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RUNWAY INCURSION PREVENTION MEASURES

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1.0 GENERAL

Nigeria Civil Aviation Authority Advisory Circulars from Aerodrome Standards Department contain information about standards, practices and procedures that the Authority has found to be an Acceptable Means of Compliance (AMC) with the associated Regulations.

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

2.0 PURPOSE

This Advisory Circular provides methods, acceptable to the Authority, for demonstrating compliance with the Runway Incursion Prevention Measures as well as explanatory and interpretative material to assist in showing compliance.

3.0 APPLICATION

The material contained in this Advisory Circular applies to the operation of aerodromes regulated under Part 12 of Nig.CARs to ensure safety aircraft operation at an aerodrome.

4.0 REFERENCE

The Advisory Circular relates specifically to Part 12.2.9.14 of the Nig.CARs.

5.0 STATUS OF THIS AC

This AC is the second to be issued on this subject

AMENDMENT PROCEDURE

The Director, Aerodrome and Airspace Standards is responsible for the development, issuance and control of amendments to this document as well as ensuring that the AC is updated in the technical library for staff and the website ncaa.gov.ng for public use.

Each page will show the document number, issue/amendment number, issue date and page number at the base of the page.

All amendments must be recorded in the Record of Amendments.

Any observation made or contribution to the content of this document by the user should be directed to the following address for consideration and adoption

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RUNWAY INCURSION PREVENTION MEASURES



1. INTRODUCTION

The Nigeria Civil Aviation Regulations require aerodrome operators to implement Safety Management System, as a part of the Aerodrome certification/Licensing process. Nig.CARs Part 12.2.9.14 makes it imperative for the aerodrome to put in place procedures for the safe and orderly operation of aircraft on the runway and other areas. The prevention of runway incursion is a part of safety Management System efforts.

Competent operational personnel are the true goalkeepers of the aviation safety system. Care must be taken to avoid falling into the pitfall of focusing safety efforts on organizational issues exclusively, to the detriment of the human contribution to success and failure of the aviation safety 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 combination of both. A 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 guidance material for the prevention of the runway incursion.

1.1 DEFINITION

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 takeoff of aircraft.

1.2. PREVENTION OF RUNWAY INCURSION

- 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;

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- 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 Management (ATM) 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.

- 1.2.4. The Authority shall verify through its safety oversight programme the degree of implementation of runway safety programmes of the Aerodrome Operators.

1.3. PURPOSE OF THIS GUIDANCE MATERIAL

- 1.3.1. While runway safety takes into account issues such as foreign objects, debris and animals straying onto the runway and other logistical deficiencies, this guidance material 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.
- 1.3.2. Successful prevention of runway incursions requires the collaboration of air traffic controllers, pilots, vehicle drivers and aerodrome management. This guidance material is intended for regulators, aerodrome designers and planners, aircraft operators, air navigation service providers, aerodrome operators, and Accident investigation branch.
- 1.3.3. This guidance material also aims primarily, to provide guidance essential for implementation of 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 guidance material, the principles of Safety Management Systems (SMS) should be used to mitigate or eliminate the hazardous factors.
- 1.3.4. Beginning with causal factors, the guidance material 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.
- 1.3.5. Much can be learned by analyzing previous incidents and accidents. A standardized runway incursion report form (Appendix F) and a runway incursion causal and contributory factors identification form (Appendix G) by State are included which will allow

a national approach to data collection. Comprehensive analyses of data are essential to distinguish trends, causal factors and develop cost-effective risk reduction strategies.

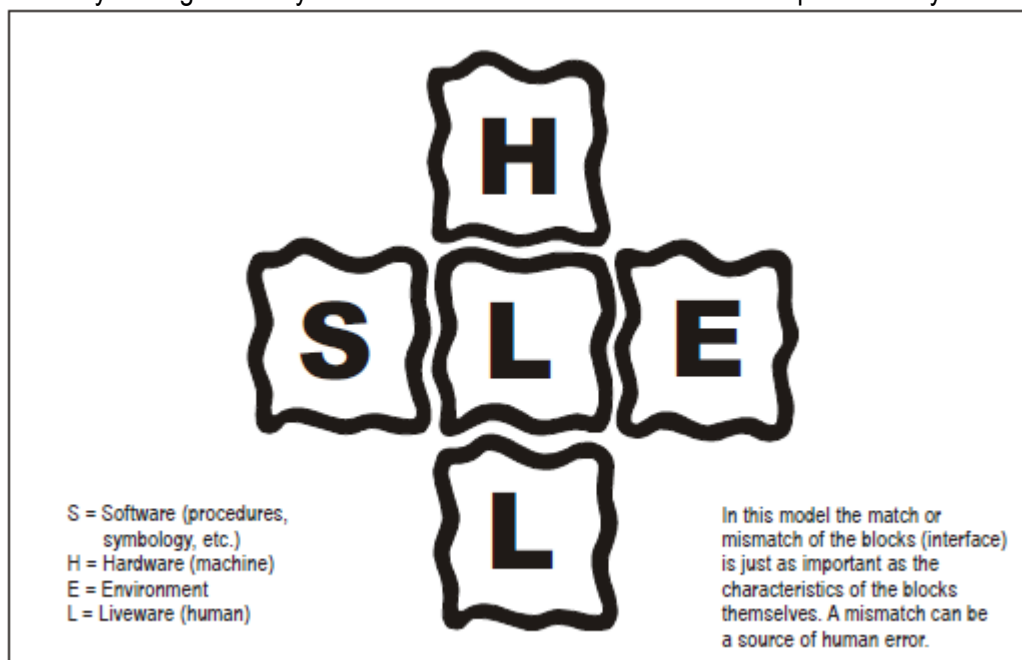
- 1.3.7. A runway incursion severity classification (RISC) model is also attached. Use of this RISC model will enable a consistent assessment to be made of the severity of runway incursion events.

2.. **CONTRIBUTORY FACTORS**

2.1. **BACKGROUND**

- 2.1.1. Pilots, controllers and drivers may each be involved in runway incursions. 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).

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



The SHEL Model

- 2.1.3. Runway incursions can be divided into several recurring scenarios. Common scenarios include:
- a) an aircraft or vehicle crossing in front of a landing aircraft;
 - b) an aircraft or vehicle crossing in front of an aircraft taking off;
 - c) an aircraft or vehicle crossing the runway holding position marking;
 - d) an aircraft or vehicle unsure of its position and inadvertently entering an active runway;
 - e) a breakdown 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.
- 2.1.4. Statistics show that most runway incursions occur in visual meteorological conditions (VMC) during day light hours; however, most accidents occur in low visibility or at night. All runway incursions should be reported and analyzed, whether or not another aircraft or vehicle is present at the time of the occurrence.

