



สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand

GUIDANCE MATERIAL FOR PREVENTION OF RUNWAY INCURSIONS

CAAT-GM-OPS-RI

Revision: 00

Date: 22 December 2023



Director General of the Civil Aviation Authority of Thailand

Intentionally Left Blank

Foreword

Since the first ICAO Global Runway Safety Symposium held in Montréal, Canada, in May 2011, ICAO and the Runway Safety Programme (RSP) Partners have been working together to minimize and mitigate the risks of runway incursions, runway excursions and other events linked to Runway Safety.

The ICAO runway safety programme involves substantial collaboration with partner organizations including: Airports Council International (ACI); the Civil Air Navigation Services Organisation (CANSO); the European Aviation Safety Agency (EASA); European Organisation for the Safety of Air Navigation (EUROCONTROL); the United States Federal Aviation Administration (FAA); the Flight Safety Foundation (FSF); the International Air Transport Association (IATA); the International Council of Aircraft Owner and Pilot Associations (IAOPA); the International Business Aviation Council (IBAC); the International Coordinating Council of Aerospace Industries Associations (ICCAIA); the International Federation of Airline Pilots' Associations (IFALPA); and the International Federation of Air Traffic Controllers' Associations (IFATCA).

Recommendations were made at the runway safety seminars held in the Asia and Pacific and Middle East Regions for ICAO to produce a manual containing runway incursion prevention guidelines. Therefore, the objective of this manual is to help States, international organizations, aerodrome operators, air traffic service (ATS) providers and aircraft operators to implement runway safety programmes taking into account best practices already implemented by some States, international organizations, aerodrome operators, ATS providers and airlines.

The Runway Safety Programme promotes the establishment of Runway Safety Teams (RSTs) at airports as an effective means to reduce runway related accidents and incidents. The requirement for airports to establish a RST was one of the main outcomes of the first ICAO Global Runway Safety Symposium held in Montréal, Canada, in May 2011. The establishment of effective RSTs has helped to significantly reduce the runway safety related risks globally since 2011, with over 200 international airports world-wide having registered a RST with ICAO. The Runway Safety Programme Partners continue to support the establishment of effective RSTs with Runway Safety Go-Team Missions. To register a RST or to request a Runway Safety Go-Team Mission please visit <https://www.icao.int/safety/RunwaySafety>.

Table of Contents

Foreword	1
Table of Contents	2
Abbreviations	4
0. Introduction.....	0-1
0.1 Background.....	0-1
0.2 Purpose.....	0-1
0.3 Applicability	0-2
0.4 Reference (Refer regulation)	0-2
0.5 Definitions.....	0-3
1. Contributory Factors	1-1
1.1 Background.....	1-1
1.2 Breakdown in Communications.....	1-2
1.3 Pilot Factors	1-2
1.4 Air Traffic Control Factors.....	1-2
1.5 Airside Vehicle Driver Factors.....	1-3
1.6 Aerodrome Design Factors	1-3
2. Establishing A Runway Incursion.....	2-1
2.1 Runway Safety Teams.....	2-1
2.2 Objective.....	2-1
2.3 Generic Terms of Reference	2-1
2.4 Hot Spots	2-2
2.5 Actions Items	2-2
2.6 Responsibility for Tasks Associated With Action Items	2-2
2.7 Effective Of Completed Action Items	2-2
2.8 Education and Awareness	2-3
3. Recommendations for The Prevention of Runway Incursions.....	3-1
3.1 General principles.....	3-1
3.2 Aerodrome operator issues.....	3-2
3.3 Communications.....	3-2
3.4 Aircraft operator issues	3-3
3.5 Data collection and lesson sharing	3-4
3.6 Regulatory issues	3-5
3.7 Aeronautical information management (AIM).....	3-6
APPENDIX A Communications Guidance	A-1
1. Introduction.....	A-1
2. Factors Actors Affecting Communication Breakdown.....	A-1
3. Loss Of Communication and Runway Incursions.....	A-1
4. Aviation Language for International Services.....	A-2
5. Runway Frequency	A-2
6. Aerodrome Control Phraseologies	A-2
7. Aerodrome Control Phraseology – Readback.....	A-7
8. Avoiding Call Sign Confusion	A-7
9. Communication Techniques – General	A-7
10. What To Do If Uncertain Of Your Position On The Maneuvering Area	A-7
11. Conditional Clearances	A-8

APPENDIX B Aircraft Operator/Flight Crew Best Practices.....	B-1
1. Sterile Cockpit for Safety	B-1
2. Engine Out Taxiing (EOT)	B-2
3. Communications.....	B-3
4. Situational Awareness	B-4
5. Navigating on The Ground - Visual Aids	B-5
6. Training.....	B-6
7. Best Practices Planning of Airport Ground Operations.....	B-6
7.1 Briefing	B-6
7.2 Taxiing – navigating on the ground.....	B-7
7.3 Communication	B-8
7.4 Crossing or entering a runway	B-8
APPENDIX C Oversight Activities For Regulators.....	C-1
1. Safety Regulatory Audits and Inspections	C-1
2. Risk-Based Oversight	C-2
APPENDIX D Safety Management Systems	D-1
1. Safety Management Systems Guidance Materials Risk Based, Data Driven Systematic Approach To Safety.....	D-1
2. Assessing the Effectiveness of SMS Implementation	D-1
APPENDIX E Interpreting Events – Runway Incursion?	E-1
APPENDIX F Incident reporting and data collection.....	F-1
1. JUST CULTURE AND SYSTEMIC ISSUES.....	F-1
2. A Standard Approach to Runway Incursion Incident Reporting and Data Collection	F-2
APPENDIX G Classification of the severity of runway incursions /Runway incursion severity classification (RISC) calculator	G-1
1. Severity Classification	G-1
2. Factors That Influence Severity	G-1
3. Runway Incursion Severity Classification Calculator	G-2
APPENDIX H ICAO model runway incursion initial report form	H-1
APPENDIX I ICAO model runway incursion causal factors identification form	I-1
APPENDIX J ICAO Runway safety Toolkit.....	J-1

Abbreviations

Abbreviations	Meaning
<i>ADP</i>	Airside driving permit
<i>AIP</i>	Aeronautical Information Publication
<i>ARIA</i>	Aerodrome runway incursion assessment
<i>ATC</i>	Aerodrome runway incursion assessment
<i>ATIS</i>	Automatic terminal information service
<i>ATM</i>	Air traffic management
<i>NOTAM</i>	Notice to airmen
<i>PANS</i>	Procedures for Air Navigation Services
<i>RISC</i>	Runway incursion severity classification
<i>RTF</i>	Radiotelephony
<i>RVR</i>	Runway visual range
<i>RWY</i>	Runway
<i>SARPs</i>	Standards and Recommended Practices
<i>SMS</i>	Safety management system(s)
<i>SSR</i>	Secondary surveillance radar
<i>UHF</i>	Ultra-high frequency
<i>VHF</i>	Very high frequency

0. Introduction

0.1 Background

0.1.1 Runway incursions have sometimes led to serious accidents with significant loss of life. Although they are not a new problem, with increasing air traffic, runway incursions have been on the rise.

0.1.2 Aviation safety programmes 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.

0.2 Purpose

0.2.1 While runway safety takes into account issues such as foreign object debris and animals straying onto the runway and other logistical deficiencies, this 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 manoeuvring area and aerodrome management. 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.

0.2.2 Successful prevention of runway incursions requires the collaboration of air traffic controllers, pilots, vehicle drivers and aerodrome management. This manual is intended for regulators, aerodrome designers and planners, aircraft operators, air navigation service providers, aerodrome operators and investigation boards within:

- a) States having yet to commence a runway safety initiative;
- b) States seeking additional guidance;
- c) States having existing runway safety or reporting systems in place and seeking global harmonization; and
- d) States seeking harmonization with ICAO safety management system (SMS) provisions.

0.2.3 This manual aims primarily to provide global guidance essential for the implementation of national or local runway safety programmes. Such initiatives aim to remove hazards and minimize the residual risk of runway incursions and to reduce active failures and the severity of their consequences. In all aspects of this manual, the principles of safety management systems (SMS) should be used to mitigate or eliminate the hazardous factors.

0.2.4 Beginning with a high-level discussion of causal factors, the manual explores the factors that can result in runway incursions. Initiatives are also identified that aircraft and aerodrome operators and air navigation service providers can adopt to remove hazards, mitigate residual risks and create a cooperative, effective and safe operational environment.

0.2.5 Much can be learned by analyzing previous incidents and accidents. A standardized runway incursion initial report form and a runway incursion causal factors identification form are included (Appendices H and I respectively) which will facilitate a global approach to data collection. Comprehensive analyses of data are essential to distinguish trends and causal factors and develop cost-effective risk reduction strategies.

0.2.6 A runway incursion severity classification (RISC) calculator is also available (see Appendix G). Use of the RISC calculator will enable a consistent assessment to be made of the severity of runway incursion events.

0.2.7 Safety initiatives addressing awareness, training infrastructure and procedures, and technologies such as the ICAO runway safety toolkits are available (see Appendices J). Educational material for pilots, controllers, vehicle drivers and aerodrome operators is described. Finally, guidance is offered on how individual States can implement or improve runway incursion prevention safety programmes. Core to these initiatives is the uniform application of ICAO provisions which will ensure consistency of safe operations on the manoeuvring area.

0.3 Applicability

In 2008, the European Aviation Safety Agency (EASA) embedded this concept as an essential requirement to the European Union “EASA Basic Regulation”, a key element in helping to raise the safety of runway operations at European airports. More recently, the Commission Regulation No 139/2014 (or “Aerodrome Regulation” as it is sometimes known), and its associated Acceptable Means of Compliance (AMC) and Guidance Material (GM), further elaborate the importance of these runway safety arrangements. Other EU legal instruments covering standardised European rules of the air (SERA); air operations; the reporting, analysis and follow-up of occurrences in civil aviation; common requirements for the provision of air navigation services; and technical requirements and administrative procedures relating to air traffic controllers' licences and certificates also impact runway safety to one degree or another.

