Manual for Preventing Runway Incursions

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International Civil Aviation Organization
FOREWORD

In 2001, the ICAO Air Navigation Commission took action to address the problem of runway incursions. Several critical areas were identified that needed to be investigated and which had a relation to overall runway safety. These included: radiotelephony phraseology, language proficiency, equipment, aerodrome lighting and markings, aerodrome charts, operational aspects, situational awareness and Human Factors.

To improve the situation with respect to runway incursions and to encourage the implementation of relevant provisions, ICAO embarked on an education and awareness campaign which began with a comprehensive search of best available educational material for use in an interactive runway safety toolkit, which has been included as Appendix J to this manual. To address aerodromes, air traffic management and flight operations, among other subjects, ICAO also conducted a series of seminars on runway safety, in the ICAO regions, with the aim of disseminating information on the prevention of runway incursions.

Between 2002 and 2005, runway safety seminars were held in the Asia/Pacific, Middle East, Africa, North America, Caribbean, South America, and European Regions as part of the ICAO education and awareness campaign.

Recommendations generated from the Runway Safety Seminars, held in the Asia/Pacific and Middle East Regions, requested that ICAO produce a manual with runway incursion prevention guidelines. The objective of this manual is to help States, international organizations, aerodrome operators, ATS providers and aircraft operators to implement runway safety programmes taking into account best practices already in place in some States, international organizations, aerodromes, ATS providers and airlines.

The above efforts were undertaken to address a specific problem, that of runway incursions. This focus on the so-called “tip of the arrow” was necessary however, the need to address safety in a proactive and systemic manner cannot be overstressed.

An evolution in terms of safety thinking has led to a change of focus, from individuals, to organizations. It is now acknowledged that senior management decisions are influential in shaping the operational contexts within which operational personnel perform their duties and discharge their responsibilities. It is also well known that, no matter the extent to which operational personnel may excel in their performance, they can never ultimately outperform, safety-wise, systemic deficiencies and flaws in the system that bounds them. This thinking is reflected in recent Standards and Recommended Practices (SARPs) on safety management, which for the first time explicitly address the contribution and responsibility of senior management regarding safety as follows.

Annex 6 — Operation of Aircraft, requires operators to establish and maintain an accident prevention and flight safety programme.

Amendment 44 to Annex 11 — Air Traffic Services, requires States to implement safety programmes and ATS providers, to implement safety management systems (SMS).

Annex 14 — Aerodromes, requires aerodrome operators to implement SMS, as a part of the certification process of an aerodrome, and recommends the same for already certified aerodromes.
Such evolution in safety thinking notwithstanding, it is a fact that properly selected, trained and motivated operational personnel remain the custodians of safety when the system breaks down due to unanticipated deficiencies in design, training, technology, procedures or regulations. Human performance at the tip of the arrow becomes then the last line of defence against latent conditions that penetrate through the aviation system defences and hold the potential for safety breakdowns. Operational personnel are the true goalkeepers of the aviation safety system.

From this broad perspective, it remains imperative to avoid falling into the pitfall of focussing safety efforts on organizational issues exclusively, to the detriment of the human contribution to success and failure of the aviation system.

Active failures by operational personnel are sometimes bred by flaws in the system, sometimes by well-known and documented human limitations, most times by a consideration of both. A true systemic approach to safety must encompass consideration of latent conditions in the system as well as active failures on the front lines of operations. Such a systemic approach underlies this manual.
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Chapter 1

INTRODUCTION

1.1 WHAT IS A RUNWAY INCURSION?

1.1.1 Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444) defines a runway incursion as:

“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”.

1.2 INTRODUCTION TO RUNWAY INCURSION PREVENTION

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

1.2.2 Aviation safety programmes have a common goal – to reduce hazard, 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.

1.2.3 Several States and international organizations have embarked on extensive programmes to reduce the risk of runway incursions. According to a Transport Canada report (September 2000), a number of factors were likely to be responsible for the continuing increased trend in runway incursions, including traffic volume, capacity-enhancing procedures, and aerodrome design. The report concluded that:

a) as traffic volume increases the likelihood of a runway incursion potential increases more rapidly when capacity-enhancing procedures are in effect than when they are not;

b) if traffic remains the same, the potential for runway incursion increases when capacity-enhancing procedures are put into operation;

c) many aerodrome improvement projects resulted in a more complex aerodrome layout which, together with inadequate aerodrome design standards, signage, marking and lighting, the lack of standard taxi routes and the availability of improved aerodromes diagrams had worsened the situation; and

d) increasing environmental pressure to compromise safe air traffic control (ATC) practices by requiring too many configuration changes.
The above factors, combined with: inadequate training, poor infrastructure and system design and inadequate ATC facilities, lead to increased risk of runway incursions.

Runway incursion prevention was closely examined by the Eleventh Air Navigation Conference (AN Conf/11) (Montreal, September/October 2003).

The Conference recommended that States take appropriate actions to improve runway safety worldwide through the implementation of runway safety programmes. It was also recommended that when capacity-enhancing procedures at aerodromes were considered, appropriate safety studies should be conducted which take due consideration of the effect on runway safety.

The Conference urged ICAO to develop a common definition of runway incursion to be used worldwide.

The use of a common taxonomy and severity classification to assess runway incursion error type and contributory factors in the ICAO accident and incident data reporting (ADREP) system, and to identify the most serious incidents is fundamental to global risk reduction. A common definition, taxonomy and severity classification allow runway incursion data to be compared globally.

ICAO is verifying via the ICAO universal safety oversight audit programme (USOAP) the degree of implementation of runway safety programmes by States.

1.3 PURPOSE OF THE ICAO MANUAL FOR PREVENTING RUNWAY INCURSIONS

While runway safety takes into account issues such as foreign objects, 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.

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 who have yet to commence a runway safety initiative;

b) States seeking additional guidance;

c) States having existing runway safety or reporting systems in place seeking global harmonization; and

d) States seeking harmonization with ICAO safety management system (SMS) provisions.
The Manual for Preventing Runway Incursions (Doc 9870) aims primarily, to provide global guidance essential for implementation of national or local runway safety programmes. Such initiatives aim to remove hazards and minimize residual risk of runway incursions, to reduce active failures and 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.

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

Much can be learned by analyzing previous incidents and accidents. A standardized runway incursion report form and a runway incursion causal and contributory factors identification form are included which will allow a global approach to data collection. Comprehensive analyses of data are essential to distinguish trends, causal factors and develop cost-effective risk reduction strategies.

A runway incursion severity classification (RISC) model is available (see Appendix H). Use of this RISC model will enable a consistent assessment to be made of the severity of runway incursion events.

A computer program (Aerodrome Runway Incursion Assessment (ARIA)) that helps Local Runway Safety Teams identify factors that contribute to runway incursions at a specific aerodrome is available (see Appendix I).

Safety initiatives addressing awareness, training infrastructure, procedures, and technologies such as the ICAO and EUROCONTROL runway safety toolkits are available (see Appendices J and K respectively). Educational materials for pilots, controllers, vehicle drivers and aerodrome operators are 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 maneuvering area.
Chapter 2

CONTRIBUTORY FACTORS

2.1 BACKGROUND

2.1.1 Pilots, controllers and drivers may each 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 reported being involved in runway incursions ref. EUROCONTROL survey, 2001. Mitigation strategies that address all three parties should be included in systemic solutions.

2.1.2 As noted previously runway incursions may be the result of many differing factors. Analysis of the occurrence can be executed using the SHEL Model (sometimes referred to as SHELL Model) shown in Figure 1 below.

![Figure 1. The SHEL Model](image)

In this model the match or mismatch of the blocks (interface) is just as important as the characteristics of the blocks themselves. A mismatch can be a source of human error.

Importantly, the SHEL Model draws attention not to these different components in isolation, but to the interface between the human elements and the other factors. For example, the L-L interaction would include aspects of communication, cooperation and support; the L-H interaction represents the Human/Machine Interface (HMI) issues. The contributory factors described in this chapter (normally designated as Liveware by the SHEL model) do not exclude contributions from the other aspects of organizational life, e.g. policies, procedures, environment, but which are critical factors associated with safety management systems and which must be addressed to improve safety overall.
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 of communication leading to a failure to follow an air traffic control instruction; and

f) an aircraft passing behind an aircraft or vehicle that has not vacated the runway.

Statistics show that most runway incursions occur in visual meteorological conditions (VMC) 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.

2.2 COMMUNICATION BREAKDOWNS THAT MAY RESULT IN RUNWAY INCURSIONS

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

a) use of non-standardized phraseology;

b) a failure by the pilot or the vehicle driver to provide a correct read-back of an instruction;

c) the controller does not ensure that the read-back by the pilot or the vehicle driver conforms with the clearance issued;

d) pilot and or vehicle driver misunderstanding the controller’s instructions;

e) pilot and or vehicle driver accepting a clearance intended for another aircraft or vehicle;

f) blocked and partially blocked transmissions; and

g) overlong or complex transmissions.

See Appendix A for more detailed guidance on communication best practices.
2.3 PILOT FACTORS THAT MAY RESULT IN RUNWAY INCURSIONS

2.3.1 Pilot factors that may result in a runway incursion include inadvertent non compliance with ATC clearances. Often these cases result from a breakdown in communication or a loss of situational awareness in which a pilot thinks that he/she is at one location on the aerodrome (such as a specific taxiway or intersection) when they are actually elsewhere, or they believe that the clearance issued was to enter the runway, while in fact it was not.

2.3.2 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 have to perform mandatory head down tasks, which reduce situational awareness;

d) pilots being pressed by complicated and/or capacity enhancement procedures, leading to rushed behaviour;

e) 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.

2.4 AIR TRAFFIC CONTROL FACTORS THAT MAY RESULT IN RUNWAY INCURSIONS

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

a) momentarily forgetting about:

1) an aircraft;

2) the closure of a runway;

3) a vehicle on the runway, or

4) a clearance that had been issued;

b) failure to anticipate the required separation or miscalculation of the impending separation;

c) inadequate coordination between controllers;
d) crossing clearance issued by a ground controller instead of air/tower controller;

e) misidentifying an aircraft or its location;

f) failure by the controller to provide a correct read-back of another controllers instruction;

g) failure by the controller to ensure that read-back by the pilot or the vehicle driver conforms with the clearance issued;

h) communication errors;

i) over long or complex instructions;

j) use of non standard phraseologies; and

k) reduced reaction time due to on the job training.

2.4.2 Other common factors include:

a) distraction;

b) workload;

c) experience level;

d) inadequate training;

e) lack of clear line of sight from the control tower;

f) human-machine interface; and

g) incorrect or inadequate handover between controllers.

See Appendix C for more detailed guidance on air traffic control best practices.

2.5 AIRSIDE VEHICLE DRIVER FACTORS THAT MAY RESULT IN RUNWAY INCURSIONS

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

a) failure to obtain clearance to enter the runway;

b) not complying with ATC instructions;

c) inaccurate reporting of position to ATC;

d) communication errors;

e) inadequate training for airside vehicle drivers;
2.6 AERODROME DESIGN FACTORS

2.6.1 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.

2.6.2 Common factors include:

a) complexity of airport layout including roads and taxiways adjacent to the runway;

b) not enough 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 ICAO Aerodrome Design Manual (Doc 9157) for more detailed guidance on aerodrome design.
Chapter 3

HOW TO ESTABLISH A RUNWAY INCURSION PREVENTION PROGRAMME

3.1 Runway Safety Teams

3.1.1 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 the appropriate management on the potential runway incursion issues and to recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed as a result of local occurrences or combined with information collected elsewhere.

3.1.2 The team could comprise representatives from aerodrome operations, air traffic service providers, airlines or aircraft operators, pilot and air traffic controller associations and any other groups with a direct involvement in runway operations. The team should meet on a regular basis. Frequency of meetings should be determined by the individual groups.

3.1.3 At some aerodromes, other groups may already exist that could carry out the functions of a runway safety team.

3.2 Objectives and Terms of Reference

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

a) improve runway safety data collection, analysis, and dissemination;

b) check that signage and marking are ICAO compliant and visible for pilots and drivers;

c) develop initiatives for improving the standard of communications;

d) identify potential new technologies that may reduce the possibility of a runway incursion;

e) ensure procedures are compliant with ICAO Standards and Recommended Practices (SARPs); and

f) initiate local awareness by developing and distributing runway safety education and training materials to controllers, pilots and personnel driving vehicles on the aerodromes.
3.3 **Generic Terms of Reference for the Team are Suggested as Follows**

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

a) determining the number, type and if available the severity of runway incursions;

b) considering the outcome of investigation reports to establish local hot spots or problem areas at the aerodrome;

c) working as a combined team to better understand the operating difficulties of those working in other areas, and suggest areas for improvement;

d) ensuring the recommendations contained in the ICAO Manual for Preventing Runway Incursions have been implemented;

e) identifying any local problem areas and suggest improvements;

f) conducting a runway safety awareness campaign, that focuses on local issues, for example by producing and distributing local hot spot maps or other guidance material as considered necessary. An example of a local map is attached; and

g) regularly reviewing the airfield to ensure adequacy and compliance with ICAO SARPs.

3.4 **Identification of Action Items Associated with Mitigating Runway Safety Deficiencies**

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

3.5 **Hot Spots**

3.5.1 ICAO Definition of a Hot Spot - Hot Spot: A location on an aerodrome movement area where there is an increased risk of collision or runway incursion (see figures 2, 3 and 4).

*Note 1.*— The criteria used to establish and chart a hot spot are contained in the PANS-ATM and Annex 4.

