

European Action Plan for the Prevention of Runway Incursions

Edition 2.0



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STATEMENT OF COMMITMENT

The numbers of runway incursion reports are rising. From the reports that have been received, it is shown that there are a minimum of two runway incursions every day in the European region. Accidents continue to take place on runways. Findings from those incident and accident reports have been used to determine the new recommendations contained in this update to the European Action Plan for the Prevention of Runway Incursions.

The increasing availability of runway incursion incident reports is a positive indication of the commitment of organisations and operational staff to prevent runway incursions and runway accidents by learning from the past accidents and incidents and sharing this information across Europe.

The new recommendations contained in this document are the result of the combined and sustained efforts of organisations representing all areas of aerodrome operations. The organisations that contributed to this action plan are totally committed to enhancing the safety of runway operations by advocating the implementation of the recommendations that it contains. These organisations include, but are not limited to, Aerodrome Operators, Air Navigation Service Providers, Aircraft Operators, and Regulators.

Core to these recommendations is the uniform and consistent application of ICAO provisions. The Regulator will decide upon the strategy for implementation at applicable aerodromes within its own State. The recommendations are mainly generic and it will be for the responsible organisations to decide specific details, after taking local conditions into account e.g. aerodromes where joint civilian and military operations take place.

The establishment of Local Runway Safety Teams, which should comprise, as a minimum, representatives from Aircraft Operators, Air Navigation Service Providers and the Aerodrome Operator, is intended to facilitate effective local implementation of the recommendations. At the same time, Local Runway Safety Teams address runway safety specific issues relating to their own aerodrome.

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INTRODUCTION AND BACKGROUND

The European Action Plan for the Prevention of Runway Incursions is based upon the International Civil Aviation Organisation (ICAO) Standards and Recommended Practices (SARPs) and is therefore suitable for universal application.

The ICAO Runway Incursion definition is “Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take off of aircraft.”

Since the first release of the European Action Plan for the Prevention of Runway Incursions, Local Runway Safety Teams have been established at hundreds of airports across Europe. The implementation of the recommendations contained in the first version of the Action Plan has been extensive, thanks to these teams and the organisations that support them. The European Aviation Safety Agency (EASA) has now embedded this concept as an essential requirement to the European Union “EASA Basic Regulation”, a key element in helping to raise the safety of runway operations at European airports.

Many operational staff have experienced a runway incursion and have contributed to the future prevention of runway incursions through incident reports. These reports have taught us that the majority of contributory and causal factors are concerned with communication breakdown, ground navigation errors due to inadequate or ambiguous surface signs and markings and relevant information needed in the cockpit.

The runway incursion problem is difficult to solve. One of the important challenges is that pilots and drivers on a runway without a valid ATC clearance believe they have permission to be there.

WHAT'S CHANGED

Having acknowledged the great value to preventing runway incursions through incident reporting, the new recommendations address the need to improve the quality of data provided in runway incursion incident reports and the need to disseminate the lessons that can be learned from the actual incidents. This new document has a number of recommendations designed to improve the quality of those reports.

Communications is again a priority for runway incursion prevention, with new emphasis on visibility and tracking of traffic. Recognition is given to the importance of what happens just before a runway incursion, and also to other similar incidents such as ground navigation errors on the manoeuvring area.

The increasing numbers of civil / military aerodromes becoming available to the civilian ATM network are addressed in a completely new section for joint-use civil / military aerodromes.

The recommendations, when implemented, will enhance runway safety by the consistent and harmonised application of existing ICAO provisions, and by improving controller – pilot - vehicle driver communications and working procedures at an aerodrome.

Practical use of the ICAO runway incursion definition (Effective November 2004), allows runway incursion data to be compared, common causes and contributory factors to be identified and lessons to be shared.

A EUROCONTROL European Single Sky Implementation (ESSIP) objective relates to this Action Plan.

Examples of Local Runway Safety Team achievements are contained in the guidance materials shown in the appendices to this document and are highlighted below.

Manoeuvring Area Vehicle Driver training has been enhanced to specifically raise awareness of the hazards of runway incursions.

ACI EUROPE (Airports Council International) has published a framework training curriculum for use at aerodromes around the world.

IFATCA (International Federation of Air Traffic Controllers) leads a runway safety cell, produces its own studies and holds working practice discussions at conference to raise awareness of the best working practices available.

IFALPA (International Federation of Airline Pilots Associations) has taken the lead on the use of aircraft lights to show that a take off clearance has been received and issued a global policy for its member pilots. A method for the naming of taxiways, runways and their intersections and holding positions, to remove ambiguity, has been proposed to ICAO.

ICAO has issued the Runway Incursion Prevention Manual (doc. 9870).

IMPORTANT AND URGENT ACTIONS

There is an obvious need to reach a wide audience with the information contained in this Action Plan. Runway incursions are still considered one of the most serious safety threats amongst operational personnel.

It is intended that a mutual exchange of information and data between organisations will take place to facilitate lesson learning and assist in enhancing runway safety.

To assist your organisation to plan this activity a generic approach is suggested.

- Confirm your organisation's useage of the relevant ICAO provisions - note any discrepancies.
- Identify any changes required in your operations.
- Identify any changes required from your operating partners.
- Document the change requirements.
- Invite your internal and where appropriate external partners to a joint meeting, using the local runway safety team to discuss the problem, and identify solutions.
- Conduct an appropriate safety assessment of the proposed change.
- Implement the change.
- Monitor the effectiveness of the change.

Changes to aerodrome operations may involve the introduction of new aerodrome infrastructure including visual aids or, new ways to use the existing platform. Prior to making local changes that differ from ICAO provisions, consideration should be given to the potential global effect on air traffic management. A considered approach to local change would be to create an operational evaluation period prior to permanent introduction of the desired operation. If you are satisfied with the outcome of the operational evaluation, consult ICAO to determine the overall effect on the air traffic management system prior to permanent introduction to operations.

FOR FURTHER INFORMATION ON THE CONTENT OF THIS ACTION PLAN PLEASE CONTACT:

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EUROPEAN ACTION PLAN FOR THE PREVENTION OF RUNWAY INCURSIONS

RECOMMENDATIONS

- 1.1 General principles**
- 1.2 Aerodrome operator issues**
- 1.3 Communications**
- 1.4 Aircraft operator**
- 1.5 Air navigation service provider issues**
- 1.6 Data collection and lesson sharing**
- 1.7 Regulatory issues**
- 1.8 aeronautical information management**
- 1.9 Technology**
- 1.10 Civil military**
- 2.0 Future work**

1.1 GENERAL PRINCIPLES

#	RECOMMENDATION	ACTION	GUIDANCE
1.1.1	At individual aerodromes, as designated by the Regulator, a Runway Safety Team should be established and maintained to lead action on local runway safety issues.	Aerodrome Operators, Air Navigation Service Provider, Aircraft operators Regulator.	APPENDIX B
1.1.2	A local runway safety awareness campaign should be initiated at each aerodrome for Air Traffic Controllers, Pilots and Manoeuvring Area Vehicle Drivers and other personnel who operate on or near the runway. The awareness campaign should be periodically refreshed to maintain interest and operational awareness.	Local Runway Safety Team	APPENDIX B
1.1.3	Confirm that all infrastructure, practices and procedures relating to runway operations are in compliance with ICAO provisions.	Aerodrome Operator (lead), Air Navigation Service Provider.	APPENDIX L APPENDIX J
1.1.4	Where practicable, ensure that specific joint training and familiarisation in the prevention of runway incursions, is provided to Pilots, Air Traffic Controllers and Manoeuvring Area Vehicle Drivers. This may include visits to the manoeuvring area to increase awareness of signage and layout where this is considered necessary.	Local Runway Safety Team, Air Navigation Service Provider, Regulator, Aerodrome Operator.	
1.1.5	Runway safety should be part of initial and recurrent training for operational staff e.g. Air Traffic Controllers, Pilots, Manoeuvring Area Vehicle Drivers and all other personnel involved in manoeuvring area operations.	Aircraft Operator, Air Navigation Service Provider, Aerodrome Operator, Regulator, Flight Training School.	
1.1.6	Ensure that adequate information is collected on all runway incursion incidents so that causal and contributory factors can be identified, lessons can be learned and disseminated for Units, Organisations, National and European regional benefit e.g., in Case Studies created for training purposes.	Aircraft Operator, Air Navigation Service Provider, Aerodrome Operator, Local Runway Safety Team, EUROCONTROL.	
1.1.7	Changes to manoeuvring area practices and procedures, including planned works must take account of runway safety and may require consultation with the local runway safety team. An adequate risk assessment should be the basis for procedural and/or infrastructural changes on the manoeuvring area.	Air Navigation Service Provider, Aerodrome Operator, Aircraft Operator.	APPENDIX G