2.2. BREAKDOWNS OF COMMUNICATION

- 2.2.1. A breakdown in communication between controllers and pilots or airside vehicle drivers is a common factor in runway incursions and often involves:
- a) use of non-standardized phraseology;
 - b) a failure by the pilot or the vehicle driver to provide a correct read-back of an instruction;
 - c) the controller does not ensure that the read-back by the pilot or the vehicle driver conforms with the clearance issued;
 - d) pilot and or vehicle driver misunderstanding the controller's instructions;
 - e) pilot and or vehicle driver accepting a clearance intended for another aircraft or vehicle;
 - f) blocked and partially blocked transmissions; and g) long or complex transmissions.

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

2.3. PILOT FACTORS

- 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 behavior;
- 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

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 controller's 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

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;
- f) no radiotelephony equipment;
- g) no radiotelephony training;
- h) lack of familiarization with the aerodrome;
- i) lack of knowledge of aerodrome signs and markings; and
- j) lack of aerodrome maps for reference in vehicles;

See Appendix D for more detailed guidance on airside vehicle driver training including communication

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.

3. HOW TO ESTABLISH A RUNWAY INCURSION PREVENTION PROGRAMME

3.1. LOCAL RUNWAY SAFETY TEAMS

3.1.1. A runway incursion prevention programme should start with the establishment of local runway safety teams at individual aerodromes. The primary role of a local runway safety team, which may be coordinated by Safety Manager responsible for Safety Management System, should be to develop an action plan for runway safety, advice 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. 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 compliant with Nig..CARs Part 12 and are visible for pilots and drivers;
 - c) develop initiatives for improving the standard of communications;
 - d) identify potential new technologies that may reduce the possibility of a runway incursion;
 - e) ensure procedures are compliant with Nig..CARs Part 12 ; 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 Doc 9870, 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, and
 - g) regularly reviewing the airfield to ensure adequacy and compliance with Nig..CARs Part 12.

3.4. HOT SPOTS

- 3.4.1. ICAO Definition of a Hot Spot: A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

Note1. — 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.

- 3.4.2. 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)
- 3.4.3. 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.

3.5. IDENTIFICATION OF ACTION ITEMS ASSOCIATED WITH MITIGATING RUNWAY SAFETY DEFICIENCIES

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

3.6. PERSONS OR ORGANIZATIONS RESPONSIBLE FOR COMPLETING THE TASKS ASSOCIATED WITH ACTION ITEMS

Each action item should have a person or organization responsible for completing 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

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 EDUCATION AND AWARENESS MATERIAL

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

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, which 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 and Nig..CARs Part 12 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 phraseologies in all communication associated with runway operations.
- 4.2.3. Periodically verify the use of standard 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 takeoff 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 Nig..CARs Part 12 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 not accept an ATC clearance which would otherwise require them to enter or cross a runway from an obliquely angled taxiway.
- 4.4.2. 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.
- 4.4.3. 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.

- 4.4.4. Pilots should turn on strobe lights when crossing a runway.

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

- 4.4.5. 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.
- 4.4.6. 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).
- 4.4.7. 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. 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.
- 4.5.5. Ensure that ATC procedures contain a requirement to include the runway designator when issuing an instruction to hold short of any runway.
- 4.5.6. Develop and utilise standard taxi routes to minimise the potential for pilot confusion.
- 4.5.7. 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.
- 4.5.8. Assess existing visibility restrictions from the control tower which have a potential impact on the ability to see the runway and clearly identify any such areas on a hot spot map.
- 4.5.9. Environmental constraints should not compromise safety e.g. regular, multiple changes to runway configuration.
- 4.5.10. Ensure that runway safety issues are included in training and briefings for ATC staff.
- 4.5.11. 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.
- 4.5.12. 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.
- 4.5.13. When conditional clearances are used, specific training should be provided to ensure that they are used strictly according to ICAO provisions.
- 4.5.14. 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.
- 4.5.15. 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 provisions of the Nigeria Civil Aviation Regulations Part 12 and then ensure a continued focus on runway safety.
- 4.6.3. Confirm the implementation of Nig..CARs Part 12 provisions and implement maintenance programmes relating to runway operations e.g. markings, lighting, and signage. Ensure that signs and markings are maintained and clearly visible, adequate and unambiguous in all operating conditions.
- 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 Nig..CARs Part 12 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 Nig..CARs Part 12.
- 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. The Authority shall focus on runway incursion risk reduction in its 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 5.1 and 5.2 above.
- 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 Nigeria AIP and notification to ICAO, when ICAO Standards are involved should be undertaken.
- 4.7.5. Aerodromes should be certified in accordance with the Nigeria Civil Aviation Regulations, Part 12 .
- 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 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 AIS established procedures.
- 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.

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. Section 7 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:
- (i) Each Aerodrome 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.
 - (ii) Each Aerodrome can learn from the experiences of other aerodromes so that the same mistakes do not perpetuate. The above also applies to inter station networking.

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.

As a principle 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— *Aerodrome* 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 factor 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.

We must all remember that 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.

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 8.2. A reassessment of the final outcome may be applied at the end of the investigation process.
- 6.1.3. For the purpose of national or even global harmonization and effective data sharing, when classifying the severity of runway incursions, the following severity classification scheme should be applied:

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

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

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 environments associated with runway operations require that **all participants** accurately receive, understand, and correctly **read back all clearances and instructions** being transmitted. While read back 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 read back 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 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.

1.9. Example
Phraseologies

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.

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)*.

- 1.9.1. It should be noted that aircraft/vehicles should not hold closer to a runway than at designated runway holding points.
- 1.9.2. The procedure words ROGER and WILCO is 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)*;

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

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 1:— 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.

Note 2: — 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

- 1.9.3. Conditional clearances must consist of the condition before the line up instruction, and an acknowledgement of the correct (or otherwise) read back is required as part of the correct procedure.

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

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

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

ATC: SAS941 [THAT IS] CORRECT.

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

Note1. 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.

Note2. 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;

- 1.9.6. 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)*;

1.10. Aerodrome Control Phraseology – READ BACK

- 1.10.1. Equally important as the use of correct phraseologies is the need to obtain the required read back, in the order required and accurately.
- 1.10.2. Reproduced below are the relevant provisions in Annex 11 pertaining to this safety critical element of runway operations.