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

3.5.2 Hot spot charts should be produced locally. These charts should be checked regularly for accuracy, revised as needed, distributed locally, and published in the Aeronautical Information Publication (AIP)
3.5.3 Once hot spots have been identified, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, manage and mitigate risk. These strategies may include:

a) awareness campaigns;

b) additional visual aids (signs, markings and lights);

c) use of alternative routings;

d) construction of new taxiways; and

e) mitigating against blind spots in the Aerodrome Control Tower
ICAO Format of Hot Spot Chart
(Associated provisions in Annex 4 and PANS-ATM will be applicable on November 2007)

Figure 2
Example of a Hot Spot Chart

**Figure 3**

- **1.** Aircraft southeast on Taxiway F from the FBO or cargo ramp use caution when making the right turn onto Taxiway J. Do not cross the hold marking for Runway 30R-12L without ATC authorization.

- **2.** Outbound traffic from the airline ramp can mistake Runway 12R-30L as Taxiway D especially at the wide intersection near Taxiway L. Use caution when approaching the intersection of Taxiway D and L and do not cross the hold marking for Runway 12R-30L without ATC authorization.

- **3.** Aircraft taxiing to Runway 12L on either Taxiway C or D are often instructed to turn right onto Runway 6 and to hold short of Runway 12R - 30L. Use caution when making the right turn onto Runway 6 and watch for the red surface painted 12R - 30L marking and hold short lines. Do not cross the hold marking for Runway 12R - 30L without ATC authorization.

- **4.** Aircraft northwest on Taxiway F from the FBO or cargo ramp to Runway 12L use diligence to not miss the left turn onto Taxiway S. If the left turn at Taxiway S is missed, do not cross the hold marking for Runway 6-24 without ATC authorization.

**NOTE:** Not for Navigation
Example of a Hot Spot Chart

Example of Hotspot Map

Confusing Taxiway crossing of the Runway.

Not for operational use

B1. Confusing Runway entry. Make sure you are lining up on the correct Runway.

B3 and B5. Make sure not to cross the holding position markings without a clearance.

Explicit RWY crossing clearance required.

Figure 4
3.6 Persons or Organizations Responsible for Completing
the Tasks Associated with Action Items

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

3.7 Effectiveness of Activities Associated with Completing the Task

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

3.8 Runway Incursion Prevention Awareness Material

3.8.1 Awareness material can be used as a successful tool for reducing risk of runway incursions. These materials can include newsletters, posters, stickers and other educational information. The ICAO runway safety toolkit in Appendix J, provides a wealth of information for educational and awareness programmes.

3.8.2 Awareness materials which may also be of use to local runway safety teams are available from:

International Civil Aviation Organization (ICAO)  www.icao.int/fsix/res_ans.cfm
Eurocontrol  www.eurocontrol.int/runwaysafety
Federal Aviation Administration (FAA)  www.faa.gov/runwaysafety
Air Services Australia  www.airservicesaustralia.com
Transport Canada  www.tc.gc.ca/civilaviation/systemsafety/posters/tools.htm
International Air Transport Association (IATA)  www.iata.org
International Federation of Airline Pilot Associations (IFALPA)  www.ifalpa.org
Airports Council International (ACI)  www.airports.org
UK Safety Regulation Group  www.caasrg.gov
Chapter 4

RECOMMENDATIONS FOR THE PREVENTION OF RUNWAY INCURSIONS

4.1 INTRODUCTION TO RECOMMENDATIONS

4.1.1 The following recommendations are the result of a systemic analysis of many runway incursions. The purpose was to identify causes and contributory factors, both as active and latent failures, that led to the incidents taking place.

4.1.2 These recommendations will enhance the safety of runway operations by the consistent and uniform application of existing ICAO provisions leading to predictability and greater situational awareness.

4.2 RECOMMENDATIONS TO ENHANCE COMMUNICATIONS

4.2.1 Use the full aircraft or vehicle call signs for all communications associated with runway operations.

4.2.2 Use standard ICAO phraseologies in all communication associated with runway operations.

4.2.3 Periodically verify the use of standard ICAO phraseologies by pilots, drivers and air traffic controllers in all communication associated with runway operations.

4.2.4 Use the ICAO Procedures for Air Navigation Services — Air Traffic Management (PANS ATM, Doc 4444) read-back procedure, to include communication with vehicles operating on the manoeuvring area.

4.2.5 Conduct all communications associated with runway operations in accordance with ICAO air-ground radiotelephony communications language requirements (Annex 10 — Aeronautical Telecommunications, Volume II, Chapter 5 and Annex 1 — Personnel Licensing, Chapter 1 refer). The use of standard aviation English at International aerodromes helps provide situation awareness of everyone listening on the frequency.

4.2.6 Conduct all communications associated with the operation of each runway (vehicles, crossing aircraft etc) on the same frequency as utilised for the take off and landing of aircraft.

4.2.7 Use short and simple messages in ATC communications.

See Appendix A for more detailed guidance on communication best practices based upon ICAO provisions.
4.3  **RECOMMENDATIONS TO AIRCRAFT OPERATORS**

4.3.1 Thoroughly train pilots on Aerodrome signage, markings and lighting.

4.3.2 Include in the flight deck procedures, a requirement to obtain an explicit clearance to cross any runway. This includes runways not in use.

4.3.3 Promote best practices for pilots planning of ground operations.

4.3.4 Adopt the sterile flight deck concept while taxiing. Information on this is contained in Appendix B.

4.4  **RECOMMENDATIONS TO PILOTS**

4.4.1 Pilots should never cross illuminated red stop bars when lining up or crossing a runway unless contingency procedures are in use that specifically allow this.

4.4.2 Pilots should not accept an ATC clearance which would otherwise require them to enter or cross a runway from an obliquely angled taxiway.

4.4.3 If lined up on the runway and held more than 90 seconds beyond anticipated departure time, pilots should contact ATC and advise that they are holding on the runway.

4.4.4 Pilots should turn on aircraft landing lights when take-off or landing clearance is received, and when on approach.

   *Note.— A globally acceptable procedure is to be defined.*

4.4.5 Pilots should turn on strobe lights when crossing a runway.

   *Note.— A globally acceptable procedure is to be defined.*

4.4.6 If there is any doubt, when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.

4.4.7 If there is any doubt as to exact position on the surface of an aerodrome, pilots should contact ATC and follow the associated ICAO procedure (PANS ATM, Doc 4444).

4.4.8 Pilots should be “Head up” for a continuous watch during aerodrome surface operations.

See Appendix B for more detailed guidance on flight crew best practices including the sterile flight deck concept.
4.5 **RECOMMENDATIONS FOR AIR TRAFFIC SERVICES PROVIDERS AND AIR TRAFFIC CONTROLLERS**

4.5.1 Implement safety management systems in accordance with ICAO provisions.

4.5.2 Air traffic controllers should always use a clear and unambiguous method on the operating console to indicate that a runway is temporarily obstructed.

4.5.3 ATC should whenever practical give ATC en-route clearance prior to taxi.

4.5.4 Switch on stop bars to indicate that all traffic shall stop and switch off to indicate that traffic may proceed.

4.5.5 Never instruct aircraft or vehicles to cross illuminated red stop bars when entering or crossing a runway. In the event of unserviceable stop bars that cannot be deselected, contingency measures, such as follow-me vehicles should be used.

4.5.6 Ensure that ATC procedures contain a requirement to issue an explicit clearance including the runway designator when authorising a runway crossing or to hold short of any runway. This includes runways not in use.

4.5.7 Ensure that ATC procedures contain a requirement to include the runway designator when issuing an instruction to hold short of any runway.

4.5.8 Develop and utilise standard taxi routes to minimise the potential for pilot confusion.

4.5.9 Where applicable use progressive taxi instructions to reduce pilot workload and the potential for confusion. Progressive taxi instructions must not infer a clearance to cross a runway.

4.5.10 Assess existing visibility restrictions from the control the tower which have a potential impact on the ability to see the runway and clearly identify any such areas on a hot spot map.

4.5.11 Environmental constraints should not compromise safety e.g. regular, multiple changes to runway configuration.

4.5.12 Ensure that runway safety issues are included in training and briefings for ATC staff.

4.5.13 Identify any hazards and evaluate any risks of runway capacity enhancing procedures (intersection departures, multiple line up, conditional clearances etc.) when used either individually or in combination. If necessary develop appropriate mitigation strategies.

4.5.14 Do not issue line up clearance to an aircraft if this aircraft will be required to hold on the runway for more than 90 seconds beyond the time it would normally be expected to depart.

4.5.15 When conditional clearances are used, specific training should be provided to ensure that they are used strictly according to ICAO provisions.

4.5.16 When using multiple or intersection departures, do not use oblique or angled taxiways that limit the ability of the flight crew to see the landing runway threshold or final approach area.
Controllers should be “Head up” for a continuous watch on aerodrome operations.

See Appendix C for more detailed guidance on air traffic control best practices.

### 4.6 RECOMMENDATIONS FOR AERODROME OPERATORS AND VEHICLE DRIVERS

**4.6.1** An important factor in preventing runway incursions is to limit the physical possibilities for pilots and vehicle drivers to mistakenly enter runways. This basic principle includes, but is not limited to, the optimal use of perimeter taxiways, the avoidance of runway crossings, the simplicity and logic of taxi/runway lay-out in order to make the aerodrome instinctive, logical and user friendly for vehicle drivers, air traffic controllers and pilots. Therefore, aerodrome operators shall include those elements in the design and location of aerodrome infrastructure.

**4.6.2** Implement safety management systems in accordance with ICAO provisions and then ensure a continued focus on runway safety.

**4.6.3** Confirm the implementation of ICAO Annex 14 — *Aerodromes* provisions and implement maintenance programmes relating to runway operations e.g. markings, lighting, signage. Ensure that signs and markings are maintained and clearly visible, adequate and unambiguous in all operating conditions.

**4.6.4** During construction or maintenance ensure that information about temporary work areas is adequately disseminated and that temporary signs and markings are clearly visible, adequate and unambiguous in all operating conditions in compliance with Annex 14 provisions.

**4.6.5** Introduce a formal driver training and assessment programme in accordance with driver training guidelines contained in Appendix D, or where already in place review these guidelines.

**4.6.6** Introduce formal communications training and assessment for drivers and other personnel who operate on or near the runway.

**4.6.7** Name taxiways in accordance with ICAO naming conventions in Annex 14.

**4.6.8** If there is any doubt in the mind of a vehicle driver when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.

**4.6.9** Vehicle drivers should immediately contact ATC, when uncertain of their exact position on an aerodrome; if the driver realizes he/she is on the runway he/she immediately vacates.

**4.6.10** Vehicle driver should be “Head up” for a continuous watch during aerodrome operations.

See Appendix D for more detailed guidance on airside vehicle driver best practices including communication training for drivers.

### 4.7 GENERAL AND REGULATORY RECOMMENDATIONS

**4.7.1** National regulators should focus on runway incursion risk reduction in their oversight activities.
4.7.2 At each aerodrome, a runway safety team should be established and maintained in accordance with the terms of reference described in Chapter 3.

4.7.3 A local runway incursion prevention awareness campaign should be initiated at each aerodrome for air traffic controllers, pilots and drivers and other personnel who are involved in runway operations. The awareness campaign should be periodically updated to maintain interest and operational impact.

4.7.4 All infrastructure and procedures relating to runway operations should be in compliance with ICAO provisions. Where differences are made, appropriate publications in national AIPs and notification to ICAO when ICAO Standards are involved, should be undertaken.

4.7.5 Aerodromes should be certified according to ICAO Annex 14.

4.7.6 Joint cross training and familiarisation (such as the aerodrome resource management training course – see Appendix E) should be provided to pilots, air traffic controllers and vehicle drivers, to increase understanding of the roles and difficulties of personnel working in other areas. Where possible, visits to the manoeuvring area by all parties should take place for familiarisation of signs, markings and aerodrome layout.

4.7.7 Best Practices for regulators and air navigation service providers to consider when implementing strategies for preventing runway incursions by air traffic control are contained in Appendix C.

4.8 Recommendations relating to incident reporting and investigation

4.8.1 Ensure all runway incursions are reported and investigated in sufficient detail to identify specific causal and contributory factors (Appendices F and G).

4.8.2 To enhance lesson learning, share related runway safety data with other aviation safety organizations both nationally and internationally.

4.9 Recommendations related to aeronautical information

4.9.1 Time critical aerodrome information which may affect operations on or near the runway should be provided to pilots in ‘real-time’ using radiotelephony communication.

4.9.2 The collection, provision and dissemination of aeronautical information should be in accordance with ICAO provisions.

4.9.3 Providers of aeronautical databases and charts should establish a process with AIS with the objective of ensuring the accuracy, timeliness, and integrity of the data.

4.9.4 Ensure a process is put in place to allow users to provide feedback on the accuracy of aeronautical information.
Chapter 5

INCIDENT REPORTING AND DATA COLLECTION

5.1  OBJECTIVE

5.1.1  The objective of this chapter is to enable a standardized approach for reporting and analyzing information on runway incursions. This approach will support analysis of incursions using the severity classification scheme. Global use 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.

5.1.2  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 allows the possibility of learning 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 involved in such incidents. An international exchange of information has the potential to act as an effective contribution to global aviation safety in two ways. First, each State can contribute to 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.

5.2  JUST CULTURE AND SYSTEMIC ISSUES

5.2.1  “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. This 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 could be considered intentional, reckless or negligent. The use of just culture in occurrence reporting was strongly advocated by the Eleventh Air Navigation Conference (AN-Conf/11).

5.2.2  Even the most conscientious and well-trained pilot, airside vehicle driver and air traffic controller is capable of being involved in 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.

5.2.3  The way in which incidents are 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 for takeoff, 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.
5.2.4 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, relevant environmental conditions, etc.) and to the latent conditions that originate from deep within the organisation (e.g. complex aerodrome layout, inadequate signs and markings, high workload etc.). 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.