1.2 AERODROME OPERATOR ISSUES

#	RECOMMENDATION	ACTION	GUIDANCE
1.2.1	Verify the implementation of ICAO Annex 14 provisions and implement maintenance programmes relating to Runway operations e.g. markings, lighting, signage. Ensure that signs and markings are clearly visible, adequate and unambiguous in all relevant conditions.	Aerodrome operator.	APPENDIX L APPENDIX J
1.2.2	Works in progress - Ensure that information about temporary work areas is adequately disseminated and that temporary signs and markings are clearly visible, adequate and unambiguous in all relevant conditions.	Aerodrome operator.	APPENDIX L APPENDIX J
1.2.3	Implement safety management systems in accordance with ICAO provisions.	Aerodrome operator.	APPENDIX G
1.2.4	Ensure a continued focus on runway safety in internal audit activities.	Aerodrome operator.	APPENDIX F
1.2.5	Introduce a formal Driver training and assessment programme, or where already in place review against driver training guidelines.	Aerodrome operator.	APPENDIX C
1.2.6	Introduce formal communications training and assessment for Drivers and other personnel who operate on or near the runway.	Aerodrome operator.	APPENDIX A APPENDIX C
1.2.7	Implement the ICAO standard naming convention for the manoeuvring area to eliminate ground navigation error and communication confusion.	Aerodrome operator (lead), Air Navigation Service Provider (support).	APPENDIX K
1.2.8	Ensure all vehicles on the manoeuvring area are in radio contact with the appropriate Air Traffic Control service, i.e. ground and/or the tower either directly or through an escort, including Emergency services.	Regulator, Aerodrome Operator, Air Navigation Service Provider.	APPENDIX A APPENDIX C
1.2.9	Ensure all Manoeuvring Area Vehicle Drivers are briefed at the start of a shift and that situational awareness is maintained throughout the shift.	Aerodrome Operator.	APPENDIX C
1.2.10	Enable the tracking of vehicle movements on the manoeuvring area when possible.	Aerodrome Operator, Air Navigation Service Provider.	
1.2.11	Ensure that a policy and robust procedure for Runway Inspections are in place. Example - Identify any potential safety benefits of carrying out runway inspections in the opposite direction to runway movements and if appropriate adopt the procedure.	Aerodrome Operator, Air Navigation Service Provider, Regulator.	
1.2.12	New aerodrome infrastructure and changes to existing infrastructure should be designed to prevent runway incursions.	Aerodrome operator.	APPENDIX K
1.2.13	The aerodrome operator should ensure that a procedure exists and Manoeuvring Area Vehicle Drivers are trained for those occasions where they become uncertain of their position on the manoeuvring area.	Aerodrome Operator.	APPENDIX A APPENDIX B APPENDIX C
1.2.14	Avoid infringing lines of sight from the air traffic control tower. Assess visibility restrictions from the tower, which have a potential impact on the ability to see the manoeuvring area. Recommend improvement to restricted lines of sight and develop appropriate mitigation procedures. Disseminate this information as appropriate.	Air Navigation Service Provider, Aerodrome Operator.	APPENDIX K
1.2.15	Regularly review the operational use of aeronautical ground lighting e.g. stop bars, to ensure a robust policy to protect the runway.	Aerodrome Operator, Air Navigation Service Provider, Regulator.	APPENDIX C APPENDIX K APPENDIX J
1.2.16	Manoeuvring Area Vehicle Drivers shall not cross illuminated red lights, e.g., stop bars, when entering or crossing a runway, unless contingency procedures are in force, i.e. to cover cases where the stop bars or controls are unserviceable. The period that a stop bar is out of service must be time limited.	Aerodrome Operator.	APPENDIX C APPENDIX K APPENDIX J

1.3 COMMUNICATIONS

(LANGUAGE, RADIOTELEPHONY, PHRASEOLOGIES AND PROCEDURES)

#	RECOMMENDATION	ACTION	GUIDANCE
1.3.1	To avoid the possibility of call sign confusion, use full aircraft or vehicle call signs for all communications with runway operations.	Air Navigation Service Provider (lead), Aircraft Operator (lead), Aerodrome Operator (lead).	APPENDIX A APPENDIX E
1.3.2	Verify the use of standard ICAO RTF phraseologies.	Air Navigation Service Provider (lead), Aircraft Operator (lead), Aerodrome Operator (lead).	APPENDIX L APPENDIX A APPENDIX B APPENDIX E
1.3.3	Use the ICAO read-back procedure (also applicable to Manoeuvring Area Drivers and other personnel who operate on the manoeuvring area).	Air Navigation Service Provider (lead), Aircraft Operator (lead), Aerodrome Operator (lead).	APPENDIX L APPENDIX A APPENDIX D
1.3.4	Improve situational awareness, when practicable, by conducting all communications associated with runway operations using aviation English.	Air Navigation Service Provider (lead), Aircraft Operator (lead), Aerodrome Operator (lead).	APPENDIX A
1.3.5	Improve situational awareness, when practicable, by conducting all communications associated with runway operations on a common frequency. <i>Note - Aerodromes with multiple runways may use a different frequency for each runway</i>	Air Navigation Service Provider (lead), Aircraft Operator (lead), Aerodrome Operator (lead).	APPENDIX A
1.3.6	Avoid call sign confusion at an aerodrome by giving discrete RTF call signs to manoeuvring area vehicles.	Air Navigation Service Provider, Aerodrome Operator.	APPENDIX B APPENDIX E
1.3.7	Consider implementing a regular evaluation of radio telephony practices, looking at such things as frequency loading and use of ICAO compliant phraseology.	Air Navigation Service Provider, Aerodrome Operator, Aircraft Operators.	APPENDIX A APPENDIX B APPENDIX E
1.3.8	If conditional clearances are used, in accordance with ICAO provisions, ensure a policy and robust procedures are developed and implemented.	Air Navigation Service Provider.	
1.3.9	Significant aerodrome information which may affect operations on or near the runway, in addition to that found in NOTAMS and on the ATIS, should be provided to Manoeuvring Area Drivers and Pilots 'real-time' using radio communication.	Air Navigation Service Provider (lead), Aerodrome Operator.	APPENDIX A APPENDIX H

1.4 AIRCRAFT OPERATOR ISSUES

#	RECOMMENDATION	ACTION	GUIDANCE
1.4.1	Provide training and assessment for Pilots regarding Aerodrome signage, markings and lighting.	Aircraft Operator (lead), IAOPA (support).	APPENDIX D
1.4.2	Pilots shall not cross illuminated red lights, e.g. stop bars when lining up or crossing a runway, unless contingency procedures are in force, i.e. to cover cases where the stop bars or controls are unserviceable. The period that a stop bar is out of service must be time limited.	Aircraft Operator.	APPENDIX L APPENDIX D APPENDIX E APPENDIX K APPENDIX J
1.4.3	Ensure that flight deck procedures contain a requirement for specific clearances to cross any runway. <i>Includes non-active runways.</i>	Aircraft operator.	APPENDIX A
1.4.4	Flight Crew should not enter a runway for departure if not ready to take off. Flight Crew must advise Air Traffic Control without delay if additional time on the runway is required for operational reasons.	Aircraft Operator.	APPENDIX D
1.4.5	Promote best practices in flight deck procedures while taxiing and during final approach - to include the "Sterile flight deck" concept.	IATA (lead), ECA/IFALPA (support), Aircraft Manufacturer.	APPENDIX D
1.4.6	Promote best practices for Pilots' planning of ground operations.	IATA (Lead), ECA/IFALPA (Support).	APPENDIX D
1.4.7	Ensure a means to indicate receipt of landing / line-up / take off / crossing clearances in the cockpit.	Airframe Manufacturer, Aircraft Operator.	
1.4.8	Pilots are advised to switch on forward facing lights when in receipt of a take off clearance and show forward facing lights on the approach.	Aircraft Operator.	APPENDIX D
1.4.9	Pilots must be made aware of current safety significant airport information.	Aerodrome Operator, Aircraft Operator.	APPENDIX A APPENDIX H
1.4.10	During taxi for departure or during approach, Pilots should not accept a runway change proposal if time to re-programme the FMS / re-brief is not sufficient. This includes a change of departure intersection.	Aircraft Operator, Air Navigation Service Provider.	APPENDIX D
1.4.11	If Pilots have any doubt as to their exact position on the surface of an aerodrome, they should contact Air Traffic Control and follow the associated ICAO procedure (PANS-ATM, Doc 4444).	Aircraft Operator.	APPENDIX B
1.4.12	A Pilot should avoid being "head-down" to ensure a continuous watch while taxiing.	Aircraft Operator.	APPENDIX D
1.4.13	If there is any doubt when receiving a clearance or instruction, clarification should be requested immediately from Air Traffic Control.	Aircraft Operator.	APPENDIX A
1.4.14	Aerodrome charts or an equivalent electronic device should be displayed on the flight deck during taxi. This includes when operating at the home aerodrome.	Aircraft Operator.	APPENDIX D
1.4.15	Avoid accepting rapid exit taxiways or oblique or angled taxiways for line-up that limits the ability of the Flight crew to see the runway threshold or the final approach area.	Aircraft Operator.	APPENDIX D