" Read-back of clearances and safety-related information

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

- 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 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."

1.11. Communication techniques – general

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

1.12. Issue of en-route clearance

1.12.1. 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.

1.12.2. 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 takeoff clearance. At other times the words "DEPARTURE" or "AIRBORNE" is used.

1.12.3. Read Back requirements

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 read back, and a failure to do this shall be challenged by the controller.

1.13. Taxi instructions

1.13.1. 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.

1.13.2. 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.

1.13.3. 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.

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

- 1.13.5. 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

A/C: AFR375 AT HOLDING POINT B2.

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

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

- 1.13.6. Further guidance on this subject can also be found in Appendix B – 'Communications Guidance'.
- 1.13.7. 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.
- 1.14. Multiple line-ups on the same runway

Line-up instructions may be issued to more than one aircraft at different points on the same runway, using the ICAO criteria

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

ATC: KLM 123 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

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

2. CRITICAL PHASE OF FLIGHT

- 2.1. The numbers of ground movements on aerodromes keep on increasing significantly. 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 generations 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. This evolution is irreversible and appropriate mitigating measures should be taken 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. Visualize this information on the charts;
- d) standard taxi routes are used more often at busy aerodromes. Review the routes expected to be used. If not cleared for the expected taxi route, take adequate time to become familiar 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 will be encountered between departure and final destination;
- 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. Special attention should be paid to temporary situations such as work in progress, other unusual activity and recent changes in aerodrome layout. During this part of the briefing, the aerodrome charts should be referred to and all available information visualised .
- 5.3. Memory is "constructive" in that one has the tendency to fill in the blanks. Pilots should ensure that they follow the clearance or instruction that has actually been received and not the one expected to be received.
- 5.4. Also expectations established during the pre-taxi or pre-landing planning can be significantly altered with a different and unexpected clearance.
- 5.5. Briefing checklist:
 - a) conduct a briefing for all flight crewmembers;
 - b) become familiar with the aerodrome;
 - c) plan the timing and execution of checklists;
 - d) review NOTAMs;
 - e) ensure that the flight crew fully understand all departure briefing items;
 - f) ensure that the briefing on the assigned taxi route is as thorough as that of the instrument approach; and
 - g) ensure that the aerodrome diagram is 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 require the complete attention of all flight crew on the flight deck. If necessary, taxi-instructions should be written down, especially at complex or unfamiliar aerodromes, and the instructions should be cross-checked against the aerodrome chart. Any uncertainties about clearance or position on the aerodrome should be clarified before the start of taxi or after vacating the runway. When unsure of taxi instructions, the pilot should stop, request clarification from ATC and continue taxiing only when the required taxi routing has been confirmed. In case of doubt, the pilot should ask for clarification.
- 6.1.2. All flight crew members should monitor the clearance for taxi, take-off and landing, and they must be kept informed at all times when runway operations are in progress.

6.2. Public address announcements

- 6.2.1. Public address announcements from the flight deck should be made a moment before engine start-up or push-back and not during the taxi phase. 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 can cause the other pilot to be isolated on 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, the pilot should notify the other flight crew member. 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. All checklist activity should be cancelled when crossing and entering runways. One flight crew member should maintain full concentration on the runway traffic situation.
- 6.3.3. Red stop bars should never be crossed when lining up on or crossing a runway unless, in exceptional cases, the stop bars, lights or controls are reported to be unserviceable and contingency measures such as follow-me vehicles, are in force. In these circumstances, whenever possible, alternative routes should be used
- 6.3.4. When entering any runway, all available surveillance means should be used to check for traffic (left and right), e.g. all eyes to be used.
- 6.3.5. When cleared to line up and/or when crossing any runway, the aircraft should be positioned at a right angle to the runway where possible, in order to better observe other traffic, both arriving and departing.

6.3.6. The pilot should not rush. The higher the ground speed, the less time available to react, manoeuvres the aircraft and avoids obstacles. High speed also results in greater distance and time required to bring the aircraft to a complete stop. Time can be both an ally and an enemy and should be used wisely. The pilot should taxi defensively and be prepared for others' mistakes.

6.3.8. The "sterile flight deck" concept while taxiing should be adopted. During movement of the aircraft the flight crew must be able to focus on their duties without being distracted by non-flight related matters. Cabin crew should be made 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:

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

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.

6.3.9 It is generally accepted that the need for a sterile cockpit commences as follows:

- a) departure: when the aircraft engine(s) are started and ceases when the aircraft reaches 10 000 feet above the departure aerodrome;
- b) arrival: when the aircraft reaches 10 000 feet elevation above the arrival aerodrome until the engine(s) are shut down after landing; and
- c) at any other times determined and announced by the flight crew. (e.g. in-flight emergency, security alert).

6.3.10. All aircraft lights should be used 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.

6.3.11. The audio box and volume adjustment should be checked whenever a frequency change is made.

6.3.12. After landing, the runway should be vacated as soon as possible, but not by turning onto another runway, unless specifically instructed to do so. When the aircraft has vacated the active runway, the pilot should be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.

6.3.13. Anytime there is uncertainty about the location of the aircraft on the movement/manoeuvring area, the pilot should stop the aircraft, advise ATC, and seek clarification. Questions should be taken out of the flight deck. If necessary progressive taxi instructions should be requested.

6.3.14. The aircraft should never be stopped on a runway unless specifically instructed to do so.

PREPARATION FOR TAXI CHECKLIST

- a) if necessary write down the taxi route;

- b) assign a crew member to progressively follow the aircraft's position on the aerodrome chart;
- c) follow company SOPs in regard to exterior lighting when taxiing and cleared for take-off – where possible, have maximum illumination;
- d) adopt a sterile flight deck for the taxi phase;
- 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 and markings and keep track of the aircraft's 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) cancel any checklist activity when crossing any runway;
- r) ensure you have a correct understanding of the ICAO phraseology "Taxi to holding point"; and
- s) beware of 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 will enhance situational awareness of all those listening on the frequency.
- 6.4.2. Conducting and comprehending radiotelephony communications requires competence with standard phraseology as well as general proficiency in the language used for communications. Standard phraseology should be used at all times. Strict adherence to standard phraseology prevents miscommunications. See Appendix A for further information on Communications Best Practices.
- 6.4.3. Speaking slowly is essential when operating in foreign regions. When the speech rate is slowed, the response may be slower and clearer.

6.5. Readbacks

- 6.5.1. All clearances require a readback. The Standard in Annex 11, 3.7.3.1, states:
“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 language requirements air-ground radiotelephony communications are shown in Annex 10 — *Aeronautical Telecommunications*, Volume II, Chapter 5 and Annex 1 — *Personnel Licensing*, Chapter 1 and Appendix 1.