5.3 A STANDARD APPROACH TO RUNWAY INCURSION INCIDENT REPORTING AND DATA COLLECTION

5.3.1 Annex 13 — Aircraft Accident and Incident Investigation paragraph 8.1 requires States to establish a mandatory incident reporting system to facilitate collection of information on actual or potential safety deficiencies.

5.3.2 Annex 6 — Operation of Aircraft, Annex 11 — Air Traffic Services and Annex 14 — Aerodromes require that States 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 help to facilitate data sharing among States. The larger the data pool the more robust the analysis of common causal factors and thus a better understanding of the nature of the problem.

5.3.3 Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444), paragraph 2.4.1.2 contains procedures for ATS authorities to establish a formal incident reporting system for ATS personnel, to facilitate the collection of information on actual or potential safety hazards or deficiencies related to the provision of ATS.

5.3.4 The initial runway incursion notification form (see Appendix F) requires inclusion of data to describe the event and to classify its severity.

5.3.5 The runway incursion causal factors identification form (see Appendix G) contains the how, what and why the event took place and is completed once the detail investigation into the event is complete.

5.3.6 However, since there are few reported runway incursions per thousand aircraft movements, these incidents may appear to be unique to a particular aerodrome. It is only by pooling data that patterns of common causal factors can emerge.

5.3.7 Pooling data requires that all participating organisations adopt a common, reliable, and robust method of data collection. Furthermore, methods used to analyse the results should be harmonised to ensure a comparability of results of assessments.

Note.—The quality of the investigations has a direct impact on the assessment of risk of collision, severity of the outcome, and identification of causal and contributory factors.
Chapter 6

CLASSIFICATION OF THE SEVERITY OF RUNWAY INCURSIONS

6.1 SEVERITY CLASSIFICATION FOR RUNWAY INCURSIONS

6.1.1 The objective of the runway incursion severity classification exercise is to produce and record the assessment of each runway incursion. This is a critical component of measuring risk, 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.

6.1.2 Severity classification of runway incursions should be assessed as soon as possible after the incident notification with due regard for the required information in paragraph 6.2. A reassessment of the final outcome may be applied at the end of the investigation process.

6.1.3 For the purpose of global harmonization and effective data sharing, when classifying the severity of runway incursions, the following severity classification scheme should be applied:

<table>
<thead>
<tr>
<th>Accident</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident</td>
<td>Refer to ICAO Annex 13 definition of an accident.</td>
</tr>
<tr>
<td>A</td>
<td>A serious incident in which a collision was narrowly avoided.</td>
</tr>
<tr>
<td>B</td>
<td>An incident in which separation decreases and there is a significant potential for collision, which may result in a time-critical corrective/evasive response to avoid a collision.</td>
</tr>
<tr>
<td>C</td>
<td>An incident characterized by ample time and/or distance to avoid a collision.</td>
</tr>
<tr>
<td>D</td>
<td>Incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.</td>
</tr>
<tr>
<td>E</td>
<td>Insufficient information inconclusive or conflicting evidence precludes severity assessment.</td>
</tr>
</tbody>
</table>
Figure 5. Severity classification examples
6.2 FACTORS THAT INFLUENCE RUNWAY INCURSION SEVERITY

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

6.2.2 **Proximity of aircraft and/or vehicle** – This distance is usually approximated by the controller or from the aerodrome diagram. If the aircraft flew directly over the other aircraft or vehicle, then the closest vertical proximity should be used. When both aircraft are on the ground, the proximity that is used to classify the severity of the runway incursion is the closest horizontal proximity. When aircraft are separated in both horizontal and vertical planes, the proximity that best represents the probability of collision should be used. In incidents in which the aircraft are on intersecting runways, the distance from each aircraft to the intersection is used.

6.2.3 **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.

6.2.4 **Evasive or corrective action** – When an aircraft takes evasive action to avoid a collision, the magnitude of the manoeuvre is an important consideration in classifying the severity. This includes, but is not limited to, hard braking action, swerve, rejected takeoff, early rotation on takeoff, and go-around. The more severe the manoeuvre, the higher the contribution to the severity rating. For example, encounters involving a rejected takeoff in which the distance rolled was 300 meters, would be more severe than those in which the distance rolled was less than 30 meters.

6.2.5 **Available reaction time** – Encounters that allow the pilot little time to react to avoid a collision are more severe than encounters in which the pilot had ample time to respond. For example, in incidents involving a go-around, the approach speed of the aircraft and the distance to the runway at which the go-around was initiated needs to be considered in the severity classification. This means that an incident involving a heavy aircraft aborting the landing and initiating a go-around at the runway threshold would be more severe than one that involved a light aircraft initiating a go-around on a one-mile final.

6.2.6 **Environmental conditions weather, visibility and surface condition** – Conditions that degrade the quality of the visual information available to the pilot and controller, such as poor visibility increase the variability of the pilot and controller response, and as such, may increase the severity of the incursion. Similarly, conditions that degrade the aircraft or vehicle stopping performance, such as wet or icy runways should also be considered.

6.2.7 **Factors that affect system performance** – Factors that affect system performance, such as communication failures (e.g. “open mike”), communication errors (e.g. the controller’s failure to correct an error in the pilot’s read-back) also contribute to the severity of the incident.

6.3 Classification of runway incursion severity

6.3.1 A runway incursion severity classification (RISC) calculator is available on CD (see Appendix H for a description of this program). This calculator has been developed to assist States in assessing the severity of runway incursion events. Use of this RISC model will enable a consistent assessment to be made of the severity of runway incursion events. Alternatively, the severity of runway incursions can be classified manually using the guidance contained in Sections 6.1 and 6.2.
Appendix A

COMMUNICATIONS BEST PRACTICES

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

1.2 The demanding environment associated with runway operations require that all participants accurately receive, understand, and correctly read back all clearances and instructions being transmitted. While readback requirements are not an ICAO requirement for vehicle drivers, it may be considered best practice to apply it to enhance safety.

1.3 If in doubt or uncertain of any clearance/instruction, or part of a clearance/instruction, flight crews should request clarification from ATC and subsequently readback all items of the clearance/instruction to ensure understanding.

1.4 At times, the volume, speed of delivery, and complexity of RTF instructions can impose difficulty on controllers, vehicle drivers and/or pilots, especially when the language in use is not the native language of the participants. Transient crew not speaking in their native language are often susceptible to misunderstandings generated by use of colloquialisms, therefore the use of ICAO standard phraseology and phonetics are critical to enhancing the safety of operations.

1.5 Use of ICAO air-ground radiotelephony communication language requirements (language normally used by the station on the ground or the English language)* will facilitate the establishment and maintenance of situational awareness for all participants associated with runway operations. To be effective, a limited set of phraseologies (15 – 20) could be identified for vehicle drivers. ICAO Annex 1 contains a recommended practice concerning minimum requirements for language proficiency for pilots and ATS personnel.

* ICAO air-ground radiotelephony communications language requirements are shown in Annex Annex 10 — Aeronautical Telecommunications, Volume II, Chapter 5 and Annex 1 — Personnel Licensing, Chapter 1 and its appendix.

1.6 To maintain high levels of situational awareness it is also recommended that communications for all operations on a runway (landing, departing, crossing aircraft, vehicles crossing and runway inspections etc.) take place on the VHF channel assigned for that runway. To accommodate vehicles that are equipped with UHF radios only, channel/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.

1.7 Use of established ICAO standard phraseologies for radiotelephony communication between aircraft and ground stations is essential to avoid misunderstanding the intent of the messages, and to reduce the time required for communication. ICAO phraseology should be used in all situations for which it has been specified. When standardised phraseology for a particular situation has not been specified, plain language is used.
1.8 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 of runway operations. While the ICAO provisions in Annex 10, Volume II, Chapter 5 allow for use of abbreviated call-signs in certain circumstances, it is deemed best practice not to apply any abbreviation of call-sign in runway operations.

Example Phraseologies

1.9 Example phraseologies shown below are taken from the ICAO provisions. For a complete listing of ATC phraseologies refer to PANS-ATM (Doc 4444), Chapter 12 and Annex 10, Volume II.

Annex 10, Volume II, paragraph 5.1.1.1 “In all situations for which standard radio telephony phraseology is specified, it shall be used.”

Example ICAO Phraseologies

1.9.1 Listed below are some of the relevant key ICAO phraseologies applicable for operations on or in the vicinity of runways. These phraseologies apply to air traffic controllers, pilots, and when applicable, to vehicle drivers.

Note 1.— Words in parentheses ( ) indicate that specific information, such as a level, a place or a time, etc., must be inserted to complete the phrase, or alternatively that optional phrases may be used. Words in square parentheses [ ] indicate optional additional words or information that may be necessary in specific instances.

Note 2.— The detailed phrases listed below do not form the complete phrases to be used, nor do they represent the total number listed in the PANS-ATM (Doc 4444). They refer to those elements considered crucial to runway safety aspects.

Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)

... a) TAXI PROCEDURES

... for departure

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

Or ... where detailed taxi instructions are required

ATC: (call sign) TAXI TO HOLDING POINT [(number)] [RUNWAY (number)] VIA (specific route to be followed) [TIME (time)] [HOLD SHORT OF RUNWAY (number)] [or CROSS RUNWAY (number)];

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

PILOT: (call sign) REQUEST BACKTRACK;
ATC: (call sign) BACKTRACK APPROVED;

ATC: (call sign) BACKTRACK RUNWAY (number);

Other general instructions

ATC: (call sign) FOLLOW (description of other aircraft or vehicle);

ATC: (call sign) VACATE RUNWAY;

PILOT/DRIVER: RUNWAY VACATED (call sign)

b) HOLDING INSTRUCTIONS FROM ATC

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

(call sign) HOLD POSITION;

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

…to hold at a runway holding point

(call sign) HOLD SHORT OF (position);

READBACK FROM PILOTS/DRIVERS

(call sign) HOLDING (call sign);

(call sign) HOLDING SHORT (call sign).

1.9.2 It should be noted that aircraft/vehicles should not hold closer to a runway than at designated runway holding points.

1.9.3 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 (number);

Note — If the control tower is unable to see the crossing aircraft or vehicle (e.g. night, low visibility, etc.), the instruction 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];

Note — If the control tower is unable to see the crossing aircraft or vehicle (e.g. night, low visibility, etc.), the instruction should always be accompanied by a request to report when the aircraft or vehicle has vacated the runway.
ATC: *(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 will, when requested, report “RUNWAY VACATED” only when the entire aircraft is beyond the relevant runway-holding position.

d) PREPARATION FOR TAKE-OFF – clearance to enter runway and await take-off clearance.

ATC: *(call sign)* LINE UP [AND WAIT];

ATC: *(call sign)* LINE UP RUNWAY *(number)* - in multiple runway / intersection departures;

ATC: *(call sign)* LINE UP. BE READY FOR IMMEDIATE DEPARTURE;

e) CONDITIONAL CLEARANCES

1.9.4 Conditional clearances must consist of the condition before the line up instruction, and an acknowledgement of the correct (or otherwise) readback is required as part of the correct procedure

*e.g.*: ATC: SAS941, BEHIND DC9 ON SHORT FINAL, LINE UP BEHIND.

1.9.5 The acknowledgement of a conditional clearance must contain the condition in the readback.

*e.g.*: Pilot: BEHIND LANDING DC9 ON SHORT FINAL, LINING UP BEHIND SAS941.

ATC: SAS941 [THAT IS] CORRECT.

1.9.6 The procedure makes no provision for vehicles to receive a conditional clearance.

*Note 1.* 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.

*Note 2.* Clearly identify the aircraft or vehicle that is the subject of a conditional clearance. Always read back the identification in full.

f) TAKE-OFF CLEARANCE

ATC: *(call sign)* RUNWAY *(number)* CLEARED FOR TAKE-OFF [REPORT AIRBORNE]

*Note:* [REPORT AIRBORNE]…Applicable for Low Visibility operations;
1.9.7 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 HOLD SHORT OF RUNWAY;

Or … to cancel a take-off clearance

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

PILOT: HOLDING *(call sign)*;

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: STOPPING *(call sign)*;

Aerodrome Control Phraseology – READ BACK

1.9.8 Of equal importance to the usage of correct phraseologies is the need to obtain the required read back, in the order required and accurately.

1.9.9 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.

1.10 Annex 11 — Air Traffic Services

...  

“3.7.3 Read-back of clearances and safety-related information 3.7.3.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice.”

1.10.1 The following items shall always be read back:

a) ATC route clearances;

b) Clearances and instructions to enter, land on, take off on, hold short of, cross and backtrack on any runway; and

c) Runway in use, altimeter settings, SSR codes, level instructions, heading, and speed instructions whether issued by the controller or contained in ATIS broadcast, transition levels.
“3.7.3.1.1 Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.”

“3.7.3.1.2 The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.”

1.10.2 Communication techniques – general

1.10.2.1 Detailed below are the relevant provisions laid down in Annex 10 and PANS-ATM (Doc 4444), with regard to radio transmission guidelines and techniques.

1.10.3 Issue of en-route clearance

1.10.3.1 Whenever possible an en-route clearance should be passed to an aircraft before start of taxi. If this is not possible, controllers should try and avoid passing the clearance to a pilot engaged in complicated taxiing manoeuvres near the runway due to the possibility of distraction.

1.10.3.2 An ATC en-route clearance is NOT an instruction to take off or enter an active runway. The words “TAKE OFF” are used only when an aircraft is cleared for take-off, or when cancelling a take-off clearance. At other times the words “DEPARTURE” or “AIRBORNE” are used.

1.10.4 Read Back requirements

1.10.4.1 The Air Traffic Controller is responsible for checking the completeness and accuracy of the read back. An aircraft must include its call sign in the readback, and a failure to do this shall be challenged by the controller.

