.2.10 Error occurred within 15 minutes of assuming the control position
- 1.2.11 Controller was conducting on-the-job training
- 1.2.12 Fatigue
- 1.2.13 Other (please specify)

1.3 *Staffing*

- 1.3.1 ATC positions were combined on the same frequency
- 1.3.2 Absence of a supervisor in the tower
- 1.3.3 Supervisor was working a control position

1.4 *Decision Making*

- 1.4.1 Misjudged separation or anticipated separation
- 1.4.2 Inadequate ATC to ATC coordination
- 1.4.3 Other (please specify)

Runway Incursion Prevention Measures

1.5 Procedures

- 1.5.1 Misapplication of conditional clearance
- 1.5.2 Use of multiple line-up clearances
- 1.5.3 Other (please specify). If not an ICAO procedure, please briefly describe the procedure used and where.

1.6 Aerodrome works

- 1.6.1 ATC not advised of works on the manoeuvring area
- 1.6.2 Other (please specify).

2. FLIGHT CREW

2.1 Communications

- 2.1.1 Transmission was completely blocked
- 2.1.2 Transmission was partially blocked (“stepped-on”)
- 2.1.3 Accepted a similar aircraft’s clearance:
 - With similar call signs
 - Without similar call signs
- 2.1.4 Deviation from established ICAO standards phraseologies
- 2.1.5 Used other than ICAO language requirements for air-ground radiotelephony communications (language normally used by the station on the ground or the English language) in a situation not covered by ICAO standard phraseology
- 2.1.6 Used language not in accordance with ICAO language requirements for air-ground radiotelephony communications (language normally used by the station on the ground or the English Language)
- 2.1.7 Speech quality:
 - Not proficient in ICAO language requirements for air-ground radiotelephony communications (language normally used by the station on the ground or the English language)
 - Poorly enunciated or heavily accented

Runway Incursion Prevention Measures

- Spoken rapidly
- Spoken with an inconsistent volume

2.1.8 Did not use headsets

2.1.9 Received clearance or instructions during periods of high cockpit workload

2.1.10 Did not advise ATC of a delay on the runway prior to take-off

2.1.11 Other (please specify)

2.2 *Situational awareness*

2.2.1 Crew conducting checklists while taxiing

2.2.2 Crew member programming flight management system or other flight deck system while taxiing

2.2.3 Crew member was on another radio frequency

2.2.4 Competing radio communications

2.2.5 Unfamiliar with the aerodrome layout

2.2.6 Crew mistook their position on the aerodrome (thought they were in a different location)

2.2.7 Fatigue

2.2.8 Reported incorrect location to ATC

2.2.9 Taxied fast

2.2.10 Did not refer to the aerodrome diagram

2.2.11 Did not listen to the automatic terminal information service (ATIS)

2.2.12 Works on the manoeuvring area were not previously advised by NOTAM

2.2.13 Used out-of-date or inaccurate publications or charts

2.2.14 Failed to apply or correctly observe sterile cockpit procedures

2.2.15 Other (please specify)

Runway Incursion Prevention Measures

2.3 *Markings, Signs and Lighting*

- 2.3.1 Not ICAO-compliant
- 2.3.2 Not provided
- 2.3.3 Irregularly spaced
- 2.3.4 Ambiguous and difficult to follow
- 2.3.5 Poorly sized
- 2.3.6 Poorly situated
- 2.3.7 Poorly maintained
- 2.3.8 Other (please specify)

2.4 *Clearances and instructions*

- 2.4.1 Not ICAO-compliant
 - Conditional
 - Follow
 - Other
- 2.4.2 Flight crew did not ask for clarification when they did not understand a clearance or instruction
- 2.4.3 Did not inform ATC when they could not comply with a clearance
- 2.4.4 Forgot part of the clearance or instruction
- 2.4.5 Entered the runway after being instructed to “hold short”
- 2.4.6 Lined up on the runway after instruction to taxi to the runway-holding position (point)
- 2.4.7 Took off without a clearance after being instructed to “line up and wait”
- 2.4.8 Took off without clearance after being instructed to taxi to the runway-holding position (point)
- 2.4.9 Landed or departed on the wrong runway
- 2.4.10 Landed or departed on the taxiway
- 2.4.11 Other (please specify)

3. VEHICLE DRIVERS AND PEDESTRIANS

3.1 *Communications*

3.1.1 Did not operate on the appropriate:

- Ground frequency for operations outside the runway strip
- Tower frequency for operations within the runway strip

3.1.2 Turned the radio volume down or off after initial communication with ATC

3.1.3 Other (please specify)

3.2 *Situational awareness*

3.2.1 Forgot the details/limits of any clearance to operate on the manoeuvring area

3.2.2 Distracted by:

- Current work
- High noise levels
- Monitoring more than one frequency and possibly a mobile telephone
- Being disoriented or lost on the aerodrome

3.2.3 Failure to report correct location

3.2.4 Other (please specify)

3.3 *Marking, Signs and Lighting*

3.3.1 Not ICAO-compliant

3.3.2 Not provided

3.3.3 Irregularly spaced

3.3.4 Ambiguous and difficult to follow

3.3.5 Poorly sized

3.3.6 Poorly situated

3.3.7 Poorly maintained

Runway Incursion Prevention Measures

3.3.8 Other (please specify)

3.4 *Procedures*

3.4.1 Not adequately familiar with the aerodrome and its procedural requirements

3.4.2 Did not refer to the current aerodrome NOTAM

3.4.3 Did not refer to the current aerodrome diagram

3.4.4 Used out-of-date or inaccurate publications or charts

3.4.5 Did not advise ATC of work that affected operations

3.4.6 Ground vehicles did not stop at required positions

3.4.7 Other (please specify)

3.5 *Clearances and instructions*

3.5.1 Did not comply with ATC clearances and instructions

3.5.2 Mistook a clearance intended for another vehicle or aircraft

3.5.3 The driver did not advise ATC that he/she did not understand the clearance or instruction

3.5.4 Other (please specify)

Runway Incursion Prevention Measures

E. Person submitting the form

Name

Title

Date

2 Instructions for completing the Runway Incursion Casual Factors Identification Form

Item

- A Indicate the date/time (in UTC) and place of the runway incursion.
- B Identify the aircraft, vehicles and persons involved in the runway incursion.
- C Classify the severity of the runway incursion according to Chapter 6 of the *Manual on the Prevention of Runway Incursions* (Doc 9870).
- D Fill out all causal and coincident factors applicable to the runway incursion.
- E Provide details of the person submitting the form and the date.

Note - the information on this form should be sent to the Authority, to facilitate global identification of runway incursion casual factors.