- 6.5.2. All readback requires a hearback. In order to complete this “communication loop”, the readback must be complete and clear. The full clearance, including the call sign and runway designator, must be read back. **“Roger” is not considered to be a readback.**

6.6. Listen on the frequency

The pilot should listen on the frequency at all times and try to visualize the other traffic in the vicinity. The pilot should know what runways will be encountered between the aircraft’s current location and final destination. Particular attention should be paid to all clearances and instructions issued to traffic involving those runways.

7. OTHER COMMUNICATION BEST PRACTICES

- 7.1. Extra attention is required when other aircraft with similar call signs are on the frequency.
- 7.2. An instruction to follow other traffic does not automatically include clearance to enter or cross a runway. Each aircraft requires a specific clearance to enter or cross any runway. **If in doubt, clarification should be sought.**
- 7.3. If an aircraft has been cleared to “line up and wait”, then only a short delay on the runway should be anticipated. If in this position for an extended period, the pilot should so advise ATC 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 or land on a runway. Any misunderstanding or disagreement should be resolved immediately by contacting ATC for clarification.
- 7.5. The use of headsets improves the audibility of communications with ATC and on the flight deck.

- 7.6. The correct setting of the audio panel should be verified, especially after any temporary switch in audio sources.
- 7.7. The pilot should state the position of the aircraft on the aerodrome whenever making initial contact with any ground or aerodrome controller, regardless of whether it was previously stated to a different controller.
- 7.8. The “sterile cockpit” rule during taxi phase should be adopted.

8. SITUATIONAL AWARENESS

8.1. General

One aspect of situational awareness is pilots knowing where they are and where they want to go, as well as visualizing a picture of the airport traffic in the vicinity. Even during daylight and in good visibility, pilots can get lost. Even worse is the situation where pilots think they know their position, but find themselves elsewhere. In darkness or low visibility conditions, additional care must be taken to ensure that accuracy in navigation on the ground and the highest degree of situational awareness is maintained by all members of the flight crew.

Situational awareness checklist:

Before starting the approach:

- a) obtain all needed information;
- b) brief flight crew about planned primary runway exits and taxi routes;
- c) eliminate as much distraction as possible;
- d) have the aerodrome diagram available for instant use;
- e) maintain situational awareness on final approach at night; and
- f) listen for clearances to other aircraft.

8.2. Visual aids

- 8.2.1. 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 constantly questioning and cross checking the aircraft’s 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.
- 8.2.2. A Head-down situation during taxi should be limited to the minimum amount of time possible.
- 8.2.3. When the pilot not taxiing the aircraft focuses on the instruments on the flight deck, that pilot is not able to monitor the progress of the aircraft. Before undertaking head-down actions the other pilot should be so advised so that the navigating pilot can place added emphasis on maintaining navigational accuracy and situational awareness.

8.3. Other aids

- 8.3.1. Heading display or compasses to confirm runway or taxiway alignment with the information available from the charts. If available, the ILS centre line guidance system to confirm the correct runway alignment.
- 8.3.2. The entire runway and approach should be scanned in both directions before entering a runway and, if in doubt, clarification should be sought.

9. CONCLUSION

Runway incursion prevention checklist

- a) Strictly adhere to all relevant ICAO Standards and Recommended Practices, Procedures and guidance material, including phraseologies;
- b) ensure that flight crews follow the clearance or instructions that are actually received, and not those they expect to receive;
- c) ensure good planning of ground operations in order to decrease the workload during taxi. The flight and its associated risks starts during the preparation;
- d) ensure that good situational awareness is the top priority during taxi, and involve all crew members.;
- e) make "Crew Resource Management" principles during taxi is as important as during other phases of flight;
- f) be defensive and let the built-in safety nets do their work so that a single mistake does not lead to a serious incident or accident; and
- g) never take anything for granted.

10 STOP BARS

The following extracts from 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:

"3.2.7.3 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, chapter 5:

"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"

"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".

"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".

"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."

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

Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444).
Chapter 7:

“7.14.7 Stop bars

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 consists of lights showing red, spaced across the taxiway.”

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 Service provider to put best practices in place to prevent runway incursions.

1.2. While the use of 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 the situational awareness of all those listening on the frequency.

* 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 Appendix 1.

2. CLEARANCES

2.1. Whenever possible an en-route clearance should be passed to an aircraft before the 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.
The words "take off" shall only be used when an aircraft is cleared for take-off, or when cancelling a take-off clearance.

3. READBACK REQUIREMENTS

3.1. Readback requirements were introduced in the interests of flight safety. The stringency of the readback requirement is directly related to the possible seriousness of misunderstandings in the transmission and receipt of ATC clearances and instructions. Strict adherence to readback 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 the safety-related parts of ATC clearances and instructions.

The air traffic controller is responsible for checking the completeness and accuracy of the readback.

- 3.3. In accordance with Annex 11, the following items shall always be readback:
- 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 level; 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.
- 3.4. An aircraft must include its call sign in the readback, and failure to do so should be challenged by the controller.
- 3.5. PANS-ATM (Doc 4444) paragraph 4.5.7.5.2, it states: *“The controller **shall** listen to the readback 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 of a clearance or instruction or part thereof by flight crews and vehicle drivers. This closed loop supports the safety and redundancy of pilot/vehicle-driver/controller communications and 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. 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.
- 4.3. 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 or crossing a runway.
- 4.4. 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, 3.2.2.7.3, 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 both to 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), 7.14.7, states:

“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

At aerodromes with separate ground control and aerodrome control functions, aircraft are transferred to the tower at or approaching the holding point. 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 cannot be interpreted as a take-off clearance.

Appendix D

AIRSIDE VEHICLE DRIVING BEST PRACTICES

1. INTRODUCTION

1.1 It is usually the responsibility of the aerodrome operator to have in place a formal training, assessment and authorization 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.

1.2 As a result of local hazard analyses in Europe in 2001, the operation of vehicles on the aerodrome has been highlighted as a potentially high-risk activity which demands that a number of formal control measures 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.

1.3 The aerodrome operator should take the lead in developing an agreed standard for the vehicle

driver training programme. There will be a requirement for cooperation and partnership with air traffic control, ground handling agents, airlines and other airside service providers to ensure the safe operation of the aerodrome.