1.10.5 Taxi instructions

1.10.5.1 Taxi instructions issued by a controller will always contain a clearance limit, which is the point at which the aircraft must stop until further permission to proceed is given. For departing aircraft the clearance limit will normally be the holding point of the runway in use, but it may be any other position on the aerodrome depending on prevailing traffic circumstances. When intersection departures are used, the appropriate holding point shall be clearly identified by ATC.

1.10.6 When a taxi clearance contains a taxi limit beyond a runway, it shall contain an explicit clearance to cross that runway, or an instruction to hold short, even if the runway is not in use.

1.10.6.1 Communication with any aircraft using the runway for the purpose of taxiing, should be transferred from the ground controller to the aerodrome controller prior to the aircraft entering/ crossing a runway.

1.10.6.2 It is strongly advised, when practicable, to use standard taxi routes.

1.10.6.3 For more complicated taxi instructions, it may be appropriate to divide the message into segments, placing the clearances and instructions in sequential order, to avoid the possibility of pilot misunderstanding.
For example:

An aircraft shall taxi to RWY 06R for take-off. The aircraft has to taxi via taxiway A and B and the taxi route will necessitate a runway crossing (RWY 06L). The holding point for RWY 06L on taxiway B is named B2

ATC: AFR 375, TAXI TO HOLDING POINT B2 VIA TAXIWAY ALPHA AND BRAVO, HOLD SHORT OF RWY 06L.

A/C: TAXI TO HOLDING POINT B2 VIA ALPHA AND BRAVO, HOLDING SHORT OF RUNWAY 06L, AFR375.

Subsequently


ATC: AFR375 CROSS RWY 06L, TAXI TO HOLDING POINT RWY 06R.

A/C: CROSS 06L, TAXI TO HOLDING POINT RWY 06R AFR375.

Further guidance on this subject can also be found in Appendix B – ‘Communications Guidance’.

It should be noted that the ICAO phraseology “TAXI TO HOLDING POINT …” may be misunderstood by some pilots due to the use of non ICAO phraseology within North America, where “POSITION AND HOLD…” is used by ATC when issuing a line up clearance. There have been a number of runway safety occurrences due to this misunderstanding, and the read-backs should be very carefully monitored.

Multiple line-ups on the same runway

In Europe, Line-up instructions may be issued to more than one aircraft at different points on the same runway, using the ICAO criteria contained in the Regional Supplementary Procedures (Doc 7030), (EUR), Aerodrome Operations.

In addition to the standard phraseology in Chapter 12 of PANS-ATM (Doc. 4444), the following ATC phraseology shall be used:

ATC: KLM123 LINE UP AND WAIT RUNWAY 22 INTERSECTION BRAVO NUMBER 2 FOR DEPARTURE NUMBER ONE AN AIR FRANCE B737 DEPARTING FROM ALPHA ONE.

A/C: LINING UP AND WAIT RUNWAY 22 INTERSECTION BRAVO NUMBER 2 KLM123.
Appendix B

BEST PRACTICES ON THE FLIGHT DECK

(Based on material provided by IATA and IFALPA)

1. AIM OF THIS APPENDIX

1.1 The aim of this appendix is to highlight some of the causal or contributory factors that have resulted in runway incursions, and which were identified during a runway safety survey conducted by EUROCONTROL.

1.2 Aircraft operators are invited to review the materials put forward in this document, and where necessary, amend their Standards Operating Procedures with regard to ground operations.

2. CRITICAL PHASE OF FLIGHT

2.1 The number of ground movements on aerodromes has increased significantly during the last decades. To provide the needed capacity on the ground, it is necessary to continuously review the layout of the taxiway infrastructure leading to increasingly complex taxiway systems at major aerodromes.

2.2 With the evolutionary process of enhancement and change accelerating in recent times, it remains imperative that pilots remain aware of the signage and markings being applied. Every opportunity to familiarise oneself should be taken, and where possible, information critical to safe aerodrome operations, should be shared.

2.3 The current generation of aircraft have highly automated and complex systems that have allowed the preparation and programming of the total flight on the ground. This has resulted in flight deck workload peaks shifting to the ground phase of aircraft operations. These evolutions are irreversible and appropriate mitigating measures should be undertaken to prevent runway incursions. Consequently the taxi phase should be treated as a “critical phase of flight”.

3. PLANNING FOR TAXI OPERATIONS

3.1 A key-point in the prevention of runway incursions, is to apply preventative measures during the taxi-phase. Prioritisation of administrative and commercial tasks, such as weight and balance calculations, certain checklist items, Captain’s welcome speeches, etc. prior to leaving the ramp will assist in reducing workload during the taxi phase and result in increased attention and improved situational awareness. This can be further enhanced by assigning one crew member to progressively monitor the progress of the flight against the aerodrome chart.
4. AERODROME FAMILIARIZATION

4.1 Preparations for departure and arrival at an aerodrome can be accomplished well in advance. Familiarization for taxi operation is essential and should be completed at the gate or prior to starting descent:

   a) prepare the necessary charts for taxi and have them available for use during taxi;
   b) take some time to study the aerodrome layout. Very often some system can be identified for the naming of taxiways;
   c) remember to review the latest NOTAM for both the departure and arrival aerodrome for information concerning construction or taxiway/runway closures. Visualise this information on the charts;
   d) standard taxi routes are used more often at busy aerodromes. Review the routes you expect to use. If you are not cleared for expected taxi route, you should take adequate time to familiarize yourselves with the new routing even if it requires stopping to do so;
   e) pay special attention to the location of hot spots. These are locations on the aerodrome movement area where there is an increased risk of collisions. Know what runways you will encounter between where you are and where you are going;
   f) 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; and
   g) conduct detailed briefings for all flight crew members, especially during night and low visibility operations i.e. include “extra eyes” where available.

5. BRIEFINGS

5.1 The “before take-off” briefing should be simplified as much as possible. Go through pre-departure check-lists when the aircraft is stationary. Several taxi items can be addressed during the “before start” briefing at the gate. The briefings during taxi can be limited to a summary of the highlights and the items which have been altered since the before start briefing. This should also be done during the “descent” briefing.

5.2 The “before start” and descent briefing should also contain a complete review of the expected taxi routes with special attention to the hot spots. Pay special attention to temporary situations such as work in progress, other unusual activity and recent changes in aerodrome layout. During this part of the briefing, refer to the aerodrome charts and visualise all available information.

5.3 Memory is “constructive”. That is: we have the tendency to fill in the blanks. Ensure that you follow the clearance or instruction that you actually received and not the one you expected to receive.

5.4 Be aware that the expectations established during the pre-taxi or pre-landing planning can be significantly altered with a different and unexpected clearance.
5.5 The following additional check list may assist with briefing preparations:

a) conduct a briefing for all flight crewmembers;

b) become familiar with the aerodrome;

c) plan timing and execution of checklists;

d) review NOTAM’s;

e) flight crew should fully understand all departure briefing items;

f) assigned taxi route should be briefed as thoroughly as an instrument approach; and

g) the aerodrome diagram should be readily available to all flight crew members.

6. TAXI PROCEDURES

6.1 Clearance

6.1.1 The receipt of any clearance and the taxi clearance itself requires the complete attention of all flight crew on the flight deck. If necessary, write down taxi-instructions, especially at complex or unfamiliar aerodromes, and cross-check the instructions against the aerodrome chart. Clarify any uncertainties about your clearance or your position on the aerodrome before the start of taxi or after vacating the runway. When not sure of taxi instructions, stop, request clarification from ATC and only continue taxiing when the required taxi routing has been confirmed. In case of doubt: ask.

6.1.2 All flight crew members should monitor the clearance for taxi, take-off and landing, and must be “in the loop” at all times when runway operations are in progress.

6.2 Public address announcements

6.2.1 Public address welcome announcements by flight deck should be transferred from the taxi phase to a moment before engine start-up or push back. Safety reports show that public address announcements to passengers or commercial announcements are a direct source of error in many events. Also, operational calls on the company frequency cause the other pilot to be isolated in the flight deck. These calls and announcements should, if possible, be avoided while taxiing and especially when approaching the active runway.

6.2.2 If it is necessary to leave the ATC frequency, notify other flight crew members. Afterwards, be briefed by the other crew member of what may have been missed.

6.3 Taxi best practices

6.3.1 Only one pilot can control the aircraft during taxi and his/her primary task is to safely taxi the aircraft. The pilot not flying should assist the pilot flying to the best of his/her ability by providing guidance based upon the cleared taxi routing and the aerodrome layout map.
6.3.2 Cancel check list activity when crossing and entering runways. One flight crew member should maintain full concentration on the runway traffic situation.

6.3.3 Never cross red stop bars when lining upon or crossing a runway, unless, in exceptional cases, where the stop bars, lights or controls are reported to be unserviceable, and contingency measures, such as using follow me vehicles, are in force. In these circumstances, whenever possible, alternative routes should be used.

6.3.4 When entering any runway, check for traffic (left and right) using all available surveillance means e.g. all eyes to be used.

6.3.5 When cleared to line up and/or when crossing any runway, position the aircraft in a right angle with the runway where possible, in order to better observe other traffic, both arriving and departing.

6.3.6 Do not rush. The higher the ground speed, the less time available to react, manoeuvre the aircraft and avoid obstacles. High speed also results in greater distance and time required to bring the aircraft to a complete stop. Time can be an ally and an enemy; use it wisely. Taxi defensively, and be prepared for others mistakes.

6.3.7 When a clearance to taxi to a point beyond a runway is received, it must include the authorization to cross that runway. A runway should never be crossed unless an explicit ATC clearance has been received.

6.3.8 Adopt the “sterile flight deck” concept while 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. Ensure cabin crew 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.

6.3.9 **Sterile flight deck definition:** Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.

6.3.10 **Explanation:** Disturbances may include, but not be limited to, calls received from non-operational areas (e.g. company), entry onto the flight deck by cabin crew and extraneous conversations not related to the current phase of flight. It is generally accepted that the need for a sterile cockpit commences:

   a) departure: when the aircraft starts engine(s) and ceases when the aircraft reaches 10 000 feet above the departure aerodrome elevation;

   b) arrival: when the aircraft reaches 10 000 feet above the arrival aerodrome elevation until the engine(s) are shut down after landing; and

   c) any other times determined and announced by the flight crew. (e.g. in flight emergency, security alert etc.).

6.3.11 Use all aircraft lights to help controllers and other pilots to see the aircraft. Fixed navigation lights and taxi light should be on whenever the aircraft is moving. Landing lights should be turned on when cleared for take-off (note – standard procedures to be inserted).

6.3.12 Check audio box and volume adjustment whenever a frequency change is made.
6.3.13 Ensure all flight crew are on the appropriate frequency until all runways have been vacated after landing.

6.3.14 After landing, vacate the runway as soon as possible, but not by turning onto another runway, unless specifically instructed to do so.

6.3.15 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.

6.3.16 Anytime there is uncertainty about the location of the aircraft position on the movement/manoeuvring area, STOP the aircraft, advise ATC, and ask for clarification. Take the question out of the flight deck.

6.3.17 If necessary request progressive taxi instructions.

6.3.18 Never stop on a runway unless specifically instructed to do so.

6.3.19 The following check list may assist with best practice preparations:

a) if necessary write down taxi route;

b) assign a crew member to progressively follow aircraft position on chart;

c) follow company SOP’s in regard to exterior lighting when taxiing and cleared for take-off – where possible, maximum illumination;

d) sterile flight deck during taxi;

e) be aware that the visibility required for taxiing may be less than the runway visual range (RVR);

f) be alert for mandatory signs/markings/stop bars and runway guard lights;

g) look for visual aids such as taxiway location information and destination signs;

h) designate a crew member to look for and report signs / markings and keep track of location against the aerodrome chart;

i) conduct pre-departure checklists when the aircraft is stationary;

j) use STANDARD radio phraseology;

k) receive explicit clearance before crossing any runway;

l) READ-BACK all runway crossing or hold short clearances using correct phraseology;

m) DO NOT be rushed by any party (ATC or company);

n) LISTEN to clearances issued to other aircraft;
o) NEVER cross red stop bars when entering or crossing a runway unless contingency measures are in force, e.g. to cover cases where the stop bars or controls are unserviceable;

p) before entering or crossing any runway, CHECK FOR TRAFFIC!!

q) no checklist activity crossing any runway;

r) ensure correct understanding of the ICAO phraseology “Taxi to holding point”; and

s) a common phraseology problem is the fundamental difference between the phraseology “position and hold” (which has the same meaning as the ICAO standard phrase “line up [and wait]”) and the standard ICAO phraseology “taxi to holding point” (which means taxi to, and hold at the runway holding point. Listen carefully to the instruction. If unsure – ASK.

6.4 Language

6.4.1 While the use of the language normally used by the station on the ground or the English language* is allowed, the use of standard aviation English at international aerodromes enhances situational awareness of all those listening on the frequency.

6.5 Proficiency

6.5.1 Conducting and comprehending radiotelephony communications requires competence with standard phraseology as well as general proficiency in the language used for communications.

6.5.2 Use standard phraseology at all times. Strict adherence to standard phraseology avoids miscommunications. See Appendix A. Communications Best Practices for further information.

6.5.3 Speaking slowly is essential when operating in foreign regions. When the speech note is slowed, the response may be slower and clearer.

6.6 Read-Backs

6.6.1 Any clearance requires a read-back. The following Standard is included in ICAO Annex 11: The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

a) ATC route clearances;

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

c) 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.

* ICAO air-ground radiotelephony communications language requirements are shown in Annex 10 — Aeronautical Telecommunications, Volume II, Chapter 5 and Annex 1 — Personnel Licensing, Chapter 1 and its appendix.
6.6.2 Any read-back requires a hear-back. In order to complete this “communication loop”, the read-back must be complete and clear. Read-back the full clearance, including call sign and runway designator. “Roger” is not a read-back.