0.4 Reference (Refer regulation)

- European Action Plan for the Prevention of Runway Incursions V3.0 (November 2017)
- Runway Safety Programme – Global Runway Safety Action Plan First Edition, November 2017
- ICAO Manual on the Prevention of Runway Incursions (Doc 9870)
- ICAO Safety Management Manual (Doc 9859)
- ICAO Runway Safety Team Handbook Edition 2.0

0.5 Definitions

Term	Definition
<i>Abnormal Runway Contact (ARC)</i>	Any landing or take-off involving abnormal runway or landing surface contact.
<i>Aerodrome (ADRM)</i>	Occurrences involving aerodrome design, service, or functionality issues
<i>Bird Strike (Bird)</i>	A collision / near collision with or ingestion of one or several birds.
<i>Collision with Obstacle(s) (CTOL)</i>	Collision with obstacle(s), during take-off or landing whilst airborne.
<i>Ground Collision (GCOL)</i>	Collision while taxiing to or from a runway in use.
<i>Ground Handling (RAMP)</i>	Occurrences during (or as a result of) ground handling operations.
<i>Hot spot</i>	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.
<i>Just culture</i>	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.
<i>Local runway safety teams</i>	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.
<i>Loss of Control on the Ground (LOC-G)</i>	Loss of aircraft control while the aircraft is on the ground.
<i>Runway Excursion (RE)</i>	An event in which an aircraft veers off or overruns off the runway surface during either take-off or landing.
<i>Runway Incursion (RI)</i>	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.
<i>Runway incursion severity classification (RISC) calculator</i>	A computer programme that classifies the outcome of runway incursions.
<i>Sterile flight deck</i>	Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.

Term	Definition
<i>Undershoot / Overshoot (USOS)</i>	A touchdown off the runway surface.

1. Contributory Factors

1.1 Background

1.1.1 Pilots, controllers and drivers can all be involved in runway incursions. A survey of operational staff showed that approximately thirty per cent of drivers, twenty per cent of air traffic controllers and fifty per cent of pilots have reported being involved in runway incursions (reference: EUROCONTROL survey, 2001). Mitigation strategies that address all three parties should be included in systemic solutions.

1.1.2 As noted previously, runway incursions may be the result of many different factors. Analysis of such an occurrence can be executed using the SHELL Model (sometimes referred to as SHELL Model). Importantly, the SHELL Model does not draw attention to the 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 would represent human machine interface issues. The contributory factors described in this chapter (normally designated as Liveware by the SHELL Model) do not exclude contributions from other aspects of organizational life (e.g. policies, procedures, environment), which are critical factors associated with safety management systems and must be addressed to improve safety overall.

1.1.3 Runway incursions can be divided into several recurring scenarios. Common scenarios include:

- a) an aircraft or vehicle crossing in front of a landing aircraft;
- b) an aircraft or vehicle crossing in front of an aircraft taking off;
- c) an aircraft or vehicle crossing the runway-holding position marking;
- d) an aircraft or vehicle unsure of its position and inadvertently entering an active runway;
- e) a breakdown in communications leading to failure to follow an air traffic control instruction; and
- f) an aircraft passing behind an aircraft or vehicle that has not vacated the runway.

1.1.4 Statistics show that most runway incursions occur in visual meteorological conditions during daylight 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.

1.2 Breakdown in Communications

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

use of non-standardized phraseology;

- a) failure of the pilot or the vehicle driver to provide a correct readback of an instruction;
- b) failure of the controller to ensure that the readback by the pilot or the vehicle driver conforms with the clearance issued;
- c) the pilot and/or vehicle driver misunderstanding the controller's instructions;
- d) the pilot and/or vehicle driver accepting a clearance intended for another aircraft or vehicle;
- e) blocked and partially blocked transmissions; and
- f) overlong or complex transmissions.

See Appendix A for more detailed guidance on communication best practices.

1.3 Pilot Factors

Pilot factors that may result in a runway incursion include inadvertent non-compliance with ATC clearances. Often these cases result from a breakdown in communications or a loss of situational awareness in which pilots think that they are 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, when in fact it was not.

Other common factors include:

- a) inadequate signage and markings (particularly the inability to see the runway-holding position lines);
- b) controllers issuing instructions as the aircraft is rolling out after landing (when pilot workload and cockpit noise are both very high);
- c) pilots performing mandatory head-down tasks, which reduces situational awareness;
- d) pilots being pressed by complicated and/or capacity enhancement procedures, leading to rushed behavior;
- e) a complicated airport design where runways have to be crossed;
- f) incomplete, non-standard or obsolete information about the taxi routing to expect; and
- g) last-minute changes by ATC in taxi or departure routings.

See Appendix B for more detailed guidance on flight crew best practices including the sterile flight deck Concept.

1.4 Air Traffic Control Factors

The most common controller-related actions identified in several studies are:

- A. momentarily forgetting about:
 - a) an aircraft;
 - b) the closure of a runway;
 - c) a vehicle on the runway; or
 - d) a clearance that had been issued;
 - e) failure to anticipate the required separation, or miscalculation of the impending separation;
 - f) inadequate coordination between controllers;
 - g) a crossing clearance issued by a ground controller instead of an air/tower controller;

- i) misidentification of an aircraft or its location;
 - j) failure of the controller to provide a correct readback of another controller's instruction;
 - k) failure of the controller to ensure that the readback by the pilot or the vehicle driver
 - l) conforms with the clearance issued;
- B. communication errors;
- m) overlong or complex instructions;
 - n) use of non-standard phraseologies; and
 - o) reduced reaction time due to on-the-job training.
 - p) Other common factors include:
 - q) distraction;
 - r) workload;
 - s) experience level;
 - t) inadequate training;
 - u) lack of a clear line of sight from the control tower;
 - v) human-machine interface; and
 - w) incorrect or inadequate handover between controllers.

1.5 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) failure to comply with ATC instructions;
- c) inaccurate reporting of position to ATC;
- d) communication errors;
- e) inadequate training of airside vehicle drivers;
- f) absence of radiotelephony equipment;
- g) absence of 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.

1.6 Aerodrome Design Factors

1.6.1 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.

1.6.2 Common factors include:

- a) the complexity of the airport layout including roads and taxiways adjacent to the runway;
- b) insufficient spacing between parallel runways;
- c) departure taxiways that fail to intersect active runways at right angles; and
- d) no end-loop perimeter taxiways to avoid runway crossings.

See the *Aerodrome Design Manual* (Doc 9157) for more detailed guidance on aerodrome design.

2. Establishing A Runway Incursion

2.1 Runway Safety Teams

2.1.1 A runway incursion prevention programme should start with the establishment of runway safety teams at individual aerodromes. The primary role of a local runway safety team, which may be coordinated by a central authority, should be to develop an action plan for runway safety, advise management as appropriate on potential runway incursion issues and recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed based on local occurrences or combined with information collected elsewhere.

2.1.2 The team should 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.

2.2 Objective

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

- a) to improve runway safety data collection, analysis and dissemination;
- b) to check that signage and markings are ICAO-compliant and visible to pilots and drivers;
- c) to develop initiatives for improving the standard of communications;
- d) to identify potential new technologies that may reduce the possibility of a runway incursion;
- e) to ensure that procedures are compliant with ICAO Standards and Recommended Practices (SARPs); and
- f) to initiate local awareness by developing and distributing runway safety education and

training material to controllers, pilots and personnel driving vehicles on the aerodrome.

2.3 Generic Terms of Reference

Suggested generic terms of reference for a runway safety team are to 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 in order to establish local hot spots or
- c) problem areas at the aerodrome;
- d) working as a cohesive team to better understand the operating difficulties of personnel
- e) working in other areas and recommending areas for improvement;
- f) ensuring that the recommendations contained in the *Manual on the Prevention of Runway Incursions* (Doc 9870) are implemented;
- g) identifying any local problem areas and suggesting improvements;
- h) conducting a runway safety awareness campaign that focuses on local issues, for example, producing and distributing local hot spot maps or other guidance material as considered necessary; and
- i) regularly reviewing the airfield to ensure its adequacy and compliance with ICAO SARPs.

2.4 Hot Spots

The ICAO definition of a hot spot is:

“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.”

Note 1.— The criteria used to establish and chart a hot spot are contained in the PANS-ATM (Chapter 7) and Annex 4 — Aeronautical Charts (Chapters 13, 14 and 15).

Note 2.— Hazards associated with hot spots should be mitigated as soon as possible and so far as is reasonably practicable.

Aerodrome charts showing hot spots should be produced locally, checked regularly for accuracy, revised as needed, distributed locally, and published in the Aeronautical Information Publication (AIP).

Once hot spots have been identified, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, to manage and mitigate the risk. These strategies may include:

- a) awareness campaigns;
- b) additional visual aids (signs, markings and lighting);
- c) use of alternative routings;
- d) construction of new taxiways; and
- e) the mitigation of blind spots in the aerodrome control tower.

2.5 Actions Items

A plan containing action items for mitigating runway safety deficiencies 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 of, or facilities at, the aerodrome; air traffic control procedures; airfield access requirements; pilot and vehicle operator awareness; and production of hot spot maps.

2.6 Responsibility for Tasks Associated With Action Items

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

2.7 Effective Of Completed Action Items

Periodically the effectiveness of implemented and/or completed action items should be assessed. 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 that action item.

2.8 Education and Awareness

2.8.1 Education and awareness material such as newsletters, posters, stickers and other educational information are invaluable tools for reducing the risk of runway incursions. The ICAO runway safety toolkit, discussed in Appendix J, provides a wealth of information for educational and awareness programmes.