- 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 the health and safety aspects of operating vehicles, plant and equipment in close proximity to aircraft on the movement and manoeuvring areas, aprons, stands and airside roads;
 - b) specific training on the vehicle, plant and equipment, e.g. car, tug, high loader, coach;
 - c) additional training on the hazards associated with runways and taxiways if the specific job function requires the driver to operate on the manoeuvring area; and
 - d) training in the correct use of RTF and standard phraseology since an essential requirement for operating a vehicle on the manoeuvring area is the need to communicate with the aerodrome control tower.
- 1.5 The following guidance is considered to be “good practice” and is applicable to the majority of aerodromes. A generic framework is given for the four main areas described in 1.4. It is vital that both the theoretical formal training and practical experience cover all four areas. The aim of this guidance is to ensure consistency and a high degree of standardization in the manner in which a driver obtains an “airside driving permit”.

2. DEVELOPMENT OF A FRAMEWORK FOR A VEHICLE DRIVER TRAINING PROGRAMME

2.1 Airside vehicle driver

Issues to be considered when developing programmes and knowledge requirements for the airside driving permit (ADP) as required by Nig.CARS Part 12.2.9.7 (2) include:

- a) Airside driving permit (ADP)
 - 1) the issuing authority (normally the aerodrome operator), the validity of the permit in terms of time, conditions of use, and its transferability;
 - 2) ownership of the permit and control and audit of permit issue;
 - 3) local enforcement and driving offence procedures; and
 - 4) relationship to State driver licensing system.
- b) National legislation and regulation
 - 1) government/State regulations related to general vehicle driving licences;
 - 2) State/regional/local government requirements; and
 - 3) national aviation safety authority requirements/guidance for driving airside.
- c) Aerodrome regulations and requirements
 - 1) rules of the air and ATC procedures applicable to aerodromes as they relate to vehicles, particularly rights of way;
 - 2) specific aerodrome regulations, requirements and local instructions;
 - 3) local methods used to disseminate general information and instructions to drivers; and

- 4) local methods used to disseminate information regarding works in progress.
- b) Personal responsibilities
- 1) agreed national or airport requirements concerning fitness to drive (medical and health standards);
 - 2) issue and use of personal protective equipment such as high visibility clothing and hearing protection;
 - 3) general driving standards;
 - 4) no-smoking/no-drinking requirements airside;
 - 5) responsibilities with respect to foreign object debris and fuel/oil spillage; and
 - 6) the responsibility to ensure that a vehicle is suitable for the task and is used correctly.
- e) Vehicle standards
- 1) condition and maintenance standards agreed at the aerodrome and/or national level;
 - 2) the requirement to display obstruction lights and company insignia;
 - 3) the requirement for, and content of, daily vehicle inspections;
 - 4) agreed standards of aerodrome and company vehicle fault reporting and rectification; and
 - 5) local requirements for the issue and display of airside vehicle permits.
- f) General aerodrome layout
- 1) the general geography of the local aerodrome;
 - 2) aviation terminology used such as runway, taxiway, apron, roads, crossings, runway-holding points;
 - 3) all aerodrome signs, markings and lighting for vehicles and aircraft;
 - 4) specific reference to signs, markings and lighting used to guard runways and critical areas; and
 - 5) specific reference to any controlled/uncontrolled taxiway crossing procedures.
- g) Hazards of general airside driving
- 1) speed limits, prohibited areas and no parking regulations;
 - 2) the danger zones around aircraft;
 - 3) engine suction/ingestion and blast, propellers and helicopters;
 - 4) aircraft refuelling;
 - 5) foreign object debris and spillages;
 - 6) vehicle reversing;
 - 7) staff and passengers walking across aprons;
 - 8) air bridges and other services such as fixed electrical ground power;
 - 9) the general aircraft turnaround process;
 - 10) aircraft emergency stop and fuel cut-off procedures;
 - 11) hazardous cargo;
 - 12) local vehicle towing requirements; 13) requirements for driving at night; and

- 14) requirements for driving in adverse weather conditions, particularly low visibility.
- h) Local organizations
 - 1) the role of the aerodrome operator in setting and maintaining standards;
 - 2) the national aviation safety authority and its responsibilities;
 - 3) the national and/or local police and their involvement with airside driving; and
 - 4) other enforcement authorities dealing with vehicles, driving, health and safety.
 - i) Emergency procedures
 - 1) actions and responsibilities in a crisis situation (any accident or significant incident occurring on the airport);
 - 2) action in the event of a vehicle accident;
 - 3) specific action in the event of a vehicle striking an aircraft;
 - 4) action in the event of fire;
 - 5) action in the event of an aircraft accident/incident; and
 - 6) action in the event of personal injury.
 - j) Communications
 - 1) radio procedures and phraseologies to be used, if applicable;
 - 2) light signals used by ATC;
 - 3) procedures to be used by vehicle drivers if lost or unsure of position;
 - 4) local emergency telephone numbers; and
 - 5) how to contact the local aerodrome safety unit.
 - k) Practical training (visual familiarization)
 - 1) airside service roads, taxiway crossings and any restrictions during low visibility;
 - 2) aprons and stands;
 - 3) surface paint markings for vehicles and aircraft;
 - 4) surface paint markings that delineate the boundary between aprons and taxiways;
 - 5) signs, markings and lighting used on the taxiway that indicate the runways ahead;
 - 6) parking areas and restrictions;
 - 7) speed limits and regulations; and
 - 8) hazards during aircraft turnarounds and aircraft movements.

2.2 Manoeuvring area vehicle driver

2.2.1 All drivers expected to operate on the manoeuvring area of an aerodrome should obtain an ADP covering the programme in 2.1. Any driver expected to drive on the manoeuvring area should also obtain an agreed period of experience in general airside driving before training to operate on the manoeuvring area.

2.2.2 The number 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 or handling agent for aircraft towing and runway crossings.