1.5 AIR NAVIGATION SERVICE PROVIDER ISSUES

#	RECOMMENDATION	ACTION	GUIDANCE
1.5.1	Implement safety management systems in accordance with ESARR3 provisions.	Air Navigation Service Provider.	APPENDIX G
1.5.2	Ensure a clear and robust procedure is in place, and where practicable, appropriate technology is used to show that a runway is occupied, obstructed or unavailable.	Air Navigation Service Provider.	APPENDIX B
1.5.3	Whenever practical give en-route clearance prior to taxi.	Air Navigation Service Provider.	APPENDIX E
1.5.4	If an aircraft, vehicle or person becomes lost or uncertain of its position on the manoeuvring area, Air Traffic Control must re-establish full situational awareness without delay.	Air Navigation Service Provider.	APPENDIX A APPENDIX B
1.5.5	Regularly review the operational use of aeronautical ground lighting e.g. stop bars, to ensure a robust policy to protect the runway from the incorrect presence of traffic.	Air Navigation Service Provider.	APPENDIX L APPENDIX B APPENDIX E APPENDIX K APPENDIX J
1.5.6	Aircraft or vehicles shall not be instructed to cross illuminated red lights, e.g. stop bars when entering or crossing a runway unless contingency procedures are in force, e.g. to cover cases where the stop bars or controls are unserviceable. Stop Bars that protect the runway must be controllable by the runway controller.	Air Navigation Service Provider.	APPENDIX L APPENDIX B APPENDIX E APPENDIX K APPENDIX J
1.5.7	Ensure that Air Traffic Control communication messages are not over long or complex.	Air Navigation Service Provider.	APPENDIX A APPENDIX E
1.5.8	Ensure that Air Traffic Control procedures contain a requirement to issue a specific clearance to cross any runway. <i>Includes non-active runways.</i>	Air Navigation Service Provider	APPENDIX L APPENDIX E
1.5.9	Identify any potential safety benefits of carrying out runway inspections in the opposite direction to runway movements and if appropriate adopt the procedure.	Aerodrome Operator, Air Navigation Service Provider (joint activity).	
1.5.10	Use standard taxi routes when practical to minimise the potential for pilot confusion, on or near the runway.	Air Navigation Service Provider.	APPENDIX L
1.5.11	Where applicable use progressive taxi instructions to reduce pilot workload and the potential for confusion.	Air Navigation Service Provider.	APPENDIX E
1.5.12	Avoid infringing sight lines from the tower and assess visibility restrictions from the tower, which have a potential impact on the ability to see the runway, and disseminate this information as appropriate. Recommend improvement when possible and develop appropriate procedures.	Air Navigation Service Provider, Aerodrome Operator.	APPENDIX L APPENDIX K
1.5.13	Ensure that runway safety issues are included in training and briefing for Air Traffic Control staff.	Air Navigation Service Provider.	APPENDIX B APPENDIX E
1.5.14	Identify any potential hazards of runway capacity enhancing procedures when used individually or in combination and, if necessary, develop appropriate mitigation strategies. (Intersection departures, multiple line-up, conditional clearances etc.)	Air Navigation Service Provider.	APPENDIX G
1.5.15	Do not issue a line up clearance if the aircraft will be expected to wait on the runway for more than 90 seconds beyond the time it will normally be expected to depart.	Air Navigation Service Provider	
1.5.16	Avoid using oblique or angled taxiways for line-up that limit the ability of the Flight crew to see the runway threshold or the final approach area.	Air Navigation Service Provider.	APPENDIX D
1.5.17	When planning a runway change for departing or arriving traffic, consider the time a pilot will require to prepare / re-brief.	Air Navigation Service Provider, Aircraft Operator.	APPENDIX D
1.5.18	As far as practicable, controllers should be "head-up" for a continuous watch of aerodrome operations	Air Navigation Service Provider.	

1.6 DATA COLLECTION AND LESSON SHARING

#	RECOMMENDATION	ACTION	GUIDANCE
1.6.1	Promote the implementation of occurrence reporting, compatible with an international, harmonised reporting system e.g. ADREP 2000, ECCAIRS.	Regulator.	APPENDIX B
1.6.2	Disseminate de-identified information on actual runway incursions locally to increase understanding of causal and contributory factors to enhance lesson learning. Where appropriate, send de-identified information to the EURO-CONTROL Runway Safety Office for the benefit of the European runway safety programme.	Regulator, Aerodrome Operator, Air Navigation Service Provider, Aircraft Operator.	APPENDIX B

1.7 REGULATORY ISSUES

#	RECOMMENDATION	ACTION	GUIDANCE
1.7.1	Confirm that all infrastructure, practices and procedures relating to runway operations are in compliance with ICAO provisions.	Regulator.	APPENDIX L APPENDIX J
1.7.2	Ensure implementation of safety management systems is in accordance with the applicable standards.	Regulator.	APPENDIX G
1.7.3	Ensure that safety assurance documentation for operational systems (new and modified) demonstrates compliance with regulatory and safety management system requirements.	Regulator.	APPENDIX G
1.7.4	Regulators should focus on runway safety in their oversight activities e.g. preventing runway incursion risks.	Regulator.	APPENDIX F
1.7.5	Certify aerodromes according to ICAO provisions, Annex 14.	Regulator.	APPENDIX L
1.7.6	Ensure that Aerodrome Operators and Air Navigation Service Providers regularly review the operational use of aeronautical ground lighting e.g. stop bars, to ensure a robust policy to protect the runway from the incorrect presence of traffic.	Air Navigation Service Provider, Aerodrome Operator, Aircraft Operator, Regulator.	APPENDIX G APPENDIX K APPENDIX J
1.7.7	Ensure that the content of training materials for Pilots, Air Traffic Controllers and Drivers working on the manoeuvring area includes runway incursion prevention measures and awareness.	Regulator.	
1.7.8	Noise mitigation rules should not increase, and, should seek to reduce where possible, the risk of runway incursion. Noise mitigation rules that could potentially adversely affect runway incursion risk should undergo a risk assessment. <i>Guidance note Those noise mitigation elements that could potentially affect runway incursion/excursion risk include (but are not limited to): Airfield design and alignment based on noise consideration, noise preferred runway or runway operational mode, time-based runway selection to share noise load, runway specific curfews, arrival/departure curfews etc. which may (e.g.) require additional backtrack, runway crossings or other similar and otherwise avoidable risk.</i>	Regulator.	
1.7.9	Ensure an adequate risk assessment as the basis for procedural and/or infrastructural changes on the manoeuvring area.	Regulator.	