2.8.2 Other awareness material that may be helpful to local runway safety teams is available from:

- 1) Airports Council International (ACI)
www.airports.org
- 2) Air Services Australia
www.airservicesaustralia.com
- 3) European Organisation for the Safety of Air Navigation (EUROCONTROL)
www.eurocontrol.int/runwaysafety/public/subsite_homepage/homepage.html
- 4) Federal Aviation Administration (FAA)
www.faa.gov/runwaysafety
- 5) International Air Transport Association (IATA)
www.iata.org
- 6) International Civil Aviation Organization (ICAO)
www.icao.int/fsix/res_ans.cfm
- 7) International Federation of Airline Pilots' Associations (IFALPA)
www.ifalpa.org
- 8) Transport Canada
www.tc.gc.ca/civilaviation/systemsafety/posters/tools.htm
- 9) United Kingdom Safety Regulation Group
<http://www.caa.co.uk>

3. Recommendations for The Prevention of Runway Incursions

3.1 General principles

#	Recommendation	Action
1	Promote and make available specific joint training and familiarization in the prevention of runway incursions to Pilots, Air Traffic Controllers and Manoeuvring Area Vehicle Drivers.	Aircraft Operator, Regulator.
2	a. Assess how the subject of Runway Safety is included within initial and refresher/recurrent training for operational staff. b. Consider what more can be done to include the viewpoint and procedures of other stakeholders operating on the aerodrome.	Aircraft Operator, Regulator.
3	a. Ensure that adequate information is collected on all runway incursion incidents so that causal and contributory factors can be identified, lessons can be learned and actions taken. b. In addition, the salient points from investigation reports should be disseminated for Units, Organisations, and National and European stakeholders as information that may influence future safety improvement actions.	Aircraft Operator.
4	Assess the arrangements currently in place that coordinate changes to manoeuvring area procedures, including works in progress. Guidance Note: This assessment should include the role of the aerodrome local Runway Safety Team in change management.	Regulator.
5	a. Assess the implementation and effectiveness of Safety Management Systems related to runway safety activities. b. Ensure a continued focus on runway safety in internal audit activities.	Aircraft Operator, Regulator.
6	Continue to develop components of SMS as detailed by ICAO, EU or EUROCONTROL (ESARR3) provisions that move towards a data driven, performance-based safety system approach with an emphasis on safety assurance and identifying and sharing best practice and signs of excellence.	Aircraft Operator, Regulator.

3.2 Aerodrome operator issues

#	Recommendation	Action
1	<p>Assess all arrangements associated with aerodrome construction works/works in progress (WIP):</p> <ul style="list-style-type: none"> a. Ensure that up to date information about temporary work areas and consequential operational impact is adequately presented and disseminated. b. Ensure that sufficient coordination between ANSPs and Aerodrome Operator is in place prior to notification to the Regulator. c. Ensure that existing signs are covered and markings are removed when appropriate. d. Ensure that temporary signs and markings are clearly visible, adequate and unambiguous in all appropriate conditions. e. Aerodrome construction contractors and other personnel working airside should be appropriately briefed (about runway safety/runway incursion prevention) prior to starting work and be properly supervised whilst they are on the aerodrome. 	Aircraft Operator

3.3 Communications

#	Recommendation	Action
1	Implement, monitor and ensure the use of standard phraseologies as applicable: EU: SERA Part C AMC, ICAO: Doc. 4444, PANS-ATM.	Aircraft Operator.
2	Implement, monitor and ensure the use of the readback procedure (also applicable to manoeuvring area drivers and other personnel who operate on the manoeuvring area).	Aircraft Operator.
3	Where practicable, improve situational awareness by conducting all communications associated with runway operations using aviation English.	Aircraft Operator.
4	Consider regular evaluation of radio telephony practices, assessing elements such as frequency loading and use of EU/ICAO compliant phraseology.	Aircraft Operator.
5	ANSPs and Aerodrome Operators should implement procedures that ensure significant aerodrome information which may affect operations on or near the runway, in addition to that found in NOTAMS and on the ATIS, should be provided to manoeuvring area drivers and pilots 'real-time' using radio communication.	Aircraft Operator.

3.4 Aircraft operator issues

#	Recommendation	Action
1	Provide training and assessment for pilots regarding Aerodrome signage, markings and lighting.	Aircraft Operator.
2	Pilots shall not cross illuminated red stop bars when lining-up or crossing a runway (or on a taxiway where placed), unless contingency procedures are in force, e.g., to cover cases where the stop bars or controls are unserviceable.	Aircraft Operator.
3	Ensure that flight deck procedures contain a requirement for explicit clearances to cross any runway. Guidance Note: Includes non-active runways.	Aircraft Operator.
4	Flight Crew should not enter a runway for departure if not ready to take-off. Flight Crew must advise Air Traffic Control on first contact with the Tower if additional time on the runway is required for operational reasons.	Aircraft Operator.
5	If received significantly early, flight crew should confirm with ATC the line-up/take-off or crossing clearance when approaching the runway holding position.	Aircraft Operator.
6	Flight crew should consider confirming landing clearance on short final, if ATC issued it more than 5 nautical miles from touch down.	Aircraft Operator.
7	Ensure a means to indicate receipt of landing / line-up / take off / crossing clearances in the cockpit.	Aircraft Operator.
8	Pilots are advised to switch on forward facing lights when in receipt of a take-off clearance and show forward facing lights on the approach.	Aircraft Operator.
9	Pilots must be made aware of current safety significant airport information.	Aircraft Operator.
10	During taxi for departure or during approach, pilots should not accept a runway change proposal if time to re-programme the FMS / re-brief is not sufficient. This includes a change of departure intersection.	Aircraft Operator.
11	If Pilots have any doubt as to their exact position on the surface of an aerodrome, they should contact Air Traffic Control and follow the associated ICAO procedure (ICAO Doc.4444, PANS-ATM).	Aircraft Operator.
12	A pilot should avoid being "head-down" to ensure a continuous external watch is maintained whilst taxiing	Aircraft Operator.

#	Recommendation	Action
13	If there is any doubt when receiving a clearance or instruction, clarification should be requested immediately from Air Traffic Control.	Aircraft Operator.
14	Aerodrome charts or an equivalent electronic device should be displayed on the flight deck during taxi. This includes when operating at the home aerodrome.	Aircraft Operator.
15	Avoid accepting rapid exit taxiways or angled taxiways for line-up that limits the ability of the Flight crew to see the runway threshold or the final approach area.	Aircraft Operator.
16	Ensure that crews are aware of the significance of red lights (e.g., stop bars and other red lights) used in line with alerting systems to prevent incorrect entry onto a runway and to enhance situational awareness.	Aircraft Operator.
17	A pilot shall only apply Engine-Out–Taxi (EOT) procedure after careful consideration of local and operational circumstances so as to avoid a conflict with sterile cockpit procedures.	Aircraft Operator.

3.5 Data collection and lesson sharing

#	Recommendation	Action
1	Review and promote the implementation of occurrence reporting regimes and ensure their compatibility with ICAO, EU and national provisions.	Regulator, Aircraft Operator
2	Disseminate de-identified information on actual runway incursions locally to increase understanding of causal and contributory factors to enhance lesson learning.	Regulator, Aircraft Operator.

3.6 Regulatory issues

#	Recommendation	Action
1	Confirm that all infrastructure, practices and procedures relating to runway operations are in compliance with EU Regulations and, as applicable, any ICAO and/or national provisions.	Regulator.
2	Ensure the implementation of safety management systems is in accordance with EU Regulations and, as applicable, any ICAO and/or national standards.	Regulator.
3	Ensure that safety assurance documentation for operational systems (new and modified) demonstrates compliance with regulatory and safety management system requirements. .	Regulator.
4	Ensure that Aerodrome Operators and Air Navigation Service Providers regularly review the operational use of aeronautical ground lighting e.g., stop bars, to ensure a robust policy to protect the runway from the incorrect presence of traffic. Guidance Note: Aircraft operators should also be invited to review to provide a wider perspective.	Regulator, Aircraft Operator.
5	Regulators should focus on runway safety in their oversight activities e.g., preventing runway incursion risks.	Regulator.
6	Ensure that the content of training materials for Pilots, Air Traffic Controllers and Drivers working on the manoeuvring area includes runway incursion prevention measures and awareness.	Regulator.
7	Ensure that environmental procedures e.g., noise mitigation rules take due account of runway safety. Guidance Note: Those noise mitigation elements that could potentially affect runway incursion/excursion risk include (but are not limited to): Airfield design and alignment based on noise consideration, noise preferred runway or runway operational mode, time-based runway selection to share noise load, runway specific curfews, arrival/departure curfews etc. which may (for example) require additional backtrack, runway crossings or other similar and otherwise avoidable risk.	Regulator.
8	Assess the performance of the change management process for procedural and/or infrastructural changes on the manoeuvring area.	Regulator.

#	Recommendation	Action
9	<p>National agencies charged with the oversight of aviation safety should consider how they discharge their responsibilities for runway safety which may include:</p> <ul style="list-style-type: none"> a. The establishment and coordination of a national/state runway safety group that, inter alia, will address the prevention of runway incursions and runway collision risk. b. Ensuring the prevention of runway incursions in national runway safety plans/State Safety Plans. c. Supporting the state-wide promotion and coordinated implementation of EAPPRI v3.0. d. Participating in aerodrome local Runway Safety Teams. 	Regulator.

3.7 Aeronautical information management (AIM)

#	Recommendation	Action
1	<p>Ensure that the means and procedures are established at aerodromes for the collection of post-flight information and</p> <p>to allow users to provide feedback on the availability and quality of aeronautical information, in accordance with ICAO Annex 15 Aeronautical Information Services.</p>	Aircraft Operator.
2	<p>The ergonomics of aeronautical maps and charts and relevant documentation should be improved to enhance their readability and usability, and be in accordance with relevant standards for aeronautical charts.</p>	Aircraft Operator.
3	<p>Move towards digital aeronautical information management to provide and use high quality aeronautical and aerodrome data in an interoperable exchange format.</p>	Regulator.
4	<p>Improve situational awareness by adopting the use of technologies that enable operational staff on the manoeuvring area to confirm their location in relation to the runway e.g.</p> <p>via GPS with transponder or airport moving maps, visual aids, signs etc.</p>	Aircraft Operator.

APPENDIX A Communications Guidance

1. Introduction

The demanding environment associated with aerodrome operations on a runway requires that all participants accurately receive, understand, and correctly read back all air traffic control clearances and instructions. All access to a runway (even if non-active) should take place only after a positive ATC clearance has been given / received and a correct readback has been provided / accepted, and after the stop bar (where provided) has been switched off; providing a clearance in a timely manner, as the aircraft is approaching the relevant runway, will help to prevent runway incursions. This appendix offers guidance materials built upon Best Practices from aerodromes that may help to protect the integrity of voice communications for operational staff working on the maneuvering area.

2. Factors Actors Affecting Communication Breakdown

From studies of investigation reports, and from reports/ surveys regarding runway safety occurrences, it is apparent that communications issues are frequently a causal or contributory factor.