6.7 **Listen**

6.7.1 Listen on the frequency at all times. Try to visualise the other traffic in the vicinity. Know what runways will encountered between where you are and where you are going. Be particularly attentive to all clearances and instructions issued to traffic involving those runways.

### 7. OTHER COMMUNICATION BEST PRACTICES

7.1 Be extra attentive when other aircraft with similar call signs are on the frequency.

7.2 When instructed to follow other traffic, 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 in doubt, seek clarification.

7.3 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 an extended period, advise about your position and seek clarification.

7.4 Both the pilot flying and the pilot not flying should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, take-off and land on a runway. Any misunderstanding or disagreement should be cleared up immediately by contacting ATC for clarification.

7.5 The use of headsets increases the readability of communications with ATC and within the flight deck.

7.6 Ensure the correct setting of the audio panel, especially after any temporary switch in audio sources.

7.7 State your position on the aerodrome whenever making initial contact with any ground or aerodrome controller, regardless of whether you have previously stated your position to a different controller.

7.8 Adopt the sterile cockpit rule during taxi phase.

### 8. SITUATIONAL AWARENESS

8.1 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 think 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.
8.2 The following check list may assist with maintaining situational awareness:

8.3 Before starting the approach

a) obtain all needed information;

b) brief planned primary runway exit and taxi route;

c) eliminate as much distraction as possible;

d) have aerodrome diagram available for instant use;

e) maintain situational awareness on final approach at night; and

f) listen for clearances to other aircraft.

8.4 Visual aids

8.4.1 Charts, signs, markings and lighting are all aids to assist in determining position. A high level of awareness must be maintained to observe and respond to mandatory signs and markings. Correct knowledge of all the symbols and signs is therefore necessary. 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 crew. A crew member who is in doubt or does not agree with something must speak-up.

8.4.2 Head down situation during taxi should be limited to the minimum amount of time possible.

8.4.3 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.

8.5 Other aids

8.5.1 Use your heading display or compass to confirm the runway or taxiway alignment with the information available from the charts. If available, use the ILS centreline guidance system to confirm the correct runway alignment.

8.5.2 Have a good look out; scan the entire runway and approach in both directions before entering a runway. If in doubt, seek clarification.

9. CONCLUSION

9.1 You can help to prevent runway incursions! How?

a) it is essential to adhere strictly to all relevant ICAO Standards and Recommended Practices, Procedures and guidance material, including phraseologies;
b) flight crews need to ensure that they follow the clearance or instructions that are actually received, and not those that the flight crew is expecting to receive;

c) good planning of ground operations can decrease the workload during taxi. The flight and its associated risks starts during the preparation;

d) good situational awareness is the top priority during taxi. All crewmembers should be involved;

e) application of “Crew Resource Management” principles during taxi is as important as during other phases of flight;

f) even the most professional and experienced people make mistakes. By being defensive and letting the built-in safety nets do their work, a single mistake should not lead to a serious incident or accident; and

g) never take anything for granted.

References

The following ICAO standards and recommended practices are provided to assist flight crews in understanding the use and application of stop bars:

Annex 2 — Rules of the Air, Chapter 3, paragraph 3.2.2.7.3

“An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off.”

Annex 14 — Aerodromes, Volume I — Aerodrome Design and Operations

Paragraph 5.3.19.9 Selectively switchable stop bars shall be installed in conjunction with at least three taxiway centre line lights (extending for a distance of at least 90 m from the stop bar) in the direction that it is intended for an aircraft to proceed from the stop bar.

Paragraph 5.3.19.13 Note 1— A stop bar is switched on to indicate that traffic stop and switched off to indicate that traffic proceed.

Paragraph 5.4.3.35 A taxiway shall be identified by a designator comprising a letter, letters or a combination of a letter or letters followed by a number.

Paragraph 5.4.3.36 Recommendation. When designating taxiways, the use of the letters I, O or X and the use of words such as inner and outer should be avoided wherever possible to avoid confusion with the numerals 1, 0 and closed marking.

Paragraph 5.4.3.37 The use of numbers alone on the manoeuvring area shall be reserved for the designation of runways.

“Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.

Note.— *Stop bars are located across taxiways at the point where it is desired that traffic stop, and consist of lights, showing red, spaced across the taxiway.*”

**Other References**


University of Leiden, Human factors in runway incursion incidents, Patrick Hudson, Netherlands.


FAA/IATA Runway Incursion Prevention Program.
Appendix C

AIR TRAFFIC CONTROL BEST PRACTICES

1. AIM OF THIS APPENDIX

1.1 The aim of this appendix is to highlight some of the causal or contributory factors that have resulted in runway incursions, and which were identified during a runway safety survey in Europe in 2001. It is usually the responsibility of the air traffic services provider to put best practices in place to prevent runway incursions.

1.2 While the use of the language normally used by the station on the ground or the English language* is allowed, the use of standard aviation English at international aerodromes enhances situational awareness of all those listening on the frequency.

2. CLEARANCES

2.1 Whenever possible an en-route clearance should be passed to an aircraft before start of taxi. If this is not possible, controllers should try and avoid passing the clearance to a pilot engaged in complicated taxiing manoeuvres near the runway, due to the possibility of distraction.

2.2 An en-route clearance does not authorize the pilot to take off or enter an active runway.

2.3 The words “TAKE OFF” shall only be used when an aircraft is cleared for take-off, or when cancelling a take-off clearance.

3. READ-BACK REQUIREMENTS

3.1 Read-back requirements have been introduced in the interests of flight safety. The stringency of the read-back requirement is directly related to the possible seriousness of misunderstandings in the transmission and receipt of ATC clearances and instructions. Strict adherence to read-back procedures ensures that the clearance or instruction has been received and understood correctly by the correct aircraft.

3.2 The flight crew must read back to the air traffic controller safety-related parts of ATC clearances and instructions.

3.3 The air traffic controller is responsible for checking the completeness and accuracy of the read-back.

*ICAO air-ground radiotelephony communications language requirements are shown in Annex 10 — Aeronautical Telecommunications, Volume II, Chapter 5 and Annex 1 — Personnel Licensing, Chapter 1 and its appendix.
3.4 In accordance with Annex 11, the following items shall always read-back:

a) ATC route clearances

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway;

c) 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 level; and

d) other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

3.5 An aircraft must include its call sign in the readback, as a failure to do this should be challenged by the controller.

3.6 In PANS-ATM (Doc 4444) paragraph 4.5.7.5.2, it is stated “The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back”. This requirement constitutes an essential cross-check to confirm correct understanding by flight crews and vehicle drivers, of a clearance/instruction or part thereof. This loop supports the safety and redundancy of pilot/vehicle driver/controller communications. Whenever adverse factors are likely to affect communications, strict adherence to this closed loop constitutes an important line of defence against communication errors.

4. TAXI INSTRUCTIONS

4.1 Taxi instructions issued by a controller must always contain a clearance limit, which is the point at which the aircraft must stop until an instruction to proceed is given. For departing aircraft the clearance limit will normally be the runway holding point of the runway in use, but it may be any other position on the aerodrome including runway intersections depending on prevailing traffic circumstances. When intersection departures are used, the appropriate runway holding points shall be clearly identified by ATC.

4.2 When a taxi clearance contains a taxi limit beyond a runway, it must contain an explicit clearance to cross that runway, even if the runway is not in use.

4.3 Where an expected or anticipated runway crossing is required, a means of communicating this to the pilots, at the gate or prior to descent, should be established.

4.4 Communication with any aircraft related to the use of a runway for the purpose of taxiing, should be transferred from the ground controller to the aerodrome controller prior to the aircraft entering/crossing a runway.

4.5 It is strongly advised, when practicable, to use standard taxi routes. For more complicated taxi instructions, it may be appropriate to divide the message into segments, placing the clearances and instructions in sequential order, to avoid the possibility of pilot misunderstanding.
5. **STOP BARS**

5.1 Annex 2 states “An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off”. This standard applies to both runways and taxiways where fitted with stop bars. The objective of this standard is to maintain the integrity of the stop bars, which are intended to protect the relevant part of a manoeuvring area.

5.2 PANS-ATM (Doc 4444) states “7.14.7 Stop bars shall be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.” As such, a controller should never issue a clearance to cross a stop bar without first switching off the stop bar. The only exception to this should be when contingency measures are required due to unserviceability. An example of a contingency measure is the use of a follow-me vehicle.

6. **TAKE-OFF PROCEDURES**

6.1 At aerodromes with separate ground control and aerodrome control functions, aircraft are transferred to the tower at or approaching the holding point.

6.2 Since misunderstandings in the granting and acknowledgement of take-off clearances can result in serious consequences, care should be taken to ensure that the phraseology employed during the taxi manoeuvres can not be interpreted as a take-off clearance.

7. **POSITION HAND-OVER**

7.1 NAVCANADA in their runway safety survey found a significant percentage of incidents involving ATC operational errors take place after a controller position hand-over takes place. To ensure that the complete traffic situation is included in a position hand-over, the use of a standardised hand-over check-list should be considered.
Appendix D

AIRSIDE VEHICLE DRIVING BEST PRACTICES

(The guidance is a compilation of material drawn from nay sources including ICAO, IATA, Airport Council International (ACI) and a large number of aerodromes that already operate vehicle driver training programmes)

1.1 Introduction

1.1.1 It is usually the responsibility of the Aerodrome Operator to have in place a formal training, assessment and authorisation programme for all drivers operating airside. Information already exists that indicates that vehicles and their drivers have caused runway incursions at a number of aerodromes.

1.1.2 As a result of local hazard analyses in Europe in 2001, the operation of vehicles on the aerodrome have been highlighted as a potentially high risk activity which demands a number of formal control measures to be put in place to manage the risk. A vehicle driver training programme is one of these control measures and should form part of the overall Safety Management System of the Aerodrome Operator.

1.1.3 The aerodrome operator should take the lead in developing an agreed standard for the vehicle driver training programme. There will be a requirement for co-operation and partnership with air traffic control, ground handling agents, airlines and other airside service providers to ensure the safe operation of the aerodrome.

1.1.4 Depending upon the scale and complexity of the aerodrome and the individual requirements of the driver, the training programme should take into account the following main areas:

   a) a generic airside vehicle driver training programme which covers operational safety and health and safety aspects of operating vehicles, plant and equipment in close proximity to aircraft on movement/manoeuvring areas, aprons, stands and airside roads;

   b) specific training on the vehicle, plant and equipment, e.g. car, tug, high loader, coach;

   c) where the specific job function requires the driver to operate on the manoeuvring area then additional training on the hazards associated with runways and taxiways should be covered; and

   d) an essential requirement of operating a vehicle on the manoeuvring area is the need to communication with the Aerodrome Control Tower. This requires training in the correct use of RTF and standard phraseology.
1.1.5 The following material describes what should be considered as ‘good practice’ guidance and is applicable to the majority of aerodromes. The material describes a generic framework for the four main areas shown above. It is vital that both theoretical formal training and practical experience cover all four areas. The aim of this guidance is to ensure consistency and a high degree of standardisation in the manner in which a driver obtains an ‘Airside Driving Permit’.

2. FACTORS ASSOCIATED WITH DEVELOPMENT OF A FRAMEWORK FOR AN AIRSIDE VEHICLE DRIVER TRAINING PROGRAMME

2.1 Issues to be considered when developing programmes and knowledge requirements for the airside driving permit (ADP):

   a) the issuing authority (normally the aerodrome operator), its validity in terms of time, conditions of use, its transferability;

   b) ownership of the permit, control and audit of permit issue;

   c) local enforcement and driving offence procedures; and

   d) relationship to State driver licensing system.

2.2 National Legislation and Regulation

   a) government/State regulations related to general vehicle driving licences;

   b) State/regional/local government requirements; and

   c) national aviation safety authority requirements/guidance for driving airside.

2.3 Aerodrome Regulations and Requirements

   a) rules of the air and ATC procedures applicable to aerodromes as they relate to vehicles, particularly rights of way;

   b) specific aerodrome regulations, requirements and local instructions;

   c) local methods used to disseminate general information and instruction to drivers; and

   d) local methods used to disseminate information regarding works in progress.

2.4 Personal Responsibilities

   a) fitness to drive (medical/health standards) national or airport agreed requirements;

   b) issue and use of personal protective equipment such as high visibility clothing and hearing protection;

   c) general driving standards;
d) no-smoking/no-drinking requirements airside;

e) responsibilities with respect to foreign object debris (FOD) and fuel/oil spillage; and

f) responsibility for individuals to ensure vehicle is serviceable for the task and used correctly.

2.5 **Vehicle Standards**

a) condition and maintenance standards agreed at aerodrome and/or national level;

b) the requirements to display obstruction lights and company insignia;

c) requirements and content of daily vehicle inspections;

d) agreed standards of aerodrome and company vehicle fault reporting and rectification; and

e) local requirements for the issue and display of airside vehicle permits (AVP’s).

2.6 **General Aerodrome Layout**

a) the general geography of the local aerodrome;

b) aviation terminology used such as runway, taxiway, apron, roads, crossings, runway holding points, etc.;

c) all aerodrome signs, markings and lights for both vehicles and aircraft;

d) specific reference to signs, markings and lights used to guard runways and critical areas; and

e) specific reference to any controlled/uncontrolled taxiway crossing procedures.