1.8 AERONAUTICAL INFORMATION MANAGEMENT

#	RECOMMENDATION	ACTION	GUIDANCE
1.8.1	Ensure that the content of aeronautical information provided is in accordance with the ICAO standards and recommended practices and that it is regularly reviewed to ensure it is up to date and relevant to the pilot.	Air Navigation Service Provider, Aeronautical Information Service Provider (lead), Aerodrome operator support), Regulator.	APPENDIX L APPENDIX H
1.8.2	Providers of aeronautical databases and charts should establish a process with the Aeronautical Information Service Provider, with the objective of ensuring the accuracy, timeliness and integrity of the data.	Aeronautical Information Service Provider, Industry.	APPENDIX H
1.8.3	Ensure the means and procedures are established to allow users to provide feedback on the availability and quality of aeronautical information.	Aeronautical Information Service Provider, Aerodrome Operator, Aircraft Operator, EUROCONTROL (AIM).	APPENDIX H
1.8.4	The ergonomics of aeronautical maps and charts and relevant documentation should be improved to enhance their readability and usability.	Air Navigation Service Provider, Aeronautical Information Service Provider, Aerodrome Operator, Aircraft Operator, EUROCONTROL.	APPENDIX H
1.8.5	Move towards digital aeronautical information management, to provide and use high quality data in an interoperable exchange format.	Aerodrome Operator, Air Navigation Service Provider, Aeronautical Information Service Provider, Regulator, EUROCONTROL.	APPENDIX H
1.8.6	Aerodrome Operators and Aeronautical Information Service Providers should establish formal arrangements and assign responsibilities for maintaining direct and continuous liaison.	Air Navigation Service Provider, Aeronautical Information Service Provider, Aerodrome Operator, Regulator.	APPENDIX H

1.9 TECHNOLOGY

#	RECOMMENDATION	ACTION	GUIDANCE
1.9.1	Improve situational awareness by considering the use of technologies that enable operational staff on the manoeuvring area to confirm their location in relation to the runway e.g. via GPS with transponder or airport moving maps, visual aids, signs.	Aerodrome Operator, Air Navigation Service Provider, Aircraft Operator.	
1.9.2	Promote the integration of safety nets to provide immediate and simultaneous runway and traffic proximity alerts for Pilots, Air Traffic Controllers and Manoeuvring Area Vehicle Drivers.	EUROCONTROL, SESAR.	

1.10 CIVIL/MILITARY JOINT-USE AERODROME OPERATIONS

#	RECOMMENDATION	ACTION	GUIDANCE
1.10.1	Where more than one aerodrome operator exists at a joint-use aerodrome, a leading aerodrome operator should be identified to secure a harmonised, consistent and coordinated application of the recommendations for the prevention of runway incursions.	Military Aviation Authority, Regulator.	APPENDIX I
1.10.2	New investment or reconstruction work on the manoeuvring area should be planned, coordinated and safety assessed between civil and military entities, in consultation with the Local Runway Safety Team.	Military Aviation Authority, Regulator, Aerodrome Owner/Operator, Air Navigation Service Provider, Local Runway Safety Team.	APPENDIX B APPENDIX I
1.10.3	Differences in application of Civil and Military traffic procedures that can affect operational safety should be published in accordance with Annex 15, Aeronautical Information Services.	Aerodrome Operator, Air Navigation Service Provider, Aeronautical Information Service Provider, Military Aviation Authority, Regulator.	APPENDIX L APPENDIX I
1.10.4	Coordinate civil and military inspection/audit activities and subsequent safety recommendations with civil and military authorities.	Regulator, Military Aviation Authority.	APPENDIX G APPENDIX I
1.10.5	Timely planning and coordination of aerodrome operations between civil and military aerodrome entities should be established as appropriate.	Aerodrome Operator.	APPENDIX I
1.10.6	Standard ICAO phraseology should be in use during civil operations at joint use aerodromes.	Air Navigation Service Provider, Aircraft Operator.	APPENDIX A APPENDIX E APPENDIX I
1.10.7	When practicable, procedures to use VHF frequency for communications or cross coupled UHF/VHF associated with runway operations should be developed for civil and military traffic operating simultaneously. The objective is to maintain the required level of situational awareness with civil and military Pilots, Manoeuvring Area Vehicle Drivers and Air Traffic Controllers.	Air Navigation Service Provider, Aerodrome Operator.	APPENDIX A APPENDIX B APPENDIX C APPENDIX E APPENDIX I
1.10.8	Once a formation of military aircraft is established on the manoeuvring area, the formation should be treated as one entity.	Air Navigation Service Provider, Aircraft Operator.	APPENDIX I
1.10.9	Conditional clearances should not be used for civilian traffic during military formation flight operations.	Air Navigation Service Provider.	APPENDIX L APPENDIX I
1.10.10	Standard ICAO Annex 14 aerodrome signs, lights and markings should be used where civil and military share a manoeuvring area.	Aerodrome Operator.	APPENDIX L APPENDIX I
1.10.11	Wherever practicable military aircraft should display lights in accordance with ICAO Annex 2. If required, additional procedures should be applied to maintain the required level of situational awareness at joint-use aerodromes.	Aircraft Operator.	APPENDIX L APPENDIX D APPENDIX I
1.10.12	Ensure that military Pilots and Manoeuvring Area Vehicle Drivers who are deployed at civil aerodromes are competent to operate within the remit of ICAO provisions and local procedures.	Military Aviation Authority, Regulator, Aerodrome Operator, Aircraft Operator.	APPENDIX L APPENDIX C APPENDIX D APPENDIX I

2. FUTURE WORK

#	RECOMMENDATION	ACTION	GUIDANCE
2.1.1	Information about the development of new technologies that can be applied to runway safety shall be disseminated as part of the general runway safety awareness campaign.	EUROCONTROL, SESAR.	APPENDIX B
2.1.2	Identify ICAO guidance material that should be upgraded to ICAO standards and recommended practices and review other materials relevant to Runway Incursion prevention.	EUROCONTROL Runway Safety Working Group.	
2.1.3	Routinely review runway incursion causal and contributory factors data.	EUROCONTROL.	

APPENDICES



APPENDIX A

COMMUNICATIONS GUIDANCE

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APPENDIX A

COMMUNICATIONS GUIDANCE

Introduction

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

Factors affecting communication breakdown

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

Examples of communication breakdown on the manoeuvring area include, but may not be limited to:

- Complex instructions to different aircraft;
- Controller high speech rate;
- Two different languages;
- Frequency congestion / blocked frequency;
- Use of non standard ICAO phraseology by air traffic control;
- Call sign confusion;
- Poor read-back procedure;
- Inadequate aviation English;
- Different frequencies associated with runway operations;
- Inadequate driver communication training.

Loss of communication and runway incursions.

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

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

ICAO doc. 4444 AIR-GROUND COMMUNICATIONS FAILURE
Note 2.— An aircraft equipped with an SSR transponder is expected to operate the transponder on Mode A Code 7600 to indicate that it has experienced air-ground communication failure.

Aviation language for international services

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

ICAO Annex 1

As of 5 March 2008, aeroplane, airship, helicopter and powered-lift pilots, air traffic controllers and aeronautical station operators shall demonstrate the ability to speak and understand the language used for radiotelephony communications to the level specified in the language proficiency requirements in Appendix 1.

Appendix 1

REQUIREMENTS FOR PROFICIENCY IN LANGUAGES USED FOR RADIOTELEPHONY COMMUNICATION

1. General

Note.— The ICAO language proficiency requirements include the holistic descriptors at Section 2 and the ICAO Operational Level (Level 4) of the ICAO Language Proficiency Rating Scale in Attachment A. The language proficiency requirements are applicable to the use of both phraseologies and plain language.

2. Holistic descriptors

Proficient speakers shall:

- a) *communicate effectively in voice-only (telephone/radio-telephone) and in face-to-face situations;*
- b) *communicate on common, concrete and work-related topics with accuracy and clarity;*
- c) *use appropriate communicative strategies to exchange messages and to recognise and resolve misunderstandings (e.g. to check, confirm, or clarify information) in a general or work-related context;*
- d) *handle successfully and with relative ease the linguistic challenges presented by a complication or unexpected turn of events that occurs within the context of a routine work situation or communicative task with which they are otherwise familiar; and*
- e) *use a dialect or accent which is intelligible to the aeronautical community.*

ICAO Annex 10 Language to be used

The air-ground radiotelephony communications shall be conducted in the language normally used by the station on the ground or in the English language.