Examples of factors leading to communication breakdown on the maneuvering area include, but are not limited to:

- Complex instructions to different aircraft.
- Controller/pilot/driver high speech rate.
- Two different languages being used.
- Frequency congestion / blocked frequency.
- Use of non-standard EU/ICAO phraseology.
- Call sign confusion.
- Absent, poor or incomplete readback.
- Incomplete or ambiguous clearances.
- Inadequate aviation English
- Heavily accented English.
- Different frequencies associated with runway operations.
- Inadequate driver communication training.

3. Loss Of Communication and Runway Incursions

Entering a runway (to line up or cross) or landing without a valid ATC clearance will lead to the incorrect presence of traffic on a runway and require a runway incursion to be reported. Pilots should squawk 7600 in VMC or IMC to advise loss of communication on the maneuvering area.

Be aware that when communication is lost on the approach most pilots will land without a clearance. Pilots should squawk 7600 in VMC or IMC to advise loss of communication

4. Aviation Language for International Services

Use of Aviation English is proven to be a significant factor in the establishment and maintenance of situational awareness for all participants associated with runway operations.

5. Runway Frequency

It is recommended that communications for all operations on a runway (landing, departing, crossing aircraft, vehicles crossing and runway inspections etc.) take place on the VHF frequency assigned for that runway; this will help to maintain high levels of situational awareness. To accommodate vehicles that are equipped with UHF radios only, frequency 'coupling' should be employed to ensure that all UHF communications associated with runway operations are simultaneously transmitted on the appropriate VHF frequency (and vice versa). When using RTF frequency coupling, Controllers (and drivers) need to be mindful of 'clipped' transmissions, where the beginning or end of the transmission is not broadcast/received.

Concerns about runway frequency congestion due to drivers using VHF can be alleviated by treating every use of the runway as a planned traffic movement, and keeping detailed discussions e.g., FOD descriptions, for another frequency.

Some aerodromes (e.g., Brussels Airport) have taken the principles described above further and have introduced the concept known as "Triple One": One Runway, One Frequency, One Language (English) as a means to further improve communications/situational awareness for all operations on a runway.

6. Aerodrome Control Phraseologies

Use of established standard EU and ICAO phraseologies for radio telephony communication between aircraft and ground stations is essential to avoid misunderstanding, and to reduce the time required for communication. EU/ ICAO phraseology shall be used in all situations for which it has been specified. When standardised phraseology for a particular situation has not been specified, plain language shall be used. EU SERA (AMC of SERA 14001) and ICAO Annex 10 Volume II, Aeronautical Telecommunications both state this requirement is as follows:

"Standardised phraseology shall be used in all situations for which it has been specified. Only when standardized phraseology cannot serve an intended transmission, plain language shall be used."

All personnel involved in operations associated with runways must use clear, concise and unambiguous phraseologies. Such usage will ensure that safety levels are maintained or improved upon.

A. TAXI PROCEDURES

For departure

ATC (call sign) TAXI TO HOLDING POINT [number] RUNWAY (number)

ATC (call sign) BACKTRACK RUNWAY (number);

Or where detailed taxi instructions are required

Other general instructions

ATC (call sign) TAXI TO HOLDING POINT [number] RUNWAY (number) HOLD SHORT OF RUNWAY (number) [contact TWR]

Caution should be exercised when using the phrase 'follow', at or near runway holding points as pilots and drivers have been known to interpret this as clearance to continue following traffic as it enters or lines-up on a runway.

ATC (or CROSS RUNWAY (number)) TIME (time);

ATC (call sign) VACATE RUNWAY

It should be noted that the words "**position ... and / or hold**" may be misunderstood by some pilots due to the use of non ICAO phraseology within North America, where "taxi into position and hold..." is used by ATC when issuing a line up clearance. There have been a number of runway safety occurrences with the key words 'position' and 'hold' misapplied, therefore read-backs should be very carefully monitored when using these words. See also, Holding instructions from ATC below.

PILOT/DRIVER (call sign) RUNWAY VACATED

The Pilot or Driver may not always be sure if they are clear of the ILS sensitive area. Don't assume runway vacated means no runway re-entry for some aerodrome layouts.

ATC (call sign) TAXI VIA RUNWAY (number);

ATC (call sign) EXPEDITE TAXI (reason)

PILOT (call sign) REQUEST BACKTRACK

PILOT/DRIVER (call sign) EXPEDITING

ATC (call sign) BACKTRACK APPROVED

ATC (call sign) TAXI SLOWER (reason)

PILOT/DRIVER (call sign) SLOWING DOWN

B. HOLDING INSTRUCTIONS FROM ATC

ATC (call sign) HOLD (direction) OF (position, runway number, etc.);

READBACK FROM PILOTS/DRIVERS

(call sign) HOLDING;
 (call sign) HOLDING SHORT.

ATC (call sign) HOLD POSITION;

ATC (call sign) HOLD (distance) FROM (position)

It should be noted that aircraft should not hold closer to a runway than specified in ICAO Doc. 4444, Chapter 7, 7.6.3.1.3.1.

... to hold not closer to a runway than specified in ICAO Doc. 4444, PANS-ATM, Chapter 7, 7.6.3.1.3.1

ATC (call sign) HOLD SHORT OF (position);

The procedure words, ROGER and WILCO, are insufficient acknowledgement of the instructions HOLD, HOLD POSITION and HOLD SHORT OF (position). In each case the acknowledgement shall be by the phraseology HOLDING or HOLDING SHORT, as appropriate.

C. TO CROSS A RUNWAY

PILOT/DRIVER (call sign) REQUEST CROSS RUNWAY
R

***Note** - If the control tower is unable to see the crossing aircraft or vehicle (night, low visibility, etc.), the instructions should always be accompanied by a request to report when the aircraft or vehicle has vacated the runway.*

ATC (call sign) CROSS RUNWAY (number)
 [REPORT VACATED]

AT (call sign) TAXI TO HOLDING POINT [number]
 [RUNWAY (number)] VIA (specific route to be followed), [HOLD SHORT OF RUNWAY
 (number)] or [CROSS RUNWAY (number)]

***Note** - The pilot or driver will, when requested, report “RUNWAY VACATED” when the aircraft or vehicle is clear of the runway.*

D. PREPARATION FOR TAKE-OFF -CLEARANCE TO ENTER RUNWAY AND AWAIT TAKE-OFF CLEARANCE.

ATC [call sign] LINE UP RUNWAY [number];

ATC [call sign] LINE UP. BE READY FOR IMMEDIATE DEPARTURE:

Good practice read back example

Proposing ‘be ready for immediate departure’ or asking the question ‘are you ready for immediate departure?’ does not imply a take-off clearance has been given

The phrase ‘Go ahead’ (meaning pass your message) may be misinterpreted as an instruction to move the vehicle or aircraft and should therefore NOT be used

E. MULTIPLE LINE-UPS ON THE SAME RUNWAY.

Line-up instructions may be issued to more than one aircraft at different points on the same runway, using the ICAO criteria contained in ICAO Doc. 7030. In addition to the standard phraseology in Chapter 12 of PANS-ATM the following ATC phraseology shall be used:

ATC (call sign) LINE UP AND WAIT RUNWAY 22, INTERSECTION ALPHA ONE, NUMBER 2 FOR DEPARTURE, NUMBER ONE AN AIR FRANCE B737 DEPARTING FROM INTERSECTION BRAVO.

PILOT LINING UP AND WAIT RUNWAY 22, INTERSECTION ALPHA ONE, NUMBER 2, (call sign)

ICAO Doc. 4444, PANS-ATM 12.2.7 Conditional phrases, such as “behind landing aircraft” or “after departing aircraft”, shall not be used for movements affecting the active runway(s), except when the aircraft or vehicles concerned are seen by the appropriate controller and pilot. The aircraft or vehicle causing the condition in the clearance issued shall be the first aircraft/vehicle to pass in front of the other aircraft concerned. In all cases a conditional clearance shall be given in the following order and consist of:

F. CONDITIONAL CLEARANCES

For example:

ATC “(call sign), BEHIND DC9 ON SHORT FINAL,

- b) the condition;
- c) the clearance; and
- d) brief reiteration of the condition,

Note - This makes explicit the need for the aircraft receiving the conditional clearance to identify the aircraft or vehicle causing the conditional clearance.

The acknowledgement of a conditional clearance must contain the condition in the read-back e.g.

PILOT BEHIND LANDING DC9 on SHORT FINAL, LINING UP BEHIND call sign.

ATC (call sign) [that is] correct

Note: The procedure also makes no provision for vehicles to be included in the process of receiving a conditional clearance. They may only be the subject of a conditional clearance.

G. TAKE-OFF CLEARANCE

ATC (call sign) CLEARED FOR TAKE-OFF
 [REPORT AIRBORNE].... Applicable for Low
 Visibility operations;

Best Practice to prevent wrong runway selection, or
 when more than one runway in use, always use the
 designator in the instruction,

ATC (call sign) RUNWAY (number) CLEARED FOR TAKE-
 OFF

When take-off clearance has not been complied with,

ATC (call sign) TAKE OFF IMMEDIATELY OR VACATE
 RUNWAY [(instructions)];

ATC (call sign) TAKE OFF IMMEDIATELY OR HOLDSHORT
 OF RUNWAY

Or to cancel a take-off clearance

ATC (call sign) HOLD POSITION, CANCEL TAKE-OFF runway
 I SAY AGAIN CANCEL TAKE-OFF (reasons);

PILOT (call sign) HOLDING;

Or to stop a take-off after an aircraft has commenced
 take-off roll

ATC (call sign) STOP IMMEDIATELY [(repeat aircraft call
 sign) STOP IMMEDIATELY]

PILOT (call sign) STOPPING;

7. Aerodrome Control Phraseology – Readback

Of equal importance to the usage of correct phraseologies is the need to obtain the required readback, in the order required and accurately. Listed below are the provisions provided in the relevant ICAO documents pertaining to this safety critical element of runway operations, together with the paragraph number in the ICAO document.