2.7 **Hazards of General Airside Driving**

a) speed limits, prohibited areas and no parking regulations;

b) the danger zones around aircraft;

c) engine suction/ingestion and blast, propellers and helicopters;

d) aircraft refuelling;

e) FOD and spillages;

f) vehicle reversing;

g) staff and passengers walking across aprons;
h) air-bridges and other services such as fixed electrical ground power;

i) the general aircraft turnaround process;

j) aircraft emergency stop and fuel cut off procedures;

k) hazardous cargo;

l) local vehicle towing requirements;

m) requirements for driving at night; and

n) requirements for driving in adverse weather conditions, particularly low visibility.

2.8 Local Organizations

a) the role of the Aerodrome Operator in setting and maintaining standards;

b) the national aviation safety authority and its responsibilities;

c) the national and/or local police and their involvement with airside driving; and

d) other enforcement authorities dealing with vehicles, driving, health and safety.

2.9 Emergency Procedures

a) actions and responsibilities in a crisis situation (any accident or significant incident occurring on the airport);

b) action in the event of a vehicle accident;

c) specific action in the event of a vehicle striking an aircraft;

d) action in the event of fire;

e) action in the event of aircraft accident/incident; and

f) action in the event of personal injury.

2.10 Communications

a) radio procedures and phraseologies to be used, if applicable;

b) light signals used by ATC;

c) procedures to be used by vehicle drivers if lost or unsure of position;

d) local emergency telephone number; and

e) how to contact the local aerodrome safety unit.
2.11 **Practical Training (Visual Familiarization)**

a) airside service roads, taxiway crossings and any restrictions during low visibility;

b) aprons and stands;

c) surface paint markings for vehicles and aircraft;

d) surface paint markings that delineate the boundary between aprons and taxiways;

e) signs, markings and lights used on the taxiway and help indicate runways ahead;

f) parking areas and restrictions;

g) speed limits and regulations; and

h) hazards during aircraft turnarounds and aircraft movements.

2.12 **Framework for Manoeuvring Area Vehicle Driver Training Programme**

2.12.1 All drivers expected to operate on the manoeuvring area of an aerodrome should obtain an ADP which has covered the programme detailed above. It is also expected that any driver who will drive on the manoeuvring area will have obtained an agreed period of experience of general airside driving before training to operate on the manoeuvring area.

2.12.2 The numbers of drivers permitted to drive on the manoeuvring area should be kept to the minimum necessary, and the functions they perform should normally be within the following areas of responsibility:

a) runway inspections;

b) bird control;

c) rescue and fire fighting;

d) essential engineering;

e) ATC;

f) snow clearing and de-icing; and

g) airline/handling agent for aircraft towing and runway crossings.

2.12.3 All drivers should be trained initially and be provided with refresher training at agreed intervals with particular additional emphasis on the following areas.
2.13 Aerodrome Regulations and Requirements

a) air traffic control rules, rights of way of aircraft;

b) definitions of movement area, manoeuvring area, aprons, stands; and

c) methods used to disseminate information regarding works in progress.

2.14 Air Traffic Control

a) function of aerodrome control and its area of responsibility;

b) function of ground movement control and its area of responsibility;

c) normal and emergency procedures used by ATC relating to aircraft;

d) ATC frequencies used and normal hand over/transfer points for vehicles;

e) ATC call signs, vehicle call signs, phonetic alphabet, standard phraseology; and

f) demarcation of responsibilities between ATC and apron control if applicable.

2.15 Personal Responsibilities

a) fitness to drive with particular emphasis on eyesight and colour perception;

b) correct use of personal protective equipment;

c) responsibilities with respect to FOD; and

d) responsibilities with respect to escorting other vehicles on the manoeuvring area.

2.16 Vehicle Standards

a) responsibility to ensure vehicle used is fit for purpose and task;

b) requirements for daily inspection prior to operating on the manoeuvring area;

c) particular attention to the display of obstruction and general lights; and

b) serviceability of all essential communications systems with ATC and base operations.

2.17 Aerodrome Layout

a) particular emphasis on signs and markings and lights used on the manoeuvring area;

b) special emphasis on those signs, markings and lights used to protect the runway;

c) description of equipment essential to air navigation such as instrument landing system (ILS);
d) description of protected zones related to ILS antenna;

e) description of ILS protected areas and their relation to runway holding points;

f) description of runway instrument/visual strip, cleared and graded area; and

g) description of lights used on the manoeuvring area with particular emphasis on those related to low visibility operations.

2.18 Hazards of Manoeuvring Area Driving

a) engine suction/ingestion and blast, vortex, propellers and helicopter operations;

b) requirements for driving at night;

c) requirements for operations in low visibility and other adverse weather conditions;

d) procedures for vehicle and or radio becoming unserviceable while on manoeuvring area; and

e) rights of way for aircraft, towed aircraft and rescue and fire fighting services (RFFS) vehicles in emergency.

2.19 Emergency Procedures

a) actions to be taken in event of vehicle accident/incident;

b) actions to be taken in event of aircraft accident/incident;

c) actions to be taken if FOD or other debris is found on runways and taxiways;

d) procedures to be used by vehicles if lost or unsure of position; and

e) local emergency telephone number.

2.20 Aircraft Familiarisation

a) knowledge of aircraft types and ability to identify all types normally operating at the aerodrome;

b) knowledge of airline call signs; and

c) knowledge of aircraft terminology relating to engines, fuselage, control surfaces, undercarriage, lights, vents etc.
2.21 **Practical Training (Visual Familiarization)**

a) all runways (including access and exit routes), holding areas, taxiways and aprons;

b) all signs, surface markings and lights associated with runways, holding positions, CAT 1/2/3 operations;

c) all signs, surface markings and lights associated with taxiways;

d) specific markings that demarcate the boundary between aprons and manoeuvring area;

e) navigation aids such as ILS, protected area, antenna, RVR equipment and other meteorological equipment;

f) hazards of operating around aircraft landing, taking off or taxiing; and

g) any locally used naming convention for particular areas or routes.

2.22 **Framework for a Radiotelephony (RTF) Training Programme**

2.22.1 The movement of vehicles on the manoeuvring area is subject to authorization by ATC. Depending upon the complexity of the aerodrome, ATC may operate a number of frequencies. Typically the aerodrome (tower) controller will be responsible for all vehicles operating on the runway, and the ground controller will be responsible for all vehicles operating on the taxiways. It is essential to fit all vehicles that operate on the runway with the appropriate radio communication frequencies.

2.22.2 All drivers of vehicles operating on the manoeuvring area should be expected to display a high degree of competence with respect to use of RTF phraseology and ICAO air-ground radiotelephony communications language requirements.

2.23 **Hierarchy of Message Priority**

a) message priorities, understanding of distress, alerting, control, and information messages.

2.24 **Use of the Phonetic Alphabet**

a) correct pronunciation of both letters, words and numbers.

2.25 **Use of Standard Phraseology**

a) emphasis on drivers using standard phraseology; and

b) caution should be noted with certain phrases such as ‘cleared’, and ‘go ahead’
2.26 Use of Call Signs for Aircraft, ATC and Vehicles
   a) understanding of terminology and acronyms used by ATC and pilots;
   b) knowledge of the airline call signs used at the aerodrome; and
   c) vehicle call signs should be appropriate to function e.g. ‘Operations’, ‘Fire’, ‘Engineer’, where there are more than one vehicle the use of numbers e.g. ‘Fire 2’.

2.27 Use of Read back Procedures
   a) vehicle drivers should use standard read back in the same manner as pilots for instructions such as ‘enter/cross the runway’, and if conditional clearances are used.

2.28 Readability Scale
   a) understanding and use of the readability scale from 1 – 5.

2.29 Lost or Uncertain of Position
   a) understanding of local procedures for vehicles lost or uncertain of position on the manoeuvring area.

2.30 Vehicle Breakdown
   a) local procedure for vehicle breakdown on runways and taxiways; and
   b) procedure for indicating to ATC of vehicle failure.

2.31 Radio Fail Procedure
   a) understanding of the local procedure if radio failure occurs whilst on the runway or taxiway; and
   b) understanding of the light signals that may be used by ATC to pass instructions to vehicles.

2.32 Correct Transmitting Technique and RTF Use
   a) understand the reasons for listening out prior to transmitting
   b) use of standard phraseology and ICAO air-ground radiotelephony communications procedures (there are no language requirements for vehicle drivers). Apply Annex 14, Volume I, paragraph 9.7, Aerodrome vehicle operations;
   c) words and sounds to be avoided;
   d) correct positioning of microphones to avoid voice distortion;
   e) avoidance of ‘clipped’ transmissions;
f) be aware of regional accents and variations of speech; and

g) speed of delivery of RTF phraseology

2.33 **Use of Portable Radios**

a) correct use of radios;

b) effective range and battery life;

c) screening/shielding effects on the aerodrome; and

d) use of correct call signs, either related to vehicle or an individual person.

2.34 **Safety while using Radios**

a) local instructions regarding use of portable radios and hand held microphones while driving a vehicle; and

b) local instructions on the use of mobile telephones while operating airside.

2.35 All of the three training programmes should consist of two main parts, the first being the classroom/theoretical part which should include the use of prepared presentations, maps, diagrams, video, booklets, checklists as appropriate. The second part should involve practical training and visual familiarization on the aerodrome with a suitably trained person. This practical tuition will take a period of time depending upon the complexity of the aerodrome. Following initial training, a programme of refresher training should be organised after an agreed period of time.

2.36 Where responsibility for vehicle driver training (apron and manoeuvring area) and RTF is delegated to a third party provider the aerodrome management should institute a programme of audits, as part of its SMS, to ensure that agreed standards are being maintained.

2.37 The above frameworks are intended only as a guide and are based on current ‘good practice’. It is incumbent on aerodromes to regularly review their vehicle driver training programmes against programmes and documentation available across the industry.

**References**

Airports Council International ACI (World) Apron Safety Handbook

ACI (World) Apron Signs and Markings Handbook

IATA Airport Handling Manual (AHM) current edition

UK Civil Aviation Authority CAP 642 - Airside Safety Management

UK Airport Operators Association - Airside Driver Training Scheme

ICAO *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), Chapter 7, Procedures for Aerodrome Control Service

ICAO *Safety Management Manual* (SMM) (Doc 9859)
Appendix E

AERODROME RESOURCE MANAGEMENT TRAINING COURSE

1. INTRODUCTION

1.1 An analysis of many runway incursions has established that a number of these incidents were the result of a breakdown in team function of air traffic controllers, air crew or vehicle drivers. This may be due to incorrect communication practices or a failure to understand the roles and difficulties of those from other areas. A training course, known as Aerodrome Resource Management, has been produced by EUROCONTROL and is intended to enhance the team role between all involved in runway operations. This course can be implemented at individual aerodromes or alternatively regional seminars can be organised. The course places emphasis on developing the team role at each airport and also building an understanding for all staff on the exact tasks and difficulties of others who operate on the manoeuvring area.

2. COURSE DESCRIPTION

2.1 The successful introduction of local runway safety teams can prove beneficial in the prevention of runway incursions. Local runway safety teams comprise pilots, airside vehicle drivers and air traffic controllers. The goal of the team is to work together to identify the local causal factors of runway incursions and identify local solutions to prevent their recurrence.

2.2 Today, all three members of this multi-professional team are working at the forefront of operational safety as individuals; they need to be a team on the manoeuvring area.

2.3 The Aerodrome Resource Management course is designed to train trainers to facilitate the members of local runway safety teams and all operational staff working on the manoeuvring area.

2.4 The course is applied to raise awareness of the operational hazards faced every day when working on or around a runway. The human factors focus reveals the importance of communication, error management and situational awareness for this group of staff.

2.5 It is highly desirable that a representative cross section of air traffic controllers, aircrew and vehicle drivers attend this multi-disciplinary course.

2.6 Detailed information can be obtained from www.eurocontrol.int/ians
### Appendix F

1. **RUNWAY INCURSION INITIAL REPORT FORM**

   **ICAO MODEL RUNWAY INCURSION INITIAL REPORT FORM**

   **A. Date/time of incident (in UTC)**
   
   (YYYYMMDDhhmm)

   **B. Person submitting the report:**
   
   Name
   
   Job Title
   
   Telephone
   
   Facility/Unit

   Date/time/place of completion of form

   ________________________________

   **C. ICAO Aerodrome Designator**

   ____________________________

   **D. Surface Condition**

   (Braking)

   **E. Aircraft, vehicle or person involved in the runway incursion** *(Indicate those involved in the incident)*

   Aircraft 1
   Aircraft 2
   Aircraft 3
   Vehicle
   Person

   **F. Weather Conditions**

   Wind
   Visibility/RVR

   Temperature (° Celsius)
   Ceiling/Cloud

   Additional Information
   ________________________________
G. Evasive Action Aircraft 1

<table>
<thead>
<tr>
<th>Action</th>
<th>No</th>
<th>Yes</th>
<th>Make selection from list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancelled takeoff clearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rejected takeoff (distance rolled)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotated early</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abrupt stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swerve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missed approach (distance to runway threshold)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
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</tr>
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</table>

H. Evasive Action Aircraft 2

<table>
<thead>
<tr>
<th>Action</th>
<th>No</th>
<th>Yes</th>
<th>Make selection from list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancelled takeoff clearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rejected takeoff (distance rolled)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotated early</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed rotation</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Abrupt stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swerve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missed approach (distance to runway threshold)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I. Evasive Action Vehicle

<table>
<thead>
<tr>
<th>Action</th>
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</tr>
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<td></td>
</tr>
<tr>
<td>Swerve</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

J. Closest Proximity (CP)

<table>
<thead>
<tr>
<th>Vertical (ft)</th>
<th>Horizontal (m)</th>
</tr>
</thead>
</table>

K. Communication Difficulties?

(Multiple choices can be made)