2.2.3 All drivers should be trained initially and be provided with refresher training at agreed intervals with particular additional emphasis on the following areas:

- a) Aerodrome regulations and requirements
 - 1) air traffic control rules, right of way of aircraft;
 - 2) the definition of movement areas, manoeuvring areas, aprons, stands; and
 - 3) methods used to disseminate information regarding works in progress.
- b) Air traffic control
 - 1) the aerodrome control function and area of responsibility;
 - 2) the ground movement control function and area of responsibility;
 - 3) normal and emergency procedures used by ATC relating to aircraft;
 - 4) ATC frequencies used and normal handover/transfer points for vehicles;
 - 5) ATC call signs, vehicle call signs, phonetic alphabet, and standard phraseology; and
 - 6) demarcation of responsibilities between ATC and apron control if applicable.
- c) Personal responsibilities
 - 1) fitness to drive with particular emphasis on eyesight and colour perception;
 - 2) correct use of personal protective equipment;
 - 3) responsibilities with respect to foreign object debris; and
 - 4) responsibilities with respect to escorting other vehicles on the manoeuvring area.
- d) Vehicle standards
 - 1) responsibility for ensuring the vehicle used is fit for the purpose and task;
 - 2) requirements for daily inspection prior to operating on the manoeuvring area;
 - 3) particular attention to the display of obstruction and general lights; and
 - 4) serviceability of all essential communications systems with ATC and base operations.
- e) Aerodrome layout
 - 1) particular emphasis on signs, markings and lighting used on the manoeuvring area;
 - 2) special emphasis on signs, markings and lighting used to protect the runway;

- 3) description of equipment essential to air navigation such as instrument landing systems (ILS);
 - 4) description of protected zones related to ILS antenna;
 - 5) description of ILS protected areas and their relation to runway-holding points;
 - 6) description of runway instrument/visual strip, cleared and graded area; and
 - 7) description of lighting used on the manoeuvring area with particular emphasis on those related to low visibility operations.
- f) Hazards of manoeuvring area driving
- 1) engine suction/ingestion and blast, vortex, propellers, and helicopter operations;
 - 2) requirements for driving at night;
 - 3) requirements for operations in low visibility and other adverse weather conditions;
 - 4) procedures in the event of a vehicle or radio becoming unserviceable while on the manoeuvring area; and
 - 5) right of way of aircraft, towed aircraft and rescue and fire fighting vehicles in an emergency.
- g) Emergency procedures
- 1) actions to be taken in the event of a vehicle accident/incident;
 - 2) actions to be taken in the event of an aircraft accident/incident;
 - 3) actions to be taken if foreign object debris or other debris is found on runways and taxiways;
 - 4) procedures to be used by vehicle drivers if lost or unsure of their position; and
 - 5) local emergency telephone numbers.
- h) Aircraft familiarization
- 1) knowledge of aircraft types and ability to identify all types normally operating at the aerodrome;
 - 2) knowledge of airline call signs; and
 - 3) knowledge of aircraft terminology relating to engines, fuselage, control surfaces, undercarriage, lights, vents, etc.
- i) Practical training (visual familiarization)
- 1) all runways (including access and exit routes), holding areas, taxiways and aprons;
 - 2) all signs, surface markings and lighting associated with runways, holding positions, CAT I, II and III operations;
 - 3) all signs, surface markings and lighting associated with taxiways;
 - 4) specific markings that demarcate the boundary between aprons and manoeuvring areas;
 - 5) navigation aids such as ILS, protected area, antenna, RVR equipment and other meteorological equipment;
 - 6) hazards of operating around aircraft landing, taking off or taxiing; and
 - 7) any locally used naming convention for particular areas or routes.

2.3 Radiotelephony (RTF)

- 2.3.1 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.
- 2.3.2 All drivers of vehicles operating on the manoeuvring area should be expected to display a high degree of competence with respect to the use of RTF phraseology and ICAO language requirements for air ground radiotelephony communications. Emphasis should be placed on the following areas:
- a) Hierarchy of message priority
message priorities, an understanding of distress, alerting, control and information messages.
 - b) Phonetic alphabet
correct pronunciation of letters, words and numbers.
 - c) Standard phraseology
 - 1) emphasis on the need for drivers to use standard phraseology; and
 - 2) the need for caution with certain phrases such as “cleared” and “go ahead”.
 - d) Call signs for aircraft, ATC and vehicles
 - 1) an understanding of terminology and acronyms used by ATC and pilots;
 - 2) knowledge of the airline call signs used at the aerodrome; and
 - 3) knowledge of vehicle call signs and that they should be appropriate to their function (e.g. “Operations”, “Fire”, “Engineer”) and numbered when more than one vehicle is used (e.g. “Fire 2”).
 - e) Readback procedures
the need for vehicle drivers to use standard readback, in the same manner as pilots, for instructions such as “enter/cross the runway”, and if conditional clearances are used.
 - f) Readability scale
understanding and use of the readability scale from 1 to 5.
 - g) Lost or uncertain of position
understanding of local procedures for vehicle drivers lost or uncertain of their position on the manoeuvring area.
 - h) Vehicle breakdown
 - 1) local procedure for vehicle breakdown on runways and taxiways; and
 - 2) procedure for notifying ATC of vehicle failure.

- i) Radio failure
 - 1) understanding of the local procedure if radio failure occurs while on the runway or taxiway; and
 - 2) understanding of the light signals that can be used by ATC to pass instructions to vehicles.

- j) Transmitting techniques and use of RTF
 - 1) understanding the reasons for listening out prior to transmitting;
 - 2) use of standard phraseology and ICAO air-ground radiotelephony communications procedures (there are no language requirements for vehicle drivers); application of Annex 14, Volume I, 9.7 (Aerodrome vehicle operations);
 - 3) words and sounds to be avoided;
 - 4) correct positioning of microphones to avoid voice distortion;
 - 5) avoidance of “clipped” transmissions;
 - 6) awareness of regional accents and variations of speech; and
 - 7) speed of delivery of RTF phraseology.

- k) Portable radios
 - 1) correct use of radios;
 - 2) effective range and battery life;
 - 3) screening/shielding effects on the aerodrome; and
 - 4) use of correct call signs, either related to a vehicle or a person.

- l) Safety while using radios
 - 1) local instructions regarding the use of portable radios and hand-held microphones while driving a vehicle; and
 - 2) local instructions on the use of mobile telephones while operating airside.

3. GENERAL CONSIDERATIONS

- 3.1 All 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, videos, booklets and 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 time depending upon the complexity of the aerodrome. Following initial training, a programme of refresher training should be organized after an agreed period of time.

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

- 3.3 The framework for a vehicle driver training programme outlined in paragraph 2 is intended only as a guide and is based on current “good practice”. It is incumbent on aerodrome operators to regularly review their vehicle driver training programmes against programmes and documentation available across the industry.