Doc. 9432 Manual radio telephony

Runway Frequency

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

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

Aerodrome Control Phraseologies

Use of established **standard ICAO phraseologies** for radio telephony communication between aircraft and ground stations is essential to avoid misunderstanding, and to reduce the time required for communication. ICAO phraseology shall be used in all situations for which it has been specified. When standardised phraseology for a particular situation has not been specified, plain language shall be used. An extract from the ICAO Standard that states this requirement is as follows:

Annex 10, Volume II

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

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

ICAO doc. 9432 Manual of Radiotelephony says

*"In the PANS-ATM [doc. 4444], it is further emphasized that the phraseologies contained therein are not intended to be exhaustive, and when circumstances differ, pilots, ATS personnel and other ground personnel will be expected to use appropriate subsidiary phraseologies which should be as clear and concise as possible and **designed to avoid possible confusion** by those persons using a language other than one of their national languages. "Appropriate subsidiary phraseologies" can either refer to the use of plain language, **or the use of regionally or locally adopted phraseologies**. Either should be used in the same manner in which phraseologies are used: clearly, concisely, and unambiguously. Additionally, **such appropriate subsidiary phraseologies should not be used instead of ICAO phraseologies, but in addition to ICAO phraseologies when required**, and users should keep in mind that many speakers/listeners will be using English as a second or foreign language.*

3.2.4 The use of plain language required when phraseologies are not available should not be taken as licence to degrade in any way good radiotelephony techniques. All radiotelephony communications should respect both formal and informal protocols dictating clarity, brevity, and unambiguity."

Example Phraseologies

Listed below are some of the relevant key ICAO phraseologies contained within those documents, applicable for operations on runways. More examples of the application of phraseologies may be found in the manual of radiotelephony ICAO doc. 9432 and Pans ATM 4444. It should be noticed that these phraseologies are for use by air traffic controllers, pilots, and when applicable, to vehicle drivers.

Special note for vehicle drivers

Doc. 4444 Phraseologies for the movement of vehicles, other than tow-tractors, on the manoeuvring area shall be the same as those used for the movement of aircraft, with the exception of taxi instructions, in which case the word “**PROCEED**” shall be substituted for the word “**TAXI**” when communicating with vehicles.

The procedure contained in ICAO doc. 4444 12.2.7 makes no provision for vehicles to be included in the process of receiving a **conditional clearance**. Vehicles may only be the subject of a conditional clearance.

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 ICAO PANS/ATM (Doc 4444) where a complete listing is available in Chapter 12. They refer to those elements considered crucial to runway safety aspects.

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)
HOLD SHORT OF RUNWAY (number) [contact TWR]

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

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

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

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

ATC (call sign) VACATE RUNWAY
PILOT/DRIVER (call sign) RUNWAY VACATED

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

ATC (call sign) EXPEDITE TAXI (reason)
PILOT/DRIVER (call sign) EXPEDITING

ATC (call sign) TAXI SLOWER (reason)
PILOT/DRIVER (call sign) SLOWING DOWN

b. HOLDING INSTRUCTIONS FROM ATC

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

ATC (call sign) HOLD POSITION;

ATC (call sign) HOLD (distance) FROM (position) ... to hold not closer to a runway than specified in Doc. 4444; Chapter 7, 7.5.3.1.3.1

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

READ-BACK FROM PILOTS/DRIVERS

(call sign) HOLDING;

(call sign) HOLDING SHORT.

It should be noted that aircraft should not hold closer to a runway than specified in Doc. 4444; Chapter 7, 7.5.3.1.3.1.

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

c. TO CROSS A RUNWAY

PILOT/DRIVER (call sign) REQUEST CROSS RUNWAY (number...)

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

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

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

Note — The pilot or driver will, when requested, report "RUNWAY VACATED" when the aircraft is clear of the runway.

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);

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

Good practice read back example

Pilot AF 2515 from S3 line-up runway 27 and wait

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

The phrase 'Go ahead' (meaning pass your message) may be misinterpreted as an instruction to move the vehicle or aircraft.

e. CONDITIONAL CLEARANCES

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

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

e.g.:

ATC "SAS 941, BEHIND DC9 ON SHORT FINAL, LINE UP BEHIND".

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

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 Scandinavian 941.

ATC Scandinavian 941 [that is] correct

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

f. TAKE-OFF CLEARANCE

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

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

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

When take-off clearance has not been complied with.

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

ATC (call sign) TAKE OFF IMMEDIATELY OR 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 (call sign) HOLDING;

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

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

PILOT (call sign) STOPPING;

Aerodrome Control Phraseology – READ-BACK

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

In PANS-ATM the regulations regarding read-backs are stated.

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. 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.

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.

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.

Studies of air ground communication practices have shown that incomplete read-backs may mask a misunderstanding. Incorrect read-backs show there is a misunderstanding. Air traffic control must challenge incomplete or incorrect read-backs.

Avoiding Call Sign Confusion

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

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

Runway Incursion Example:

An aircraft with the call sign “delta” has to taxi to a position called “delta 2” later split in “delta 2-2” And RWY 02 (RWY 2 for USA pilots) in use;

ATC to outbound taxiing traffic **“Delta xxx cross runway 07R and continue straight ahead to D2 (a taxiway)”**

Pilot Delta xxx **“Cross runway 7 right to the runway 2” (unchallenged incorrect readback)**

ATC **“Delta xxx take position on D22 please” (non ICAO phraseology)**

Pilot Delta xxx **“Affirm on D22”**

ATC to landing traffic **“RJ85 go-around I say again go-around”**

Pilot 85 **“Going around RJ85”**

Pilot Delta interpreted these instructions as Delta to (runway) 02.

ICAO DOC 4444

■ TRANSMISSION OF NUMBERS

- RWY = each digit separately
- i.e. RWY02 = runway zero two – runway two

■ TAXI PROCEDURES

- TAXI TO HOLDING POINT RWY # #
- HOLD SHORT OF RWY # # (was not said by the controller)

■ PREPARATION FOR T/O

- CLEARANCE TO ENTER A RWY MUST BE OBTAINED:
- LINE UP (AND WAIT) RWY # #

Other points of confusion include **aircraft type misidentification** and **aircraft livery confusion** where the livery is not representative of the aircraft call sign.

Communication techniques - general

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

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

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

What to do if uncertain of your position on the manoeuvring area

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

ICAO doc. 4444

"UNCERTAINTY OF POSITION ON THE MANOEUVRING AREA

Except when a pilot is in doubt as to the position of the aircraft with respect to the manoeuvring area shall immediately:

- a. *stop the aircraft; and*
- b. *simultaneously notify the appropriate ATS unit of the circumstances (including the last known position).*

In those situations where a pilot is in doubt as to the position of the aircraft with respect to the manoeuvring area, but recognizes that the aircraft is on a runway, the pilot shall immediately:

- a. *notify the appropriate ATS unit of the circumstances (including the last known position);*
- b. *if able to locate a nearby suitable taxiway, vacate the runway as expeditiously as possible, unless otherwise instructed by the ATS unit; and then,*
- c. *stop the aircraft.*

A vehicle driver in doubt as to the position of the vehicle with respect to the manoeuvring area shall immediately:

- a. *notify the appropriate ATS unit of the circumstances (including the last known position);*
- b. *simultaneously, unless otherwise instructed by the ATS unit, vacate the landing area, taxiway, or other part of the manoeuvring area, to a safe distance as expeditiously as possible; and then,*
- c. *stop the vehicle.*

7.4.1.5.4 In the event the aerodrome controller becomes aware of an aircraft or vehicle that is lost or uncertain of its position on the manoeuvring area, appropriate action shall be taken immediately to safeguard operations and assist the aircraft or vehicle concerned to determine its position."

Improving communications for little or no cost

- Introduce a method for self-checking to ensure ICAO compliant phraseology is used for air traffic controllers e.g. by taking the opportunity to listen to short samples of own R/T and comparing what was said with ICAO doc. 4444 phrases on a regular basis;
- Ensure a Cockpit friendly method to record line-up / crossing clearances is available;
- Implement a method for manoeuvring area drivers to record when a clearance to enter or cross a runway is received;
- ATC clearances must be issued early enough to ensure that they are transmitted to the aircraft in sufficient time for it to comply with them;
- Raise awareness that ICAO compliant communication practices help to prevent ground navigation errors;
- One best practice is to implement a systematic evaluation of the R/T loading; it may lead to frequency splitting;
- Consider Training recommendations for pilots, controllers and vehicle drivers, including practical exams.