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Make selection from list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readback/hearback</td>
<td></td>
</tr>
<tr>
<td>Blocked communication</td>
<td></td>
</tr>
<tr>
<td>Partially blocked communication</td>
<td></td>
</tr>
<tr>
<td>Confused callsigns</td>
<td></td>
</tr>
<tr>
<td>ACFT/vehicle on wrong frequency/no radio</td>
<td></td>
</tr>
<tr>
<td>Non-standard phraseology</td>
<td></td>
</tr>
</tbody>
</table>

L. Did the ATC forget about?

<table>
<thead>
<tr>
<th>Event</th>
<th>Make selection from list</th>
</tr>
</thead>
<tbody>
<tr>
<td>an ACFT/person/vehicle cleared onto or to cross a runway</td>
<td>Yes</td>
</tr>
<tr>
<td>an ACFT on approach to land</td>
<td></td>
</tr>
<tr>
<td>a runway closure</td>
<td></td>
</tr>
</tbody>
</table>
M. Description of Incident and Relevant Circumstances (must include):

i) a description or diagram of the geometry of the incident scenario;

ii) a description of any evasive or corrective action taken to avoid a collision;

iii) an assessment of the available reaction time and the effectiveness of the evasive or corrective action;

iv) whether a review of voice communication has been completed and results of that review; and

v) initial assessment of severity.
### Aircraft / Vehicle Details

#### N. Aircraft 1

<table>
<thead>
<tr>
<th>Reg No.</th>
<th>Call sign</th>
<th>SSR code</th>
<th>(if applicable)</th>
<th>Flight No.</th>
<th>Owner/Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Aircraft 1 type**

**Flight Details**

<table>
<thead>
<tr>
<th>Type of Flight</th>
<th>Flight Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Aviation</td>
<td>IFR</td>
</tr>
<tr>
<td>Military</td>
<td>VFR</td>
</tr>
<tr>
<td>Non-scheduled</td>
<td></td>
</tr>
<tr>
<td>Scheduled</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
</tr>
</tbody>
</table>

#### O. Aircraft 2

<table>
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<th>Reg No.</th>
<th>Call sign</th>
<th>SSR code</th>
<th>(if applicable)</th>
<th>Flight No.</th>
<th>Owner/Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Aircraft 1 type**

**Flight Details**

<table>
<thead>
<tr>
<th>Type of Flight</th>
<th>Flight Rules</th>
</tr>
</thead>
<tbody>
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<td>General Aviation</td>
<td>IFR</td>
</tr>
<tr>
<td>Military</td>
<td>VFR</td>
</tr>
<tr>
<td>Non-scheduled</td>
<td></td>
</tr>
<tr>
<td>Scheduled</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
### P. Vehicle 1

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reg No.</td>
<td></td>
</tr>
<tr>
<td>Mobile No.</td>
<td></td>
</tr>
<tr>
<td>Call sign</td>
<td></td>
</tr>
<tr>
<td>Owner/Operator</td>
<td></td>
</tr>
<tr>
<td>Vehicle type</td>
<td></td>
</tr>
</tbody>
</table>

#### Vehicle Details

**Type of Vehicle**

- Runway Inspection
- Bird control
- Tugging / Towing
- Fire Brigade
- Maintenance
- Snow clearing
- Military
- Other

### Q. Vehicle 2

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reg No.</td>
<td></td>
</tr>
<tr>
<td>Mobile No.</td>
<td></td>
</tr>
<tr>
<td>Call sign</td>
<td></td>
</tr>
<tr>
<td>Owner/Operator</td>
<td></td>
</tr>
<tr>
<td>Vehicle type</td>
<td></td>
</tr>
</tbody>
</table>

#### Vehicle Details

**Type of Vehicle**

- Runway Inspection
- Bird control
- Tugging / Towing
- Fire Brigade
- Maintenance
- Snow clearing
- Military
- Other

### R. Report received by

- **(name of person)**
- Date

### S. Date when detailed investigation will commence

- __________________________
2. **INSTRUCTIONS FOR THE COMPLETION OF RUNWAY INCURSION INITIAL REPORT FORM**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Date/time UTC and conditions (day or night).</td>
</tr>
<tr>
<td>B.</td>
<td>Details of the person submitting the report.</td>
</tr>
<tr>
<td>C.</td>
<td>Aerodrome designator as indicated in <em>Location Indicators</em> (Doc 7910).</td>
</tr>
<tr>
<td>D.</td>
<td>Information regarding runway condition at the time of the incursion that affected the braking action of the aircraft.</td>
</tr>
<tr>
<td>E.</td>
<td>Identification of aircraft, vehicle and person involved in the runway incursion. More details should be provided in N, O, P, and Q.</td>
</tr>
<tr>
<td>F.</td>
<td>Information on weather conditions such as wind, visibility, RVR, temperature, ceiling, cloud and additional information as required.</td>
</tr>
<tr>
<td>G, H, I.</td>
<td>Information regarding evasive actions taken by aircraft and/or vehicle.</td>
</tr>
<tr>
<td>J.</td>
<td>Information regarding the closest proximity (CP) or distance, horizontally and/or vertically, between both parties during the runway incursion or at the point at which both parties were aware of the situation and the aircraft was under control at taxi speed or less.</td>
</tr>
<tr>
<td>K, L.</td>
<td>Information regarding communications difficulties and ATC memory lapses.</td>
</tr>
<tr>
<td>M.</td>
<td>Describe the runway incursion, provide information requested. Attach additional papers as requested.</td>
</tr>
<tr>
<td>N, O, P, Q.</td>
<td>Detailed information regarding aircraft and vehicles involved in the runway incursion.</td>
</tr>
<tr>
<td>R.</td>
<td>Name of person receiving the report and date.</td>
</tr>
<tr>
<td>S.</td>
<td>Date when detailed investigation of the runway incursion will commence.</td>
</tr>
</tbody>
</table>
Appendix G

1. RUNWAY INCURSION CAUSAL FACTORS IDENTIFICATION FORM

Initial Runway Incursion Report Number

ICAO MODEL RUNWAY INCURSION CAUSAL FACTORS IDENTIFICATION FORM

A. Date/time/Place of incident In (UTC) (YYYYMMDDhhmm)

B. Aircraft, vehicle or person involved in the runway incursion (Indicate those involved in the incident).

Aircraft 1
Aircraft 2
Aircraft 3
Vehicle
Person

C. Severity of Runway Incursion

<table>
<thead>
<tr>
<th>Accident</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

D. Causal and Coincident Factors (Multiple choices can be made)

1. Air Traffic Control

1.1 Communications

1.1.1 Transmitted instructions which were long, complex, spoken rapidly or in a language other than ICAO air-ground radiotelephony communications language requirements (language normally used by the station on the ground or the English language)

1.1.2 Did not obtain read-backs for clearances, instructions and coordination as required by ICAO

1.1.3 Did not correct error in a read-back

1.1.4 Issued clearance to wrong aircraft

1.1.5 Confused similar call-signs

1.1.6 Transmission was completely blocked
1.1.7 Deviation from established ICAO standard phraseologies

1.1.8 Other (please specify; If not ICAO procedure, please briefly describe the procedure used). (Where?)

1.2 Situational Awareness

1.2.1 Head down time due to equipment/displays; duties other than traffic processing such as inputting flight data

1.2.2 Forgot about:
- Aircraft on an active runway
- Aircraft cleared to cross a runway
- Aircraft in the lined up position
- Aircraft on approach to land
- To issue a clearance
- That a clearance has already been issued
- Closed runways
- Vehicle on an active runway
- Vehicle cleared to cross a runway

1.2.3 Distractions due to:
- Performing other assigned duties, such as conducting operational telephone calls, weather observations and recording, issuing NOTAM and other operational information (split in two)
- Engaging in non-operational activities such as personal telephone call, extraneous conversation, reading material and radios
- Used language other than ICAO air-ground radiotelephony communications language requirements (language normally used by the station on the ground or the English language)
- Other

1.2.4 Misidentified aircraft or aircraft’s position due to:
- Incorrect position report
- An incorrect expectation (e.g. expected the aircraft to be clear of the runway)

1.2.5 A lack of visual scanning of ground movements

1.2.6 ATC tower has limitations on the view of the manoeuvring area

1.2.7 Recent runway configuration change

1.2.8 Unusual runway configuration

1.2.9 Error occurred within 15 minutes of assuming the control position

1.2.10 Controller was conducting on-the-job training
1.2.11 Fatigue

1.2.12 Other (please specify).

1.3 Staffing

1.3.1 ATC positions were combined on same frequency

1.3.2 Absence of a supervisor in the tower

1.3.3 Supervisor was working a control position

1.4 Decision Making

1.4.1 Misjudged separation or anticipated separation

1.4.2 Inadequate ATC to ATC coordination

1.4.3 Other (please specify).

1.5 Procedures

1.5.1 Misapplication of:
   Conditional clearances

1.5.2 Use of multiple line up clearances

1.5.3 Other (please specify; If not ICAO procedure, please briefly describe the procedure used). (Where?)

1.6 Aerodrome works

1.6.1 ATC not advised of works on the manoeuvring area

1.6.2 Other (please specify).
2. **Flight Crew**

2.1 **Communications**

2.1.1 Transmission was completely blocked

2.1.2 Transmission was partially-blocked “stepped-on”

2.1.3 Accepted another aircraft’s clearance:

- With similar call signs
- Without similar call signs

2.1.4 Deviation from established ICAO standard phraseologies

2.1.5 Used other than ICAO air-ground radiotelephony communications language requirements (language normally used by the station on the ground or the English language) in situation not covered by ICAO standard phraseology

2.1.6 Used language other than ICAO air-ground radiotelephony communications language requirements (language normally used by the station on the ground or the English language)

2.1.7 Speech quality:

- Not proficient in ICAO air-ground radiotelephony communications language requirements (language normally used by the station on the ground or the English language)
- Poorly enunciated or heavily accented
- Spoken rapidly
- Spoken with an inconsistent volume

2.1.8 Did not use headsets

2.1.9 Received clearance or instructions during periods of high cockpit workload

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

2.1.11 Other (please specify).

2.2 **Situational Awareness**

2.2.1 Crew conducting checklists while taxiing

2.2.2 Crew member programming Flight Management System or other flight deck system while taxiing

*ICAO air-ground radiotelephony communications language requirements are shown in Annex 10 — *Aeronautical Telecommunications*, Volume II, Chapter 5 and Annex 1 — *Personnel Licensing*, Chapter 1 and its appendix.*
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.3</td>
<td>Crew member was on another radio frequency</td>
</tr>
<tr>
<td>2.2.4</td>
<td>Competing radio communications</td>
</tr>
<tr>
<td>2.2.5</td>
<td>Unfamiliar with the aerodrome layout</td>
</tr>
<tr>
<td>2.2.6</td>
<td>Mistook position on the aerodrome (thought they were in a different location)</td>
</tr>
<tr>
<td>2.2.7</td>
<td>Fatigue</td>
</tr>
<tr>
<td>2.2.8</td>
<td>Reported incorrect location to ATC</td>
</tr>
<tr>
<td>2.2.9</td>
<td>Taxied fast</td>
</tr>
<tr>
<td>2.2.10</td>
<td>Did not refer to the aerodrome diagram</td>
</tr>
<tr>
<td>2.2.11</td>
<td>Did not listen to the ATIS</td>
</tr>
<tr>
<td>2.2.12</td>
<td>Works on the manoeuvring area not previously advised by NOTAM</td>
</tr>
<tr>
<td>2.2.13</td>
<td>Used out of date or inaccurate publications or charts</td>
</tr>
<tr>
<td>2.2.14</td>
<td>Failed to apply or correctly observe Sterile Cockpit procedures</td>
</tr>
<tr>
<td>2.2.15</td>
<td>Other (please specify).</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>2.3</td>
<td>Marking, Signs and Lighting</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Not ICAO compliant</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Not provided</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Irregularly spaced</td>
</tr>
<tr>
<td>2.3.4</td>
<td>Ambiguous and difficult to follow</td>
</tr>
</tbody>
</table>
2.3.5 Poorly sized

2.3.6 Poorly situated

2.3.7 Poorly maintained

2.3.8 Other (please specify).

2.4 Clearances and Instructions

<table>
<thead>
<tr>
<th>2.4.1</th>
<th>Misunderstood clearance:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conditional</td>
</tr>
<tr>
<td></td>
<td>Follow</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
</tbody>
</table>

| 2.4.2 | Did not ask for clarification when flight crew did not understand clearance or instruction |

| 2.4.3 | Did not inform ATC when could not comply with a clearance |

| 2.4.4 | Forgot part of the clearance or instruction |

| 2.4.5 | Entered the runway after being instructed to “hold short” |

| 2.4.6 | Lined up on the runway after instruction to taxi to the runway holding position (point) |

| 2.4.7 | Took off without a clearance after being instructed to “line up and wait” |

| 2.4.8 | Took off without a clearance after being instructed to taxi to the runway holding position (point) |

| 2.4.9 | Landed or departed on wrong runway |

| 2.4.10 | Landed or departed on taxiway |

| 2.4.11 | Other (please specify). |
3. **Vehicles and Pedestrians**

### 3.1 Communications

<table>
<thead>
<tr>
<th>3.1.1</th>
<th>Not operating on the appropriate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground frequency for operations outside the runway strip</td>
<td></td>
</tr>
<tr>
<td>Tower frequency for operations within the runway strip</td>
<td></td>
</tr>
<tr>
<td>3.1.2</td>
<td>Turned the radio volume down or off after initial communication with ATC</td>
</tr>
<tr>
<td>3.1.3</td>
<td>Other (please specify).</td>
</tr>
</tbody>
</table>

### 3.2 Situational Awareness

| 3.2.1 | Forgot the details/limits of any clearance to operate on the manoeuvring area |
| 3.2.2 | Distracted by: |
| Current work |
| High noise levels |
| Monitoring more than one frequency and possibly a mobile telephone |
| Disoriented or lost on the aerodrome |
| 3.2.3 | Failure to report correct location |
| 3.2.4 | Other (please specify). |

### 3.3 Markings, Signs and Lighting

| 3.3.1 | Not ICAO compliant |
| 3.3.2 | Not provided |
| 3.3.3 | Irregularly spaced |
| 3.3.4 | Ambiguous and difficult to follow |
| 3.3.5 | Poorly sized |
| 3.3.6 | Poorly situated |
3.3.7 Poorly maintained

3.3.8 Other (please specify).

3.4 Procedures

3.4.1 Not adequately familiar with the aerodrome and its procedural requirements

3.4.2 Did not refer to current aerodrome NOTAM

3.4.3 Did not refer to current aerodrome diagram

3.4.4 Used out of date or inaccurate publications or charts

3.4.5 Did not advise ATC of work that affected operations

3.4.6 Ground vehicles did not stop at required positions

3.4.7 Other (please specify).

3.5 Clearances and Instructions

3.5.1 Did not comply with ATC clearances and instructions

3.5.2 Mistook as theirs, a clearance intended for another vehicle or an aircraft

3.5.3 Did not advise ATC that the driver did not understand the clearance or instruction

3.5.4 Other (please specify).

E. Person submitting the form:

Name:

Title:

Date:
2. INSTRUCTIONS FOR THE COMPLETION OF RUNWAY INCURSION CAUSAL FACTORS IDENTIFICATION FORM

ITEM

A. Date/time in UTC and place where the runway incursion occurred.

B. Identification of aircraft, vehicle and person involved in the runway incursion.

C. Classify the severity of the runway incursion according to Chapter 6 of the ICAO Manual for Preventing Runway Incursions.