In ICAO Doc.4444 PANS-ATM the requirements regarding readbacks are as follows: “Read-back of clearances and safety-related information

8. Avoiding Call Sign Confusion

The use of full call signs of all traffic operating on or in close proximity to a runway has been identified as a critical element in enhancing safety for runway operations. Whilst the ICAO provisions allow for use of abbreviated call signs in certain circumstances, it is deemed Best Practice not to apply any shortening of call signs in this situation.

Call sign confusion is not restricted to similar call signs between aircraft. Confusion may occur between aircraft and vehicle call signs. Confusion with infrastructure may also be part of call sign confusion incidents.

9. Communication Techniques – General

Detailed below are the relevant provisions laid down in Annex 10, Aeronautical Communications with regard to radio transmission guidelines and techniques.

Speech-transmitting techniques should be such that the highest possible intelligibility is incorporated in each transmission. Fulfilment of this aim requires that flight crew and ground personnel should:

- a) Enunciate each word clearly and distinctly;
- b) Maintain an even rate of speech. When a message is transmitted to an aircraft and its contents need to be recorded the speaking rate should be at a slower rate to allow for the writing process. A slight pause preceding and following numerals makes them easier to understand;
- c) Maintain the speaking volume at a constant level;
- d) Be familiar with the microphone operating techniques particularly in relation to the maintenance of a constant distance from the microphone if a modulator with a constant level is not used;
- e) Suspend speech temporarily if it becomes necessary to turn the head away from the microphone.

10. What To Do If Uncertain Of Your Position On The Maneuvering Area

Pilots and airside maneuvering area drivers do not knowingly enter a runway without a valid ATC clearance. When this happens, it is most likely because the pilot or driver is uncertain of their position and situational awareness has been lost. ICAO has developed a procedure about what to do if you are a pilot, driver or air traffic controller with a team member who does not know that they are on a runway or taxiway.

11. Conditional Clearances

Safety studies have demonstrated that the misapplication and misinterpretation of conditional clearances can be a contributing factor in runway incursions.

If conditional clearances are used, in accordance with ICAO provisions, ANSPs should ensure a policy and robust procedures are developed and implemented. Moreover, ANSPs should assess conditional clearance operational procedures and practices. There should be a clear operational justification for the use of conditional clearances, i.e. to help improve the flow and throughput of traffic. Conditional clearances should not be used for the convenience of the controller and/or pilot when there is no operational requirement. Strict observations of conditional clearance conditions by controllers should be monitored as part of routine operational supervision and ongoing competency assessments.

Consider if the operational use of conditional clearances can be removed or reduced at specific aerodromes where their use cannot be justified for capacity enhancement or traffic throughput purposes.

APPENDIX B Aircraft Operator/Flight Crew Best Practices

Runway incursions often involve misunderstanding/ communication breakdown between operational staff e.g. pilots, vehicle drivers on the maneuvering area and air traffic controllers. Miscommunication can lead to a loss of situational awareness and a ground navigation error. The majority of runway incursions occur during taxiing out and departure operations.

Aircraft Operators are invited to review the materials put forward, and where necessary, amend their Standard Operating Practices with regard to ground operations.

Principle points to highlight for pilots include:

- Runway incursions may lead to Go-arounds or indecision about whether to Go-around or not;
- Inexperience, lack of practice with procedures or unclear procedures may lead to runway incursions;
- Air ground lighting is an important guidance when on or near a runway;
- Aerodrome infrastructure design is important to building situational awareness;
- A current aerodrome chart is essential for accurate navigation on the ground;
- Errors by air traffic controllers, pilots or drivers are typically caught within their peers. Thus pilots play an important part in catching the errors they have made themselves, other pilots and air traffic controllers;
- In today's air traffic management system, compliance with ICAO requirements to use aviation English on the maneuvering area is a vital safety net.
- Not gathering (i.e. not seeing or hearing) information clearly or correctly is a frequent cause of incursions when left unchallenged. An important communication factor in runway incursion incidents is incorrect or incomplete readback by pilots or air traffic controllers, particularly when conditional clearances are used.
- Misunderstandings are more likely to arise when a pilot is doing other tasks, being head-down.
- Examples of this are conducting aircraft performance calculations, deferred checklist items, administrative tasks, starting an engine during an engine-out taxi, etc.

Safety reports show that Public Address announcements to passengers or commercial announcements are a direct source of error in many events.

1. Sterile Cockpit for Safety

A key point in the prevention of runway incursions is to apply better preventative measures during the taxi-phase. Reduced workload will provide for increased attention to the taxi phase and allow an updated and accurate positional and situational awareness.

The current generation of aircraft is highly automated with complex systems, which allow preparation and programming of the total flight on the ground. Flight deck workload peaks have been shifted to now also include the ground phase of aircraft operations. Appropriate measures should be undertaken to accommodate flight crew workload on the ground. The taxi phase should be treated as a "critical phase of flight". Thus it is strongly advised to adopt the sterile flight deck concept whilst taxiing.

During movement of the aircraft the flight crew must be able to focus on their duties without being distracted by non-flight related matters. This includes public address announcements, performance (re)calculations, administrative tasks, briefings, items like flight control checks, and or checklists. Preferably these should all be completed before taxi-out. Taxi items should come after start items. If an unforeseen change makes any of these actions necessary after commencement of taxi, they should be done with the aircraft stopped and the

parking brake set. Ensure cabin crews are aware of this requirement if it is not a Standard Operating Procedure. The following definition of a 'Sterile Flight Deck' is offered as a reference.

2. Engine Out Taxiing (EOT)

Due to the multiple safety, efficiency and operational factors which vary for every aircraft, airport lay-out, weather conditions, surface conditions and traffic load, Engine Out Taxiing (EOT) procedure should not be mandatory and crews should assess its application depending on conditions.

The incorporation of an approved, standardized EOT procedure into the Operations Manual, as part of the taxiing procedures, provided the relevant crew training is performed, should be mandatory if the procedure is to be applied. The EOT procedure must clearly identify and address any areas of potential confusion like responsibilities and task allocation during start up and shutdown, and criteria for when it may or may not be applied. Moreover, the Operations Manual shall clearly state that the EOT procedure is carried out at the Pilot-In-Command's discretion, after careful consideration of local and operational circumstances.

Such circumstances include but are not restricted to:

- 1) Local airport restrictions on such operations, for example taxiway/ramp surface gradients.
- 2) Maneuverings space, tight turns and 180 degree- turns.
- 3) Possibility of Foreign Object Damage (FOD) due to increased jet blast.
- 4) Compliance with engine warm-up and cool down times for thermal stabilization as specified by the aircraft manufacturer.
- 5) Weather conditions and taxiway/ramp surface status (for example slippery, wet) that may preclude the application of the procedure.
- 6) Operating procedures related to aircraft system monitoring and checklist accomplishment, which must be consistent with a late engine start (during taxi-out) and/or an early engine shut-down (during taxi-in.)

If the Pilot-In-Command elects to carry out the EOT procedure in accordance with the above, the following factors should be taken into account:

- 1) Caution must be exercised when taxiing with one (for twin engine) or two engine(s) shut down, to compensate for the possible asymmetric force.
- 2) Slow and/or tight taxi turns in the direction of the operating engine may not be possible at high gross weight.
- 3) Aircraft system operation need to be carefully considered to ensure critical systems used for taxi remain operative, e.g. nose wheel steering, brakes, ice protection system.

An engine start procedure requires time and attention, which should not be detrimental to other taxiing duties, such as external visual scanning, systems monitoring and checklist accomplishment. Consideration should be given to the expected departure queue with regards to the time needed for engine start and "after start" items;

An engine should not be started:

- 1) By the pilot having the controls during taxi.
- 2) When taxiing on an apron or a complex taxiway layout.
- 3) When crossing an active runway.
- 4) When taxiing in low visibility conditions

3. Communications

The following guidelines, in addition to the formal R/T procedures as laid down in PANS-ATM, ICAO Doc. 4444 PANS-ATM might help pilots in maintaining adequate communication on the maneuvering area. See also Appendix A of this document (Communications Guidance) for further information.

- Expect that ATC will use the ICAO readback procedure (including drivers and other personnel who operate on the maneuvering area) to confirm that the message is correctly understood.
- Improve situational awareness, when practicable, by conducting all communications associated with runway operations using aviation English.
- Improve situational awareness, when practicable, by conducting all communications associated with runway operations on a common frequency. This allows situational awareness of other traffic for you and the other traffic and can only be achieved when a message is understood by all meaning that all communications are conducted using aviation English on the runway frequency
- Extra care should be taken when accepting a conditional clearance. Although a conditional clearance could be an aid in the situational awareness for specific situations, it might also restrict it. Therefore, it is situation dependent.
- Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would have missed an ATC call or is in doubt, it is a good practice to request it again. Similarly, if one crew member has a different perception of a situation or clearance to the other, ATC should be asked to clarify.
- Any clearance to cross or enter an active runway should be heard, understood, and confirmed by all flight crew members.

4. Situational Awareness

Situational awareness is about knowing where you are and where you want to go, as well as building the picture of the traffic in the vicinity. Even during daylight and in good visibility, people get lost. Even worse is the situation where you assume you know your position, but find yourself elsewhere. At times of darkness and Low Visibility, additional care must be taken to ensure that accuracy in navigation on the ground and the highest degree of situational awareness is undertaken by all members of the flight crew. If in doubt, seek clarification from ATC

See also Appendix A of this document (Communications Guidance) for further information.