Appendix E

AERODROME RESOURCE MANAGEMENT TRAINING COURSE

1. INTRODUCTION

An analysis of runway incursions has established that a number of them were the result of a breakdown in the team function by air traffic controllers, aircrew or vehicle drivers. This may have been due to incorrect communication practices or a failure to understand the roles and difficulties of personnel working in other areas. An aerodrome resource management training course has been produced by EUROCONTROL and is intended to enhance the team role of all those involved in runway operations. This course can be conducted at individual aerodromes or, alternatively, regional seminars can be organized. The course emphasizes developing the team role at each airport and also educating staff about 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 local causal factors in runway incursions and identify local solutions to prevent their recurrence. Presently all three members of this multi-professional team are working at the forefront of operational safety as individuals; they need to work as a team on the manoeuvring area.
- 2.2 The aerodrome resource management course is designed to train trainers to facilitate the tasks of the members of local runway safety teams and all operational staff working on the manoeuvring area.
- 2.3 The course also aims to raise awareness of the operational hazards faced every day when working on or around a runway, and the Human Factors aspect reveals the importance of communication, error management and situational awareness.
- 2.4 It is highly desirable that a representative cross section of air traffic controllers, aircrew and vehicle drivers attend this multi-disciplinary course. Detailed information can be obtained from: www.eurocontrol.int/ians/public/subsite_homepage/homepage.html.

RUNWAY INCURSION INITIAL REPORT FORM

Referenced to Nigeria Regulations

RUNWAY INCURSION PREVENTION MEASURES

Report Number

[Empty box for Report Number]



DAAS

ICAO MODEL RUNWAY INCURSION INITIAL REPORT FORM

A.

Day Night

Date/time of incident (in UTC)
(YYYYMMDDhhmm) [Empty box]

B.

Person submitting the report:

Name [Empty box]

Job Title [Empty box]

Telephone [Empty box]

Facility/Unit [Empty box]

Date/time/place of completion of form

C.

ICAO Aerodrome Designator [Empty box]

D.

Surface Condition [Empty box]
(Braking)

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

Aircraft 1	[Empty box]
Aircraft 2	[Empty box]
Aircraft 3	[Empty box]
Vehicle	[Empty box]
Person	[Empty box]

F.

Weather Conditions

Wind	[Empty box]	Visibility/RVR	[Empty box]
Temperature (° Celsius)	[Empty box]	Ceiling/Cloud	[Empty box]

[Empty box for Additional Information]

RUNWAY INCURSION PREVENTION MEASURES



G.		F2	
Evasive Action Aircraft 1	No	<input type="checkbox"/>	Yes <input type="checkbox"/> Make selection from list
Cancelled takeoff clearance			<input type="text"/>
Rejected takeoff (distance rolled)			<input type="text"/>
Rotated early			<input type="text"/>
Delayed rotation			<input type="text"/>
Abrupt stop			<input type="text"/>
Swerve			<input type="text"/>
Missed approach (distance to runway threshold)			<input type="text"/>
Other			<input type="text"/>
H.			
Evasive Action Aircraft 2	No	<input type="checkbox"/>	Yes <input type="checkbox"/> Make selection from list
Cancelled takeoff clearance			<input type="text"/>
Rejected takeoff (distance rolled)			<input type="text"/>
Rotated early			<input type="text"/>
Delayed rotation			<input type="text"/>
Abrupt stop			<input type="text"/>
Swerve			<input type="text"/>
Missed approach (distance to runway threshold)			<input type="text"/>
Other			<input type="text"/>
I.			
Evasive Action Aircraft 1	No	<input type="checkbox"/>	Yes <input type="checkbox"/> Make selection from list
Abrupt stop			<input type="text"/>
Swerve			<input type="text"/>
Other			<input type="text"/>
J. Closest Proximity (CP)			
Vertical (ft)	<input type="text"/>	Horizontal (m)	<input type="text"/>
K.			
Communication Difficulties?	No	<input type="checkbox"/>	Yes <input type="checkbox"/> Make selection from list
<i>(Multiple choices can be made)</i>			
Readback/hearback			<input type="text"/>
Blocked communication			<input type="text"/>
Partially blocked communication			<input type="text"/>
Confused callsigns			<input type="text"/>

RUNWAY INCURSION PREVENTION MEASURES



ACFT/vehicle on wrong frequency/no radio

Non-standard phraseology

L. Did the ATC forget about?

Yes

An ACFT/person/vehicle cleared onto or to cross a runway

An ACFT on approach to land

A runway closure

M. Description of the incident and relevant circumstances

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

Description:

.....

.....

.....

Diagram:

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

.....

.....

.....

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

.....

.....

.....

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

.....

.....

.....

5. Initial assessment of severity:

RUNWAY INCURSION PREVENTION MEASURES



AIRCRAFT/VEHICLE DETAILS

N. Aircraft 1

.....

Reg No. **Call sign** **SSR code** **(if applicable)**

Flight No. **Owner/Operator**

Aircraft 1 type

Flight Details

Types of flight		Flight Rules
General Aviation	<input type="checkbox"/>	IFR <input type="checkbox"/>
Military	<input type="checkbox"/>	VFR <input type="checkbox"/>
Non-scheduled	<input type="checkbox"/>	
Scheduled	<input type="checkbox"/>	
Others	<input type="checkbox"/>	
Not applicable	<input type="checkbox"/>	

O. Aircraft 2

Reg No. **Call sign** **SSR code** **(if applicable)**

Flight No. **Owner/Operator**

Aircraft 2 type

Flight Details

Types of flight		Flight Rules
General Aviation	<input type="checkbox"/>	IFR <input type="checkbox"/>
Military	<input type="checkbox"/>	VFR <input type="checkbox"/>
Non-scheduled	<input type="checkbox"/>	
Scheduled	<input type="checkbox"/>	
Others	<input type="checkbox"/>	

RUNWAY INCURSION PREVENTION MEASURES



F5

P. Vehicle 1

Reg No.	<input type="text"/>	Call sign	<input type="text"/>
Mobile No.	<input type="text"/>	Owner/Operator	<input style="width: 100%;" type="text"/>
Vehicle 1 type	<input style="width: 100%;" type="text"/>		
Vehicle Details			
Types of Vehicle			
Runway Inspection	<input type="checkbox"/>	Other <input style="width: 100%; height: 100%;" type="text"/>	
Bird control	<input type="checkbox"/>		
Tugging/Towing	<input type="checkbox"/>		
Fire Brigade	<input type="checkbox"/>		
Maintenance	<input type="checkbox"/>		
Military	<input type="checkbox"/>		

Q.