APPENDIX B

GUIDELINES FOR LOCAL RUNWAY SAFETY TEAMS

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Raise awareness of runway safety matters

References

APPENDIX B

GUIDELINES FOR LOCAL RUNWAY SAFETY TEAMS

Introduction

Recommendation 1.1.1 states that at individual aerodromes, as designated by the Regulator, **a Runway Safety Team should be established to lead action on local runway safety issues.**

A Local Runway Safety Team should form a key element in the aerodrome runway safety programme and should ensure that a strong focus is maintained on runway safety across all parties creating, de facto, an aerodrome level safety management function. At some aerodromes cross-disciplinary teams may already exist that could carry out the functions of the Runway Safety Team, using a discrete runway safety agenda. If such teams are employed it is essential that their work is not duplicated; instead the work should be integrated as part of the aerodrome's runway safety action plan.

Establish a Local Runway Safety Team

Local Runway Safety Teams have been established at many aerodromes in Europe. Experience has demonstrated that these teams have been effective at helping to minimise the risk of runway incursions at individual aerodromes, where local issues such as taxiway layout, runway configuration and aircraft operators' needs can be taken into account.

Role

The role of the Local Runway Safety Team should be to advise the appropriate Management on potential runway safety issues and to recommend mitigating measures. This appendix provides guidance on the role of that team.

Terms of Reference

The tasks mentioned here may be reflected in the suggested Terms of Reference for a Local Runway Safety Team.

- Monitor the number, type and, the severity of runway incursions;
- Identify any local problem areas and suggest improvements e.g. by sharing the outcome of investigation reports to establish local hot spots or problem areas at the aerodrome and workable mitigations with and for operational staff;
- Work as a cohesive team to better understand the operating difficulties of personnel who work in other areas and recommend areas for improvement;
- Ensure that the recommendations contained in the European Action Plan for the Prevention of Runway Incursions are implemented;
- Conduct a runway safety awareness campaign that focuses on local issues, e.g. produce and distribute local hot spot maps or other guidance material as considered necessary; and
- Review the airfield to ensure it is adequate and compliant with ICAO Standards and Recommended Practices regularly.

Composition

The team should consist of, as a minimum, representatives from at least the three main groups associated with manoeuvring area operations, namely the Aerodrome Operator (which would include a vehicle driver), Ground Handling Associations when appropriate, representatives from the Air Navigation Service Provider / and local Air Traffic Controller associations and pilots from Aircraft Operators / and local pilot associations that operate at the aerodrome and other organisations that operate on the manoeuvring area.

ICAO

All available safety recommendations of global interest to the civil aviation community, resulting from runway related accidents and incidents and their successful risk mitigations should be reported to ICAO using the normal reporting mechanism for the relevant organisations, i.e. the organisations involved in the incursion.

ICAO Runway Incursion definition

To enable the sharing of safety lessons learned and a common understanding of runway incursion causal and contributory factors ICAO introduced a commonly agreed definition of a runway incursion in November 2004. The definition is:

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

One role of the Local Runway Safety Team is to ensure that the ICAO definition is used. The following explanations are intended to provide further clarification to ease common understanding of this definition:

“Protected area of a surface designated for the landing and take-off of aircraft”.

This is to be interpreted as the physical surface of a runway, from the centreline to the holding point appropriate to the type of runway. Where operations are being conducted during Low Visibility operations this should be the holding point appropriate to the procedures in force.

The **“protected surface”** includes the ILS glide-path and localiser critical areas at all times, and the ILS sensitive areas during Low Visibility Procedures.

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

Regardless of the cause of an incident the Local Runway Safety Team needs to ensure awareness of all occurrences concerning runway safety, irrespective of their severity. The effective introduction of this definition has allowed organisations to understand runway incursion risk and manage it from the perspective of an individual aerodrome and as a collective contributor to the Air Traffic Management network.

One way of managing runway incursion risk is to identify and eliminate or mitigate hot spots on the manoeuvring area.

ICAO Hot Spot definition

The ICAO definition of a hot spot is:

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

The criteria used to establish and chart a hot spot are contained in the ICAO docs. 9870, 4444 PANS-ATM and Annex 4 - Aeronautical Charts. Hot spots should be identified and brought to the attention of the Local Runway Safety Team. Hazards associated with hot spots should be mitigated as soon as possible and so far as is reasonably practicable. Operational staff needs to be made aware of hot spots at aerodromes.

EXAMPLE	RUNWAY SAFETY – RUNWAY INCURSION	RUNWAY SAFETY – NOT INCURSION
Aircraft, vehicle or pedestrian is cleared, correctly, to enter or cross a runway and proceeds as cleared, but does not read-back the clearance.		X
Aircraft is cleared, correctly, to land or take off and proceeds as cleared, but does not read-back the clearance.		X
Aircraft lands without clearance.	X	
Aircraft lands without clearance and evidence shows that the pilot was acting appropriately in accordance with Loss of Communication procedures due to R/T failure.		X
Aircraft takes off without clearance.	X	
Aircraft, vehicle or pedestrian enters runway without clearance.	X	
Aircraft, vehicle or pedestrian is cleared to enter the runway and does so, as instructed and intended, but before the red stop bar has been “dropped”. (this also applies to traffic lights where so positioned).	X	
Aircraft, vehicle or pedestrian enters the runway at the incorrect holding point.	X	
Aircraft, vehicle or pedestrian vacates at the incorrect holding point.		X
Controller incorrectly clears an aircraft, vehicle or pedestrian to enter or cross runway.	X	
Controller incorrectly clears an aircraft to land or take-off.	X	
Aircraft lines-up out of instructed sequence.	X	

Reporting culture

Ensure it is easy for operational staff at your aerodrome to report runway incursions and other runway safety occurrences, including post-flight, for pilots after landing at the destination aerodrome. Ensure that the reporter receives feedback in a timely manner. Support the provision of a Just culture for all operational staff. Make use of lessons learned for joint training and improvement of the aerodrome services, infrastructure and practices.

Exchange of lessons learned and best practices

The problem of runway incursions is still considered to be one of the top safety issues to be resolved in aviation. Consequently, an important objective for Local Runway Safety Teams is to raise awareness of the operational hazards of working on the manoeuvring area and share good practices to prevent runway incursions.

Dissemination of Safety recommendations

A Local Runway Safety Team should ensure wide dissemination of the safety recommendations derived from accident and incident investigation findings as well as other relevant lessons learned, e.g. from operational experience, and best risk mitigation practices.

What pilots want

What pilots need for safe operation on the manoeuvring area is the consistent use of internationally agreed standard phraseology, procedures and signs, markings and lighting. Pilots' wishes for standardisation of communication practices include:

- Use of standard phraseology in accordance with Annex 11 and Doc. 4444;
- Use of signs, markings and lighting in accordance with Annex 14;
- Enhanced situational awareness, based on the use of one language – aviation English;

- Short, unambiguous taxi clearances, with no more than 2 sets of numbers to remember at a time. Special consideration should be given to new information;
- Enough sectors / frequencies to avoid congestion of the R/T channels;
- Complete information about expected taxi routing and stand, taxi-out routing and runway well in advance.
- Accurate aerodrome charts and essential information on aerodrome conditions- sources would be ATIS, and NOTAMS and real-time radio communication.

Preparing a Runway Safety Programme for your aerodrome

Do not expect pilots to be familiar with local procedures. The difficulty encountered at aerodromes where ICAO provisions are not respected, is the use of local, unique procedures and practices. Non standard items have to be interpreted by the pilot for the pre-flight briefing or whilst taxing, from the cockpit.

ICAO Standards and Recommended Practices (SARPS) are available to give the same consistent predictable operations at any aerodrome in the world.

When preparing a runway safety programme for your aerodrome each action item should designate a responsible person or organisation for completing the relevant tasks. There may be more than one person or organisation affected by an action item; however, one person or organisation should take the lead and be responsible for the completion of all the tasks associated with the action item. A realistic time frame to accomplish the work should also be associated with each action item.

Tasks

A number of the recommendations contained in the Action Plan can be dealt with by the Local Runway Safety Team.

One important task is the identification of potential runway safety issues. It is essential to ask the question 'What' can go wrong 'Where' and 'Why'. To provide workable answers it is necessary to review aerodrome practices regularly, and when relevant information is available, from incident investigation findings.