D. Fill all causal and coincident factors applicable to the runway incursion incident.

E. Details of the person submitting the form and date.

Note.— When instructed by ICAO, the information on this form should be sent to ICAO to allow global identification of runway incursion causal factors.
Appendix H

1. RUNWAY INCURSION SEVERITY CLASSIFICATION (RISC) CALCULATOR

1.1 The Runway Incursion Severity Classification (RISC) calculator is a computer program that classifies the outcome of runway incursions into one of the three severity classifications: “A”, “B”, or “C”. (See page 26 for a description of these categories). The RISC calculator program does not store any data, it simply provides a quick, easy, and standardized way to rate the severity of runway incursions. Expert judgments of severity are subject to a variety of factors. Severity judgments can change from person to person and from time to time. The calculator applies the same decision processes used by experts to determine the severity rating. Because the rating (output) is standardized to the input, the ratings are consistent. Such consistency is essential to being able to examine trends over time or see the effects of mitigation strategies. This standardized method for rating the severity of runway incursions can be used to support global sharing and comparison of data, for those states that wish to do so.

1.2 The foundation for the rating is the closest proximity, that is, how close the aircraft came to the other aircraft, vehicle, or pedestrian in vertical and horizontal space. Factors that affect the probability of a collision are also included. These factors are: aircraft dimensions and performance characteristics, visibility, the geometry of the conflict, and operator (controller, pilot or vehicle driver) responses.

1.3 The intent of the rating is to represent the risk incurred; factors such as visibility, available response time, avoidance maneuvers executed and the conditions under which they were executed allows a characterization of that risk. For example, suppose two aircraft that had landed on intersecting runways and stopped 150 m (500 ft) from each other. In unlimited visibility and without severe braking being executed by either pilot, the outcome that the aircraft would come no closer than 150 m (500 ft) has a higher chance of recurring than in reduced visibility (where there is degraded information for all parties) or with extreme avoidance maneuvers having been executed. Similarly, if available response time for one of the pilots was extremely short (e.g. less than 5 seconds), then more variability would be expected to be seen in the outcome of the pilot’s responses (and hence, the severity of the outcome) than if the available response time was long. Therefore, each factor that adds to the variability of the outcome of the incursion is considered in the rating and the more conservative rating is applied. This means that each relevant factor has the potential to make the rating of severity higher than it would have been if it were defined solely by the closest proximity. It should be noted that this is not the same as basing the rating on the worst possible, or worst credible, outcome of the scenario. The calculator does not rate the severity of the incursion based on everything that could have gone wrong. Rather, it looks at the critical sources of variability within the scenario, assigns a weight to each factor (and to each element within the factor) that contributes to the variability, and generates a rating based on the assigned weights of the factors and the elements within each factor. While it may be helpful to think of the weights as scaling the “severity” level of the factor (for example, a pilot’s acceptance of clearance intended for another aircraft is more serious than a partially-blocked transmission) they actually represent the level of variability that the factor introduces into the severity of the outcome.
The model starts with a set of situations or “scenarios” that broadly subsume all types of runway incursions that involve an aircraft and either another aircraft, vehicle, or pedestrian. Exceptions are that the calculator cannot accommodate helicopters in the air or other vertical takeoff or landing aircraft that are airborne. Also, the calculator is only designed to categorize the severity of conflicts between two aircraft (or between an aircraft and vehicle or pedestrian). Therefore, the calculator cannot rate the severity of conflicts that involve more than two aircraft.

Runway incursions that involve only a single aircraft are automatically categorized as a “D”. The scenario describes the action of the parties involved in the incursion (landing, taking off, crossed the runway, crossed the hold short line, etc.). Each scenario has a specific set of factors associated with it. The severity rating is based on closest proximity (horizontal and/or vertical) and the set of weighted factors for the particular scenario.

Relevant factors can include:

a) visibility;

b) type of aircraft;

c) avoidance maneuver executed (whether initiated by the pilot or commanded by the controller):

1) aborted takeoff (or cancelled takeoff clearance);

2) rotated early to avoid a collision;

3) executed a go-around;

4) applied hard braking; and

5) swerved

d) runway characteristics and conditions (width, braking action reported); and

e) degree to which the situation was controlled or uncontrolled (e.g. type of pilot/controller errors involved, whether all parties were on frequency, whether the controller was aware of all of the parties involved).

Subsumed within each factor are elements. Elements within the factor of visibility are levels of RVR (runway visual range), reported ceiling height and visibility, and day/night. The factor of runway characteristics include the width the runway in situations in which an aircraft on the runway conflicts with an aircraft or vehicle approaching it from the side. This factor also includes the runway conditions (dry, wet, braking action reported as poor or fair) in scenarios that involve avoidance maneuvers in which braking action is a relevant factor (e.g. hard braking action reported, aborted takeoff). There are several elements within the factor “controlled/uncontrolled”. One element concerns communication issues such as aircraft not on the correct frequency, partially- or totally-blocked transmission, pilot accepting another aircraft’s clearance, readback/hearback error, etc. The other elements map to a lack of awareness on the part of the controller (e.g. the controller forgot about an aircraft) or pilot (e.g. pilot landed on the wrong runway).
1.8 The user of the calculator enters the above information into the appropriate fields and clicks on the “calculate rating” virtual button. The severity rating is then displayed. (A complete users’ manual is provided with the CD.) Within the model, each scenario has a rating table associated with it. These tables specify, for various values of horizontal or vertical proximity: a severity rating for over all best case and worst case, and ratings for each factor at worst case when all other factors are best case. Each individual factor has associated with it a scale from zero to ten. A value of zero means there is no influence of that factor to make the severity of the given incursion greater than what is evident from the closest proximity alone. A value of ten means there is maximum influence of that factor to make the severity of the given incursion greater than what is evident from the closest proximity alone with other conditions normal. When all factors are ideal, i.e. good visibility, aircraft are small (and hence, relatively slow, light-weight and highly maneuverable), no pilot-controller communication anomalies, and no avoidance maneuvers, then all factor values are zero. When this is the case, the severity of the runway incursion is adequately represented by the given closest horizontal or vertical proximity. If, on the other hand, all factor values are tens, then the situation is such that the resulting proximity of aircraft (or aircraft and other object) could easily have been much worse and is represented by “worst case” severity rating for that scenario at the resulting proximity. The greater each factor rating, the greater the expected variability of closest proximity for recurring runway incursions under the same conditions. A detailed discussion of the mathematics behind the model is available in Sheridan, 2004 [Sheridan, T. (2004) An Interpolation Method for Rating the Severity of Runway Incursions. Presented at the Symposium on Human Performance, Situation Awareness, and Automation. Daytona Beach, 23-25 March 2004].

1.9 The U.S. Federal Aviation Administration (FAA) has compared the results of the ratings generated by the calculator to the ratings of their subject matter experts. As a result of this analysis, the FAA will be using the calculator in their assessments of the severity of runway incursions.

1.10 The RISC model can be obtained from the ICAO Website: www.icao.int/fsix/res_ans.cfm.
1. AERODROME RUNWAY INCURSIONS ASSESSMENT — ARIA

1.1 Any airport runs a certain risk of a runway incursion. However due to specific characteristics, e.g. a high rate of runway crossings, some airports have a higher vulnerability than others do. ARIA should make the important differences visible. The outcome of the model is a vulnerability index that is related to the runway incursion rate. The model is developed using a taxonomy-based approach. ARIA is a simple, easy-to-use Model, with the potential to be used for airports located worldwide.

1.2 ARIA was developed using the results of previous studies on the causes and contributing factors of runway incursions, a set of risk factors has been selected that represents the most important determinants of runway incursion risk. Subsequently, the risk factors are weighted reflecting their relative importance for the risk of runway incursions. Likewise a set of risk reduction factors has been developed. The model has been validated with success against data from eighteen European Airports, covering a wide range of characteristics (in terms of operations, layout etc).

1.3 ARIA can be obtained from: www.eurocontrol.int/runwaysafety
1. ICAO RUNWAY SAFETY TOOLKIT

1.1 The ICAO Runway Safety Toolkit on CD-ROM, has been 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 several-year period, and also makes use of 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 as the Manual for Preventing Runway Incursion and to support other runway incursion preventing programme initiatives.

1.2 The CD-ROM contains:

a) opening statement by the President of the ICAO Council;

b) introduction to all users;

c) modules for air traffic control, flight operations, aerodrome and management responsibilities; and

d) supplemental material including glossary, appendix, references and links, posters, videos, and presentations given in the ICAO runway safety awareness and education campaign.

1.3 The CD-ROM can be obtained from the ICAO website: www.icao.int/fsix/res_ans.cfm.
Appendix K

1. EUROCONTROL RUNWAY SAFETY TOOLKIT

1.1 A runway safety CD-ROM has been produced by EUROCONTROL, using expert advice from pilots, controllers, and airport operators. The International Federation of Air Line Pilots’ Associations (IFALPA), the International Federation of Air Traffic Controllers’ Associations (IFATCA), the International Air Transport Association (IATA), the European Cockpit Association, the Group of Aerodrome Safety Regulators and the Joint Aviation Authorities (JAA) also provided invaluable input to the CD-ROM.

1.2 The CD-ROM contains:

   a) the European Action Plan for the Prevention of Runway Incursions;

   b) information with graphics on signs, markings and lightings; and

   c) a self-assessment for pilots, drivers and air traffic controllers of aerodrome signs, marking, and lighting.

1.3 The CD-ROM is available from the EUROCONTROL Website: www.eurocontrol.int/runwaysafety or the Runway Safety Office, EUROCONTROL, rue de la fusée 96, B-1130 Brussels, Belgium, or Runway.Safety@EUROCONTROL.int.

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Appendix L

1. GLOSSARY OF TERMS AND ABBREVIATIONS/ACRONYMS

Terms that are defined in Standards and Recommended Practices (SARPs) and Procedures for Air Navigation (PANS) are used in accordance with the meaning and usages given therein. In this manual, however, there are a number of other terms describing facilities, services, procedures, etc., related to aerodrome operations and air traffic services that are not yet included in Annexes or PANS documents. These terms and abbreviations are given below.

2. TERMS

**Hot Spot:** A location on an aerodrome movement area where there is an increased risk of collision or runway incursion.

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

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

**Runway Incursion Severity Classification (RISC) Calculator:** Computer program that classifies the outcome of runway incursions.

**Sterile Flight Deck:** Any period of time when the flight crew should not be disturbed, except for matters critical to the safe operation of the aircraft.

3. ABBREVIATIONS/ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACFT -</td>
<td>Aircraft</td>
</tr>
<tr>
<td>ADP -</td>
<td>Airside driving permit</td>
</tr>
<tr>
<td>ARIA -</td>
<td>Aerodrome Runway Incursion Assessment</td>
</tr>
<tr>
<td>ATC -</td>
<td>Air traffic control</td>
</tr>
<tr>
<td>ATIS -</td>
<td>Automatic terminal information service</td>
</tr>
<tr>
<td>ATM -</td>
<td>Air traffic management</td>
</tr>
<tr>
<td>CP -</td>
<td>Closest proximity</td>
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<tr>
<td>FOD -</td>
<td>Foreign object debris</td>
</tr>
<tr>
<td>L -</td>
<td>Left</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>NOTAM</td>
<td>Notice to airmen</td>
</tr>
<tr>
<td>PANS</td>
<td>Procedures for Air Navigation Services</td>
</tr>
<tr>
<td>R</td>
<td>Right</td>
</tr>
<tr>
<td>RISC</td>
<td>Runway Incursion Severity Classification</td>
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<td>Radiotelephony</td>
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<td>RVR</td>
<td>Runway visual range</td>
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<tr>
<td>RWY</td>
<td>Runway</td>
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<td>SARPs</td>
<td>Standard and Recommended Practices</td>
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<td>SMS</td>
<td>Safety management systems</td>
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<td>SSR</td>
<td>Secondary surveillance radar</td>
</tr>
<tr>
<td>UHF</td>
<td>Ultra-high frequency</td>
</tr>
<tr>
<td>VHF</td>
<td>Very-high frequency</td>
</tr>
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</table>

— END —