- If Pilots have any doubt as to their exact position on the surface of an aerodrome, they should stop and contact ATC and follow the associated ICAO procedure (Doc. 4444, PANS-ATM).
- Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would doubt on the situational awareness, a good practice would be to stop the aircraft taxiing or get immediate clarification by ATC. Normally ATC is very familiar with the particular aerodrome and thus in the best position to help re-establish the situational awareness.
- Pilots should be “head-up” for a continuous watch while taxiing, and should maintain “sterile flight deck” during taxi phase. The pilot taxiing the aircraft should orient himself mostly by outside reference with the help of signs and ground markings. The other pilot should continuously verbally give navigational information. Promote best practices on flight deck procedures while taxiing and during final approach - to include the “sterile flight deck” concept.
- All access to a runway (even if non-active) should take place only after receiving a positive clearance and providing a correct readback, and after the stop bar (where provided) has been switched off; entering a runway without a valid ATC clearance will create a runway incursion. v
- Pilots shall not cross illuminated red stop bars when lining up or crossing a runway, unless contingency procedures are in force, e.g. to cover cases where the stop bars or controls are unserviceable. In this case, pilots should check with ATC that they are allowed to cross an illuminated stop bar.
- At the moment, stop bars and runway status lights are the only visual systems providing a clear red signal. This should be interpreted as a clear danger sign, thus stop taxiing.
- Crews approaching a runway with an instruction to hold short should stop the aircraft as close as possible to the holding point to make sure they clear taxiways behind them. However, the cockpit position must not cross the holding point markings and so allow the crew to continue to see all signs and markings, and the stop bars (where fitted).
- Ensure that flight deck procedures contain a requirement for explicit clearances to cross any runway, this includes non-active runways. This means that a conditional clearance for crossing should not be accepted.
- Ensure a means to indicate receipt of landing / line-up / take off / crossing clearances in the cockpit. Proper crew resource management indicates that when in doubt, all available sources should be consulted. Especially for runway operations it is essential that both pilots are fully aware of the factual clearance. ATC should cooperate as long as it takes for the crew to understand ATC instructions.
- During taxi for departure or during approach, Pilots should refrain from accepting a runway change proposal if time to re-brief is not sufficient. This includes a change of departure intersection. It is tempting to save time, fuel, capacity enhancement and for environmental reasons to accept a last-minute change for another runway or runway entry. Pilots should be fully aware that this could lead to the hurry-up syndrome. A rushed crew is prone to make errors.

- Therefore, it is absolutely imperative to make sure that enough time is available before accepting a last-minute change. ATC should be aware to avoid the ‘hurry-up’ syndrome.
- Flight Crew should not enter a runway for departure if not ready to take off. This avoids the possibility that an aircraft is “forgotten” on an active runway. Advise ATC accordingly.
- Flight Crew should verify the correct runway holding position prior to entering for the purpose of taking-off or for crossing.
- Avoid accepting rapid exit taxiways for runway entry. A rapid exit taxiway is designed to be an exit, not an entry. Using it as an entry hampers visibility, poses a threat for exact performance calculations and does not guarantee adequate visual aids.
- Pilots should turn on aircraft forward facing lights when in receipt of a take-off clearance. The moment of switching proves to be an important aid for vehicle drivers or others on an active runway.
- The flight deck traffic display (TCAS) could also be a good tool to detect traffic approaching and departing a runway. Remember, an aircraft may be departing from an intersection closer to the landing threshold out of sight, due to restricted visibility, or line of sight limitations.
- Use your heading display or compass to confirm the runway alignment (QFU) with the information available from charts. If fitted, use the ILS centerline guidance system to confirm the correct runway alignment.
- Have a good look out; scan the entire runway and approach in both directions before entering a runway. If in doubt, seek clarification: ASK.
- All flight crew members must monitor the clearance for taxi, take-off and landing, and must be “in the loop” at all times when runway operations are in progress.

5. Navigating on The Ground - Visual Aids

Charts, signs, markings and lighting: These are all aids to assist in determining your position. A high level of awareness must be maintained to observe and respond to mandatory signs and markings. A correct knowledge of all the symbols and signs is therefore a must. All the visual information that is available should correlate with the actual situation. Gathering visual information and the constant questioning and cross checking of your position is the task of the entire flight deck crew. A crew member who is in doubt or does not agree with the situation must speak-up and a check should be made with ATC. Reports to ATC and the airport should be made when factual situations differ from procedures or published information.

Aerodrome taxi charts should include ‘Hot Spots’ during taxi, specially covering risk of runway incursions. This will help to increase pilots’ situational awareness during the taxi briefing.

You Can Help to Prevent Runway Incursions! How?

- 1) It is essential to adhere strictly to all existing ICAO Standard Operating Procedures and phraseologies.
- 2) Flight crews need to ensure that they follow the clearance or instructions that are actually received, and not the one the flight crew is expecting to receive. If in doubt, ASK.
- 3) A good planning of the ground operations can decrease the workload during taxi. The flight and its associated risks start already during the preparation.
- 4) Good situational awareness is the top priority during taxi. All crewmembers should be involved here. Avoid heads down.
- 5) Application of the “Crew Resource Management” principles during taxi is as important as during the other phases of flight.

- 6) Even the most professional and experienced people make errors. By being defensive and letting the built-in safety nets do their work, a single error should not lead to a serious incident or accident.
- 7) Advise ATC if you think another aircraft may be about to enter a runway incorrectly or take-off/land incorrectly.

6. Training

Although aircraft operators provide pilots with some training for ground maneuvers, e.g. Low Visibility procedures, it is essential that pilots are fully acquainted with aerodrome signage, markings and lighting for safe runway operations, and that this knowledge is kept up to date through recurrent training

7. Best Practices Planning of Airport Ground Operations

Departing from, or coming to, an airport can be prepared well in advance. A thorough planning for taxi operation is essential. This preparation should be done at the gate or prior to starting descent.

Familiarize yourself with the airport

- Prepare the necessary charts for taxi and have them available for use during taxi.
- Take some time to study the airport layout. The naming of taxiways and other airport infrastructure can be misleading.
- Remember to review the latest NOTAM for both the Departure and Arrival airport for information concerning construction or taxiway/runway closures.
- Standard taxi routes are used more often at busy airports. Review the routes you can expect.
- Use the ATIS information and your previous experience to determine the possible taxi routes; to avoid possible late changes to taxi routes and departure clearances, be aware of scheduled runway configuration changes (e.g. from day to night) when planning flights
- Pay special attention to the location of HOT SPOTS. These are unique or complex intersections and runway crossings where runway incursions have taken place in the past or areas of the runway or associated taxi ways which are not visible from the Control Tower.
- Know what runways you will encounter between where you are and where you are going.
- Visualize this information on the charts.

Plan timing and execution of check-lists, so that no distractions occur when approaching and/or crossing runways; i.e. all eyes outside during this phase.

7.1 Briefing

- Conduct a detailed briefing for all flight crew members, especially during night and LVO. The visibility required for taxiing may be less than the Runway Visual Range.
- Brief planned primary runway exit and taxi route.
- Assigned taxi routes should be briefed as thoroughly as an instrument approach or departure.
- Airport diagrams should be readily available to all flight crew members.
- Check that the crew fully understands all briefing items. The human memory is “constructive”. That means that we have the tendency to fill in the blanks.
- Reassure yourself that you follow the clearance or instruction that you actually received, and not the one you expected to receive (confirmation bias).

7.2 Taxiing – navigating on the ground

Departing from, or coming to, an airport can be prepared well in advance. A thorough planning for taxi operation is essential. This preparation should be done at the gate or prior to starting descent.

- Write down taxi route.
- Be alert for mandatory signs, markings, stop bars and runway guard lights.
- Look for visual aids (Taxiway lights, location information and destination signs).
- Assign crew member to look for and report signs/ markings and keep track of location against the aerodrome chart.
- A crew member who is in doubt or does not agree with the situation must speak-up.
- Expect that ATC will provide ‘real-time’ significant aerodrome information which may affect operations on or near the runway when NOTAMS and ATIS which are normally used to advise pilots of significant information regarding runway operations are not available.
- Flight Crew must advise ATC on first contact with the Tower if additional time on the runway is required for operational reasons, this might be the case when e.g. in winter an engine run-up for shedding ice could be required.
- When a pilot not taxiing the aircraft focuses on the instruments in the flight deck, he/she is not able to monitor the progress of the aircraft. Before undertaking head- down actions advise the other pilot, so that added emphasis can be placed by the navigating pilot on maintaining navigational accuracy and situational awareness.
- Do not rush. The higher your ground speed, the less time you have to react, maneuver the plane and avoid an obstacle. Avoid being rushed by accepting last minute changes, especially during near runway operations. Time can be your ally and your enemy; use it wisely. Taxi defensively; this is being prepared for the errors of others

7.3 Communication

- Check your audio box and volume adjustment whenever a frequency change is made.
- Take extra care accepting a “monitor xxx.xxx frequency” clearance. When after some period this new frequency keeps silent, suspect a wrong entry and refer back to the previous frequency.
- If necessary, request progressive taxi instructions.
- Avoid leaving the active ATC frequency. If you need to leave the ATC frequency, then notify your other flight crew members. Afterwards, be briefed by the other crew member of what you have missed.
- The use of Aviation English in a busy and complicated environment should be encouraged, improving situational awareness.
- Speaking slowly is essential when operating in foreign regions. Be proficient with the language used for communication.
- Use standard ICAO compliant radio phraseology at all times. Only strict adherence to standard phraseology avoids miscommunications.
- Read back all runway crossing or hold short clearances using correct radio phraseology.
- Read back, the complete instruction must be read back and must be clear, “Roger” is not a readback. Always include:
 - a) Your full aircraft call sign to avoid call sign confusion.
 - b) ATC route clearances.
 - c) Clearances and instructions to enter, land on, take-off on, hold short of, cross and backtrack on any runway.
 - d) The runway designator to avoid wrong runway selection.
 - e) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.
- Listen to clearances issued to other aircraft. Be extra attentive when another aircraft with similar call sign is on the frequency.
- Both pilots should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, enter, line up, take-off and land on a nominated runway. Any misunderstanding or disagreement should be cleared up immediately by contacting ATC for clarification: ASK.
- The use of headsets increases the readability of communications with ATC and within the flight deck.
- Ensure all flight crew are on the appropriate frequency until all runways have been vacated after landing.
- After the landing, vacate the runway as soon as possible, but not by turning onto another runway, unless specifically instructed to do so.
- When the aircraft has vacated the active runway, be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.
- Before commencing after landing procedures, pilots should have received, understood and acknowledged the taxi clearance.

7.4 Crossing or entering a runway

- Crossing or entering a runway when cleared to line up and/or when crossing any runway, position the aircraft at a right angle with the runway where possible, in order to better observe the other traffic, both arriving and departing.
- If you are cleared to “line-up and wait”, then only a short delay on the runway should be anticipated. If you find yourself in this position for a more extended period, advise about your position and seek clarification: ASK.