It is important to ensure that:

- suitable data is available to provide evidence for making decisions;
- findings from incident and accident investigations are analysed and understood;
- lessons learned from incidents and accidents related to runway safety issues from other aerodromes, as well as one's own aerodrome are taken into account;
- reviews take place in different weather and light conditions to assess all runway entrances and visual aids to check that they are correctly located and clearly visible to pilots and drivers;
- lights, signs and markings are checked for conspicuity at a height similar to the height of the smallest and largest aircraft and vehicles using the manoeuvring area;
- all markings and signs should be adequate for and understandable by all parties, with no possible ambiguity of their meaning.

In any review the Local Runway Safety Team should take into account runway and taxiway layout, traffic intensity and mix, and both visual and non-visual aids such as markings, lights, signs, radar, taxiway designations, ATS procedures, AIP information etc.

When examining operating procedures, it is necessary to ensure that procedures employed by different companies at the aerodrome are robust, integrated and effective so as to minimise the risk of runway incursions. Extra care should be taken when examining existing or proposed runway capacity enhancing procedures or noise abatement schemes involving runway preferential systems.

Review proposed changes to the runways adjacent taxiway and apron infrastructure in the light of Runway Incursion sensitivity and provide advice to the aerodrome operators.

Measure the effectiveness of operational solutions periodically. This can be accomplished by comparing the results of the initial analysis with 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.

Another important task for the Local Runway Safety Team should be to assist in keeping a spotlight on the subject and to develop and run local awareness campaigns.

The timing of awareness campaigns is important, choosing to make a runway safety briefing at the start of a busy season, or before an unusual activity can be helpful to all operational staff.

A possible output could be the production and distribution of local hot spot maps or other guidance material as considered operationally necessary. Hot spot maps may point out unique or complex intersections and runway crossings where runway incursions have taken place in the past, or areas of the runway or associated taxiways which are not visible from the Control Tower. Consideration should be given to publishing these maps via the AIP. An example of a local map, often referred to as a 'Hot Spot Map', produced by Helsinki Vantaa Aerodrome, is shown.

Other tasks could include, assisting in verifying that communications between air traffic controllers, pilots and vehicle drivers are satisfactory, or if any improvements could be suggested. For example, although standard ICAO phraseology may be used, some messages from ATC may be overlong or complex, which may have the potential to confuse vehicle drivers or pilots.

The inherent difficulties of communicating on the manoeuvring area mean that aerodrome design, visual aids and infrastructure naming conventions play an important part in reinforcing the intended instructions passed by the air traffic controller.

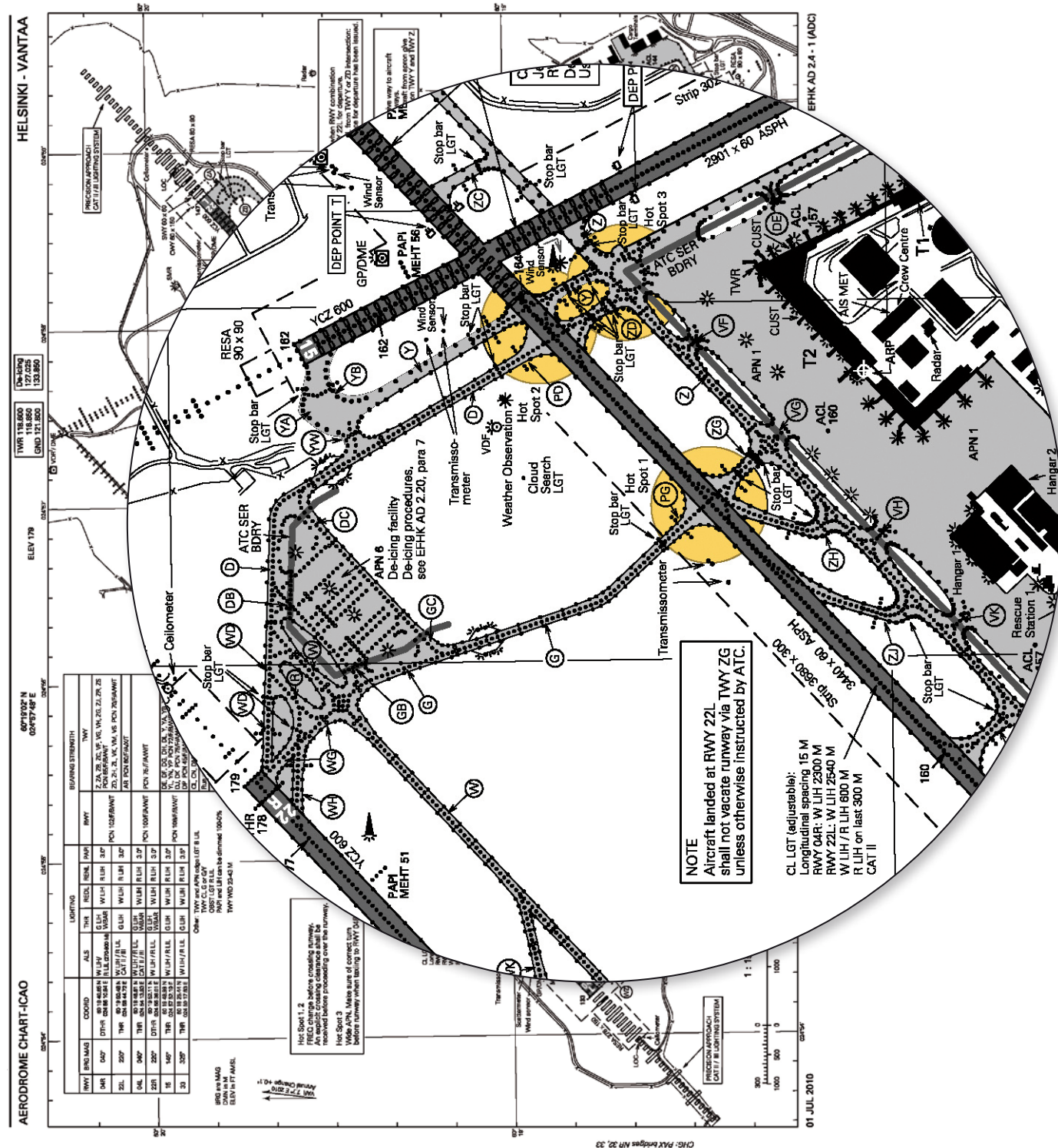
It is recommended that some members of a Local Runway Safety Team participate in safety case work, regarding changes to existing, procedures or infrastructure involving runways.

Local Runway Safety Teams can play a role in preparing the briefing pack for new users of an aerodrome, or for a new high season.

The guidance found in this Action Plan should not be seen to be limiting and good practice should be shared as appropriate. The boundaries set by national regulators and internationally accepted provisions should be respected.

Technology is available to help to prevent runway incursions and may be considered to supplement good manoeuvring area practices by enhancing situational awareness e.g. through the use of appropriate alerting functions.

Hot Spot Aerodrome Chart - Published in the AIP.



Joint training

Education and awareness of Local Runway Safety Team' achievements, can be communicated via training syllabi, newsletters, posters, stickers and the use of forums, on-line and in workshops.

Training on runway safety matters may be a supplement to core content training or EU Ops syllabi for licensing and certification and may also be included in the continuation training for air traffic controllers. EUROCONTROL provides joint training for air traffic controllers, pilots and manoeuvring area drivers called Aerodrome Resource Management. This training provides insight into the common runway incursion causal and contributory factors (such as expectation bias) and how to deal with difficult situations such as regaining situational awareness and control of the present traffic situation.

Raise awareness of runway safety matters

Ensure globally important practices to prevent runway incursions are part of your local practices and that their significance is locally understood, e.g. Never cross (or instruct a vehicle or aircraft to cross) an illuminated red stop bar.

Set up a user friendly email address to ease communication e.g. lrst@xyzairport.aa

The ICAO runway safety toolkit provides information for educational and awareness programmes.