Vehicle 2

Reg No.	<input type="text"/>	Call sign	<input type="text"/>
Mobile No.	<input type="text"/>	Owner/Operator	<input style="width: 100%;" type="text"/>
Vehicle 2 type	<input style="width: 100%;" type="text"/>		
Vehicle Details			
Types of Vehicle			
Runway Inspection	<input type="checkbox"/>	Other <input style="width: 100%; height: 100%;" type="text"/>	
Bird control	<input type="checkbox"/>		
Tugging/Towing	<input type="checkbox"/>		
Fire Brigade	<input type="checkbox"/>		
Maintenance	<input type="checkbox"/>		
Military	<input type="checkbox"/>		

RUNWAY INCURSION PREVENTION MEASURES



R. Report received by Date

(name of person)

S. Date when detailed investigation will commence

RUNWAY INCURSION PREVENTION MEASURES



Appendix G

RUNWAY INCURSION CAUSAL FACTORS IDENTIFICATION FORM

1. Initial Runway Incursion Report Number

ICAO MODEL RUNWAY INCURSION CAUSAL FACTORS IDENTIFICATION FORM

A

Date/place of incident (<i>in UTC</i>) (<i>YYYYMMDDhhmm</i>)	<input style="width: 95%; height: 20px;" type="text"/>
---	--

B

Aircraft, vehicle or persons involved in the runway incursion (*Indicate those involved in the in the incident*)

- Aircraft 1
- Aircraft 2
- Aircraft 3
- Vehicle
- Person

C

Severity of Runway Incursion

Accident	
A	
B	
C	
D	
E	

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

RUNWAY INCURSION PREVENTION MEASURES



1.1.6 Transmission was completely blocked



RUNWAY INCURSION PREVENTION MEASURES



G-2

- 1.1.7 Deviation from established ICAO standard phraseologies
- 1.1.8 Other (please specify; If not ICAO procedures, please briefly describe the

RUNWAY INCURSION PREVENTION MEASURES



G-3

1.2.11	Fatigue	<input type="checkbox"/>
1.2.12	Other (please specify)	<input type="checkbox"/>
1.3 Staffing		
1.3.1	ATC positions were combined on same frequency	<input type="checkbox"/>
1.3.2	Absence of a supervisor in the tower	<input type="checkbox"/>
1.3.3	Supervisor was working a control position	<input type="checkbox"/>
1.4 Decision Making		
1.4.1	Misjudged separation or anticipated separation	<input type="checkbox"/>
1.4.2	Inadequate ATC to ATC coordination	<input type="checkbox"/>
1.4.3	Other (please specify)	<input type="checkbox"/>
1.5 Procedures		
1.5.1	Misapplication of Conditional clearance	<input type="checkbox"/>
1.5.2	Use of multiple line up clearances	<input type="checkbox"/>
1.5.3	Other (please specify, If not ICAO procedure, please briefly describe the procedure used). (Where?)	<input type="checkbox"/>
1.6 Aerodrome works		
1.6.1	ATC not advised of works on the manoeuvring area	<input type="checkbox"/>
1.6.2	Other (please specify)	<input type="checkbox"/>

RUNWAY INCURSION PREVENTION MEASURES



G-4

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 aircrafts clearance: With similar call signs Without similar call signs	
2.1.4	Derivation 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) 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

RUNWAY INCURSION PREVENTION MEASURES



G-5

- 2.2.3 Crew member was on another radio frequency
- 2.2.4 Competing radio communications
- 2.2.5 Unfamiliar with the aerodrome layout
- 2.2.6 Mistook position on the aerodrome (thought they were in a different location)
- 2.2.7 Fatigue
- 2.2.8 Reported incorrect location to ATC
- 2.2.9 Taxied fast
- 2.2.10 Did not refer to the aerodrome diagram
- 2.2.11 Did not listen to the ATIS
- 2.2.12 Works on the manoeuvring area not previously advised by NOTAM
- 2.2.13 Used out of date or inaccurate publications or charts
- 2.2.14 Failed to apply or correctly observe Sterile Cockpit procedures
- 2.2.15 Other (please specify)

1.3 Marking, Signs and Lighting

- 2.3.1 Not ICAO compliant
- 2.3.2 Not provided
- 2.2.3 Irregularly spaced

RUNWAY INCURSION PREVENTION MEASURES



2.2.4 Ambiguous and difficult to follow



RUNWAY INCURSION PREVENTION MEASURES



G-6

2.3.5	Poorly sized	
2.3.6	Poorly situated	
2.3.7	Poorly maintained	
2.3.8	Other (please specify)	

1.4 Clearance and Instructions

2.4.1	Misunderstood clearance: Conditional Follow Other	
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 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)	

RUNWAY INCURSION PREVENTION MEASURES



RUNWAY INCURSION PREVENTION MEASURES



G-7

2. *Vehicles and Pedestrians*

3.1 *Communications*

3.1.1 Not operating on the appropriate:

Ground frequency for operations outside the runway strip

Tower frequency for operations within the runway strip

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

3.1.3 Other (please specify)

3.2 *Situational Awareness*

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

3.2.2 Distracted by:

Current work

High noise levels

Monitoring more than one frequency and possibly a mobile telephone

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

RUNWAY INCURSION PREVENTION MEASURES



3.3.6 Poorly situated



RUNWAY INCURSION PREVENTION MEASURES



G-8

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 advice 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 advice ATC that the driver did not understand the clearance or instruction

3.5.4 Other (please specify)

E. Person submitting the form:

Name: _____

RUNWAY INCURSION PREVENTION MEASURES



Title: _____

Date: _____

RUNWAY INCURSION PREVENTION MEASURES



2. INSTRUCTIONS FOR THE COMPLETION OF RUNWAY INCURSION CAUSAL

FACTORS IDENTIFICATION FORM

ITEM	Factors
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 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.
	<i>Note. — When instructed by ICAO, the information on this form should be sent to ICAO to allow global identification of runway incursion casual factors.</i>

Appendix H

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 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).

RUNWAY INCURSION PREVENTION MEASURES



Appendix I

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 guidance material, 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

ACFT - Aircraft
 ADP - Airside driving permit
 ARIA - Aerodrome Runway Incursion Assessment
 ATC - Air traffic control
 ATIS - Automatic terminal information service
 ATM - Air traffic management
 CP - Closest proximity
 FOD - Foreign object debris
 L - Left
 NOTAM - Notice to airmen
 PANS - Procedures for Air Navigation Services
 R - Right
 RISC - Runway Incursion Severity Classification
 RTF - Radiotelephony
 RVR - Runway visual range

RUNWAY INCURSION PREVENTION MEASURES



- RWY - Runway
- SARPs - Standard and Recommended Practices
- SMS - Safety management system
- SSR - Secondary surveillance radar
- UHF - Ultra-high frequency
- VHF - Very-high frequency


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Capt Muhtar Usman
Director General