- If instructed to follow other traffic, be aware this does not automatically include the clearance to enter or cross a runway. Each aircraft requires a specific clearance to enter or cross any runway.
- If there is any doubt when receiving a clearance or instruction, clarification should be requested immediately from ATC.
- Cancel check list activity when crossing and entering runways. Avoid stopping on a runway unless specifically instructed to do so.

APPENDIX C Oversight Activities For Regulators

Effective oversight of runway and aerodrome operations forms an important part of the safety management system (SMS) of the aerodrome operator, air navigation service provider, other stakeholders and of the State Safety Program activities.

EU, ICAO and national obligations place responsibilities on States to ensure safety, regularity and efficiency of aircraft operations at aerodromes under their jurisdiction. Therefore, it is essential that the State retains its overseeing responsibility and ensures that the aerodrome operator, whether or not the aerodrome operator is state owned or private, complies with the relevant ICAO SARPs and/or applicable EU or national regulations.

For the Regulator this may be partly achieved by implementing an aerodrome certification procedure to certify an aerodrome through the approval of the aerodrome manual and acceptance of their SMS. For air navigation service providers and other stakeholders a similar certification process should be in place.

1. Safety Regulatory Audits and Inspections

The Regulators should conduct safety regulatory audits and inspection on aerodromes operations to monitor and assess the level of safety achieved.

The regulatory oversight of aerodrome operators may include:

- Ensuring that an aerodrome has an effective runway incursion prevention programme that meets ICAO or EU or national requirements;
- Joint/coordinated audits and inspections to examine the interfaces between the aerodrome agencies involved in runway incursion prevention; e.g. coordination between ATC, aircraft operators, aerodrome operators and contractors during aerodrome work in progress;
- Reviewing the airside driver training programme to ensure the adequacy of driver training for the staff of all organizations operating airside;
- Reviewing Low Visibility Procedures (LVP) from a runway incursion perspective;
- Reviewing incident prevention programmes, including occurrence reporting relating to runway incursions
- Reviewing aerodrome design changes, including vehicular traffic routes that intersect runways and taxiways;
- Reviewing runway safeguarding, including entry and exit points, runway, taxiway holding points, stop bars, illuminated signs and lights;
- Reviewing procedures for third party contractors during any work in progress on the maneuvering area;
- Reviewing the work program of the aerodrome local Runway Safety Team with reference to the European Action Plan for the Prevention of Runway Incursions.

2. Risk-Based Oversight

In the frame of the introduction of Risk-based oversight (see the EASA document “Practices for risk-based oversight”) within the audits and inspections planning process of regulators, the regulator can adapt the oversight burden for an operator with regards to:

- Its intrinsic risk exposure to runway incursions;
- Its safety performance regarding runway incursions.

That is to say the means that the operator puts in place in order to reduce the runway incursion risk as far as is practicable. If the operator is intrinsically exposed to runway incursions and/or has a poor or weak runway incursion risk regime, the regulator might intensify the oversight on one or several points exposed above. On the other hand, if the operator has no runway incursion problem, the oversight burden might be relaxed.

APPENDIX D Safety Management Systems

A Safety Management System (SMS) is a management tool for the management of safety by an aviation undertaking¹, aimed at ensuring that safety is managed systematically and consistently. In summary, safety management:

- includes the entire operation;
- focuses on processes, making a clear differentiation between processes and outcomes;
- is data driven;
- involves constant risk-based monitoring;
- is strictly documented;
- aims at gradual improvement as opposed to dramatic change; and
- is based on strategic planning as opposed to piecemeal initiatives

ICAO

ICAO Annex 19 (Safety Management) consolidates the overarching safety management SARPs on safety management relating to aircraft operators, air navigation service providers and aerodromes which had previously been detailed in Annexes 6, 11 and 14 respectively.

To support the Annex 19 SARPs, ICAO Doc. 9859 (Safety Management Manual) aims to harmonise SMS implemented in the aviation sector. ICAO recommends a framework for the implementation and maintenance of a SMS by an organisation. The implementation of the framework should be commensurate with the size of the organisation and the complexity of the services provided.

Safety Management Systems Guidance Materials Risk Based, Data Driven Systematic Approach To Safety

Complimentary to core SMS activities, evolving safety thinking is to move from an events-based approach to safety (including runway safety) to a comprehensive data-driven, risk-based approach. In so doing, more focus will be given to proactive, leading safety indicators and other systemic issues (related to the prevention of runway incursions) and will supplement the traditional, reactive approach to safety. A change of approach that shifts the focus from “what went wrong” to an analysis of “what went right” can provide valuable insights and a better understanding of the everyday (positive) things that contribute towards safe operations rather than a reliance on the still relatively few occurrences that have a negative impact on safety.

Assessing the Effectiveness of SMS Implementation

To assess the effectiveness of their SMS implementation regarding runway incursions, aviation undertakings should at least focus on the following SMS related issues:

- **Change management:** The aerodrome operator and the local air navigation service provider should take special attention while conducting changes on the platform that have an impact on runway safety. While conducting the safety impact assessment study, a representative subset of the relevant actors on which the change has an impact should be included in the team in charge of its elaboration. These actors include when relevant the platform’s users and the ground handlers. Furthermore, the aerodrome operator and the local air navigation service provider should ensure that all the measures decided in the safety impact assessment study are effectively in place
- **Just culture:** The aerodrome operator should ensure that just culture is in place among the subcontractors that operate works that have an impact on runway safety.

- **Occurrences management:** The analysis of a serious occurrence related to runway safety should be systematically conducted by the aviation undertakings. Furthermore, when actions related to this analysis are decided, a control loop assessing the effective implementation of these actions should be present in the SMS of the concerned aviation undertaking.
- **Interfaces management:** The aerodrome operator and the local air navigation service provider should have contacts with a representative subset of the relevant stakeholders that have an impact on runway safety, including the subcontractors and the platform's users. Particularly, a representative subset of platform's users should actively participate to the aerodrome local Runway Safety Team (RST) meetings.
- **Communication/Training:** The aviation undertaking should ensure that all the stakeholders that have an impact on runway safety are aware and trained to address runway safety issues.

APPENDIX E Interpreting Events – Runway Incursion?

The purpose of this Appendix is to aid interpretation of runway events using the ICAO definition of runway incursion introduced in November 2004 which is: “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” Whilst the definition has been widely accepted - and no change to it is proposed - it has become very apparent that determining whether an event is a runway incursion or not is still very subjective and opinions vary considerably.

In an attempt to provide additional clarity and consistency of interpretation of the ICAO definition, this edition of the EAPPRI contains an expanded table of runway incursion and/or runway safety events as assessed by a representative working group of aviation stakeholders. This aid to interpretation will not guarantee complete consistency but will increase the level of uniformity from the current situation. The following explanations are intended to provide further clarification to ease common understanding of this definition:

“Incorrect presence” This should be interpreted as the unsafe, unauthorized or undesirable presence, or movement of, an aircraft, vehicle or pedestrian.

“Protected area of a surface designated for the landing and take-off of aircraft”. This is to be interpreted as the physical surface of a runway, from the centerline to the holding point appropriate to the type of runway. Where operations are being conducted during Low Visibility operations this should be the holding point appropriate to the procedures in force. Note: Further considerations about the Protected Area are covered later in this appendix.

Whether they are interpreted as runway incursions or not, all runway related safety events should be reviewed/ investigated, in order to learn lessons and put measures in place to prevent recurrence. It is through this process that safety improvements can be made.

Crossing a red stop-bar does not necessarily mean a runway incursion. However, the working group strongly supports that the message “never cross a red stop bar” is widely disseminated and practiced.

Table To Assist In Determining If A Runway Incursion Has Occurred

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
An aircraft vehicle or pedestrian is cleared correctly to enter or cross a runway and proceeds as cleared but does not read back the clearance.		Yes	There is no incorrect presence. Failing to read back does not create an incursion.
An aircraft is cleared correctly to land or take-off and proceeds as cleared, but does not read back the clearance.		Yes	There is no incorrect presence Failing to read back does not create an incursion.

Aircraft lands without clearance being issued by the controller.	Yes		This is an incorrect presence.
Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
Aircraft lands without clearance being received by the flight crew, having been issued by ATC.		Yes	If ATC have given the clearance, there is no incorrect presence.
Aircraft lands without clearance being received by the flight crew, after a go around instruction from ATC.	Yes		Once a go-around instruction is given it is an incorrect presence to land on the runway.
Aircraft lands without clearance and evidence shows that the pilot was acting appropriately in accordance with Loss of Communication procedures due to R/T failure.		Yes	
Aircraft takes off without clearance	Yes		The aircraft was only cleared to line up. Thus, it is an incorrect presence once take-off is commenced.
An aircraft vehicle or pedestrian enters runway without clearance.	Yes		This is an incorrect presence.
An aircraft, vehicle or pedestrian is cleared to enter the runway and does so as instructed and intended, but before the red stop bar has been "dropped". (This also applies to traffic lights where so positioned).		Yes	There is no incorrect presence as ATC clearance to enter has been given. However, pilots/drivers shall not cross illuminated red stop bars. If the stop bar does not extinguish, pilots and drivers must check with the controller before proceeding.

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
An aircraft, vehicle or pedestrian crosses a red stop-bar without ATC clearance.	Yes		It is an incorrect presence.
An aircraft vehicle or pedestrian enters the runway at the incorrect holding point.	Yes		At this location on the runway, it is an incorrect presence.
An aircraft vehicle or pedestrian vacates the runway at the incorrect holding point.		Yes	There is no incorrect presence on the runway.
Controller incorrectly clears an aircraft, vehicle or pedestrian to enter or cross a runway and the runway is entered. I.e., the controller issues a clearance he wouldn't have issued if he was conscious of the whole situation.	Yes		It is the movement onto the runway or protected area that creates the incorrect presence – not the incorrect RT transmission. The RT transmission does not mean an RI occurs at that moment.
Controller incorrectly clears an aircraft to land or take-off. I.e. the controller issues a clearance he wouldn't have issued if he was conscious of the whole situation.	Yes		It is an incorrect presence. It is the movement onto the runway or protected area that creates the incorrect presence – not the incorrect RT transmission. The RT transmission does not mean an RI occurs at that moment.
Aircraft lines up out of sequence.	Yes		It is an incorrect presence.

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
<p>Taxiway green lights are selected along a route onto the runway but the ATC clearance is only part way along that route and the a/c or vehicle proceeds on to the runway beyond the stated clearance limit.</p>	<p>Yes</p>		<p>It is an incorrect presence.</p>
<p>Two aircraft are correctly present on the runway after lining up: one for full length departure at the beginning of the runway and the other for an intersection take-off. The controller erroneously gives a take-off clearance to the aircraft at the beginning of the runway. The pilots of the aircraft realize the error, communicate it with the controller and do not start to move.</p>		<p>Yes</p>	<p>There is no incorrect presence.</p>
<p>Two aircraft are correctly present on the runway after lining up: one for full length departure at the beginning of the runway and the other for an intersection take-off. The controller erroneously gives a take-off clearance to the aircraft at the beginning of the runway. The pilots of the aircraft do not realise the error and the full-length departure starts to roll</p>	<p>Yes</p>		<p>It is an incorrect presence.</p>

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
An aircraft is cleared to take-off and a vehicle is on the runway correctly and the pilot recognises the situation and refuses to move.		Yes	There is no incorrect presence.
An aircraft is cleared to take-off and a vehicle is on the runway correctly and the aircraft commences its take off roll.	Yes		It is an incorrect presence once the aircraft begins its take-off roll.
Aircraft, vehicle or pedestrian crosses a red stop bar but stays outside of the protected surface of the runway (e.g. stop bar at Cat III position but Low Visibility conditions not present).		Yes	No incorrect presence on the runway or protected area. However, pilots/drivers shall not cross lit red stop bars and shall check with the controller.
An aircraft taxis up to a runway holding point and stops, with all undercarriage short of the holding point but the nose/ radome is beyond the holding point.	Yes		It is an incorrect presence.
During Cat III operations a vehicle enters the Cat III runway strip without ATC clearance.	Yes		It is an incorrect presence.
During Cat I operations a vehicle enters the Cat I runway strip without ATC clearance.	Yes		It is an incorrect presence.

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
A vehicle convoy is cleared by ATC to enter the runway, but the stop-bar comes back on before the last vehicle has crossed the holding point.		Yes	As the convoy was cleared to enter, there is no incorrect presence. However, pilots/drivers shall not cross lit red stop bars and shall check the status of the stop bar with the controller before proceeding.
A pilot lands an aircraft on a runway NOTAM'd as closed		Yes	If the runway is NOTAM'd as closed, it is not a runway.
Two airfield ops vehicles and 2 fire service vehicles call ATC and obtain permission to enter the runway correctly which is done. Another vehicle joins the back of the convoy without communication and 5 vehicles cross the runway.	Yes		In this example the 5th vehicle is an incorrect presence.
At night a departing aircraft is given a conditional line up clearance at the correct holding point which is read back correctly. The aircraft enters the runway at the correct time in terms of the conditional clearance, but in doing so crosses a lit stop-bar.		Yes	There was no incorrect presence. However, pilots/drivers shall not cross lit red stop bars and shall check the status of the stop bar with the controller before proceeding.

Example	Runway Safety; Runway Incursion	Runway Safety Event; Not Incursion	Rationale
An aircraft enters the runway correctly but faces in the wrong direction (e.g. cleared to enter runway 23 but lines-up facing 05 direction) and starts its roll.	Yes		It is an incorrect presence once it starts take-off roll.
The TWR controller erroneously clears an incorrect aircraft for take-off. He immediately realises his error and corrects the clearance. The aircraft does not move and remains at the holding point.		Yes	There is no incorrect presence.
A helicopter flies or ground taxis along part of the runway length without clearance to do so.	Yes		It is an incorrect presence.
An aircraft is cleared to enter the runway after a landing clearance has been given to another aircraft.		Yes	The RT clearance does not mean an incursion has immediately happened.
An aircraft is cleared to enter the runway and does so, after a landing clearance has been given to another aircraft.	Yes		It is an incorrect presence.

APPENDIX F Incident reporting and data collection

The objective of this chapter is to promote the use of a standardized approach for reporting and analysing information on runway incursions. This approach will support the analysis of runway incursions using the severity classification scheme. Global use of such an approach will enable States to collect and share data to continually improve the safety of runway operations. This chapter will discuss the ways in which the information gained from the analysis of runway incursions can be used to enhance runway safety.

To identify the causes and contributory factors of runway incursions, specific information must be collected on each occurrence. This information is best collected in a “just culture” environment where reporting is promoted. This makes it possible to learn from runway incursion data collectively. The development of effective countermeasures to factors that result in runway incursions depends upon fact-based, systematic reporting and analysis of the causal factors. An international exchange of information has the potential to effectively contribute to global aviation safety in two ways. First, each State can contribute to gaining a full understanding of how individual errors evolve into runway incursions and potential collisions, leading to the development and implementation of effective mitigating measures. Second, each State can learn from the experiences of other States so that the same mistakes do not perpetuate.

1. JUST CULTURE AND SYSTEMIC ISSUES

“Just culture” is an atmosphere of trust in which people are encouraged to provide essential safety-related information but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour. Just culture philosophy is designed to counter the strong natural inclination to blame individuals for errors that contribute to runway incursions. A key objective of the just culture perspective is to provide fair treatment for people, applying sanctions only where errors are considered to be intentional, reckless or negligent. The use of just culture in occurrence reporting was strongly advocated by the Eleventh Air Navigation Conference (AN-Conf/11).

Even the most conscientious and well-trained pilot, airside vehicle driver or air traffic controller is capable of making an error that results in a runway incursion. While a single pilot, driver or controller may be deemed responsible for the incursion, it is rarely the case that the individual is totally responsible for the error and its consequences. Pre-existing conditions, e.g. aerodrome design, and factors such as distraction, weather, traffic and workload peaks, are only some of the conditions that can induce human error.

The way in which an incident is analysed is as important as the way in which information about the event is collected. Analysis protocols can support the tenets of just culture in several ways. First, error classification schemes must be sufficiently specific to support the development of mitigating measures. For example, an error category of “aircraft observation failure” does not adequately capture the occurrence of a controller forgetting about an aircraft holding on the runway in anticipation of take-off, even though the controller should have scanned the runway before clearing another aircraft to land on the same runway. Stating that the controller “forgot” that the aircraft was there captures the nature of the controller’s error, but not the factors that induced it.

Due consideration must be given both to the circumstances under which the error occurred (e.g. the tasks the individual was performing at the time and relevant environmental conditions) and to the latent conditions that originate deep within the organization (e.g. complex aerodrome layout, inadequate signs and markings, and high workload). Identifying the circumstances under which certain types of errors are likely to occur, such as at night or when the controller is working more than one control position, points to possible mitigating measures.

2. A Standard Approach to Runway Incursion Incident Reporting and Data Collection

Annex 6 — Operation of Aircraft, Annex 11 — Air Traffic Services, and Annex 14 — Aerodromes require States to establish safety programmes in order to achieve an acceptable level of safety in the provision of services. Use of standard definitions, reporting formats and error taxonomy will facilitate data sharing among States. The larger the data pool, the more robust the analysis of common causal factors will be and, thus, a better understanding of the nature of the problem.

APPENDIX G Classification of the severity of runway incursions /Runway incursion severity classification (RISC) calculator

1. Severity Classification

The objective of runway incursion severity classification is to produce and record an assessment of each runway incursion. This is a critical component of risk measurement, where risk is a function of the severity of the outcome and the probability of recurrence. Whatever the severity of the occurrence, however, all runway incursions should be adequately investigated to determine the causal and contributory factors and to ensure risk mitigation measures are implemented to prevent any recurrence.

Severity classification of runway incursions should be assessed as soon as possible after the incident notification with due regard for the information required in 2 . A reassessment of the final outcome may be applied at the end of the investigation process.

For the purpose of global harmonization and effective data sharing, when classifying the severity of runway incursions, the severity classification scheme in Table 1-1 should be applied.

Table 1-1. Severity classification scheme

Severity Classification	Description
A	serious incident in which a collision is narrowly avoided.
B	An incident in which separation decreases and there is 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	An incident that meets the definition of runway incursion such as the incorrect presence of a single vehicle, person or 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 or inconclusive or conflicting evidence precludes a severity assessment.

Refer to ANNEX 13 for the definition of “Incident”

2. Factors That Influence Severity

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

- a) Proximity of the aircraft and/or vehicle. This distance is usually approximated by the controller or from the aerodrome diagram. When an aircraft flies directly over another 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 the pilot of 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, swerving, rejected take-off, early rotation on take-off, and go-around. The more severe the manoeuvre, the higher its contribution to the severity rating. For example, encounters involving a rejected take-off in which the distance rolled is 300 metres are more severe than those in which the distance rolled is less than 30 metres.
- 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 has 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 is more severe than one that involves a light aircraft initiating a go-around on a one-mile final.
- e) Environmental conditions, weather, visibility and surface conditions. 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 stopping performance of the aircraft or vehicle, such as wet or icy runways, should also be considered.
- f) Factors that affect system performance. Factors that affect system performance, such as communication failures (e.g. “open mike”) and communication errors (e.g. the controller’s failure to correct an error in the pilot’s readback), also contribute to the severity of the incident.

3. Runway Incursion Severity Classification Calculator

A runway incursion severity classification (RISC) calculator is available on CD (see Appendix H 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 6.1 and 6.2.

APPENDIX H ICAO model runway incursion initial report form

Refer to DOC 9870 Appendix F

Instructions for completing the runway incursion initial report form.

APPENDIX I ICAO model runway incursion causal factors identification form

Refer to DOC 9870 Appendix G

Instructions for completing the runway incursion causal factors identification form.

APPENDIX J ICAO Runway safety Toolkit

The ICAO runway safety toolkit on CD-ROM was produced by the International Civil Aviation Organization (ICAO) and Embry Riddle Aeronautical University, Florida, United States, as part of a continuing effort to assist States in the implementation of runway incursion prevention programmes. This interactive toolkit is a compilation of the best educational material available, obtained over a period of several years, and draws on information and knowledge obtained during a series of ICAO seminars on the subject of runway safety held between October 2002 and October 2004. The toolkit is meant to be used with other runway safety tools such as the Manual on the Prevention of Runway Incursions (Doc 9870) and to support other runway incursion prevention programme initiatives.

www.icao.int/fsix/res_ans.cfm.