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

References

Aerodromes Council International (ACI)
www.airports.org

Air Services Australia
www.airservicesaustralia.com

European Organisation for the Safety of Air Navigation (EUROCONTROL)
www.eurocontrol.int/runwaysafety

Federal Aviation Administration (FAA)
www.faa.gov/runwaysafety

International Air Transport Association (IATA)
www.iata.org

Chapter 3. Establishing a Runway Incursion Prevention Programme 3-7

International Civil Aviation Organisation (ICAO)
www.icao.int/fsix/res_ans.cfm
ICAO doc. 9870 Runway Incursion Prevention Manual

International Federation of Airline Pilots' Associations (IFALPA)
www.ifalpa.org

Transport Canada
www.tc.gc.ca/civilaviation/systemsafety/posters/tools.htm

United Kingdom Safety Regulation Group
<http://www.caa.co.uk>



APPENDIX C

AIRSIDE VEHICLE DRIVER TRAINING

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APPENDIX C

AIRSIDE VEHICLE DRIVER TRAINING

Introduction

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

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

The Aerodrome Operator is responsible for developing an agreed standard for the vehicle driver training programme. There will be a requirement for co-operation and partnership with Air Traffic Control, Ground Handling Agents, Airlines and other Service Providers airside to ensure the continued operation of the programme.

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

- A generic airside vehicle driver training programme which covers operational safety and health and safety aspects of operating vehicles, plant and equipment in close proximity to aircraft on aprons, stands and airside roads;
- Specific training on the vehicle, plant and equipment, e.g. car, tug, high loader, coach;
- Where the specific job function requires the driver to operate on the manoeuvring area then additional training on the hazards associated with runways and taxiways should be covered;
- An essential requirement of operating a vehicle on the manoeuvring area is the need to use VHF radio communications with Air Traffic Control that will require training in the correct use of RTF and standard phraseology;
- Works In Progress.

The following programme frameworks describe what may be considered as 'good practice' guidance for Airside and Manoeuvring Area vehicle driver training, with special attention given to a separate framework for radio telephony training. The guidance is a compilation of material drawn from many sources including ICAO, IATA, ACI and a large number of aerodromes that already operate vehicle driver training programmes. It is vital that both theoretical classroom training and practical experience cover all the areas mentioned. The aim of this guidance is to ensure consistency and a high degree of standardisation in the manner in which a driver obtains an 'Airside Driving Permit', therefore it may be applied to the majority of aerodromes.

Training Delivery

The three programme frameworks are intended as generic guidance and each aerodrome will need to apply those areas of training that are applicable to their local geography, conditions and type of operation.

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

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

Framework for an Airside Vehicle Driver Training Programme

The Airside Driving Permit (ADP)

- The issuing authority (normally the aerodrome operator), its validity in terms of time, conditions of use, non transferability of ownership of the permit, control and audit of permit issue;
- Local enforcement and driving offence procedures;
- Relationship to State driver licensing system.

National Legislation and Regulation

- Government/State regulations related to general vehicle driving licences;
- State/Regional/Local government requirements;
- Regulatory requirements/guidance for driving airside; and
- Local Organisations.

Aerodrome Regulations and Requirements

- Rules of Air Traffic Control, rights of way of aircraft;
- Specific aerodrome regulations, requirements and local instructions;
- Local methods used to disseminate general information and instruction to drivers;
- Local methods used to disseminate information regarding works in progress.

Right Of Way On The Ground

- Vehicles must always give priority to taxiing aircraft, aircraft on tow or being pushed back and aircraft with their anti-collision lights on.

Personal Responsibilities

- Fitness to drive (medical/health standards) national or airport agreed requirements (alcohol/drugs);
- Issue and use of personal protective equipment such as high visibility clothing and hearing protection;
- General driving standards;
- No smoking requirements airside;
- Responsibilities with respect to FOD and fuel/oil spillage;

- Responsibility for individuals to ensure vehicle is suitable for the task, and used correctly;
- Concentration – no use of mobile phones/portable electronic devices for personal use.

Vehicle Standards

- Condition and maintenance standards agreed at aerodrome and/or national level;
- The requirement to display obstruction lights and company insignia;
- Requirements and content of daily vehicle inspections ;
- Agreed standards of aerodrome and company vehicle fault reporting and rectification;
- Local requirements for the issue and display of Airside Vehicle Permits (AVP's).

General Aerodrome Layout

- The general geography of the local aerodrome;
- Aviation terminology used such as runway, taxiway, apron, roads, crossings etc;
- All standard aerodrome signs, markings and lights for both vehicles and aircraft;
- Specific reference to those signs, markings and lights used to guard runways;
- Specific reference to any controlled/uncontrolled taxiway crossing procedures.

Hazards of General Airside Driving

- Speed limits, prohibited areas and no parking regulations;
- The danger zones around aircraft;
- Engine suction/ingestion and blast, propellers and helicopters;
- Aircraft refuelling, fuelling zones, vehicle access/exit;
- FOD and spillages;
- Vehicle reversing, use of banksman;
- Staff and passengers walking across aprons, rights of way;
- Air-bridges and other services such as fixed electrical ground power;
- The general aircraft turnaround process;
- Aircraft emergency stop and fuel cut off procedures;
- Hazardous cargo;
- Local vehicle towing requirements;
- Requirements for driving at night;
- Requirements for driving in adverse weather conditions, particularly low visibility.

Local Organisations

- The role of the Aerodrome Operator in setting and maintaining standards;
- The Regulator and its responsibilities;
- The National and/or local Police and their involvement with airside driving other enforcement authorities dealing with vehicles, driving, health and safety.

Emergency Procedures

- Action to be taken in the event of a vehicle accident;
- Specific action to be taken in the event of a vehicle striking an aircraft;
- Action to be taken in the event of fire;
- Action to be taken in the event of aircraft accident/incident;
- Action to be taken in the event of personal injury.

Communications

- Radio procedures to be used, if applicable;
- Light signals used by ATC, if applicable;
- Procedures to be used by vehicle drivers if lost or unsure of position;
- Local emergency telephone number;
- How to contact the local aerodrome safety unit;
- Pedestrian and traffic hand signals.

Practical Training (Visual Familiarisation)

- Airside service roads, taxiway crossings and any restrictions during low visibility, standard taxiways used;
- Aprons and stands;
- Surface paint markings for vehicles and aircraft;
- Surface paint markings that delineate the boundary between aprons and taxiways;
- Signs, markings and lights used on the taxiway and help indicate runways ahead;
- Parking areas and restrictions;
- Speed limits and regulations;
- Hazards during aircraft turnarounds and aircraft movements.

Framework for Manoeuvring Area Vehicle Driver Training Programme

It is anticipated that all drivers expected to operate on the manoeuvring area of an aerodrome will obtain an airside vehicle driver's permit which has covered the programme detailed above. It is also anticipated that any driver expected to drive on the manoeuvring area will have obtained an agreed period of experience of general airside driving before training to operate on the manoeuvring area.

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

- Runway and taxiway inspections;
- Bird Control;
- Rescue and Fire Fighting;
- Essential Engineering;
- ATC;
- Snow clearing and De-icing;
- Airline/Handling agent for aircraft towing and runway crossings.

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

Aerodrome Regulations and Requirements

- Rules of Air Traffic Control, rights of way of aircraft;
- Definitions of movement area, manoeuvring area, aprons, stands;
- Methods used to disseminate information regarding works in progress.

Air Traffic Control

All access to a runway (even if inactive) should take place only after receiving a positive ATC clearance and providing a correct readback, and after the stop bar (where provided) has been switched off; Entering a runway without a valid ATC clearance will create a runway incursion, irrespective of the status of aeronautical ground lighting.

- Function of aerodrome control and its area of responsibility;
- Function of ground movement control and its area of responsibility;
- Normal and emergency procedures used by ATC relating to aircraft;
- ATC frequencies used and normal hand over/transfer points for vehicles;
- ATC call signs, vehicle call signs, phonetic alphabet, standard phraseology;
- Demarcation of responsibilities between ATC and Apron Control if applicable;
- Familiarisation with low visibility procedures and the changes they bring to manoeuvring area vehicle operations.

Personal Responsibilities

- Fitness to drive with particular emphasis on eyesight and colour perception;
- Correct use of personal protective equipment;
- Responsibilities with respect to FOD;
- Responsibilities with respect to escorting other vehicles / aircraft on the manoeuvring area;
- Awareness briefing at the start of a shift.

Briefing

Manoeuvring area drivers should be briefed at the start of shift so they are aware of the airfield status. This should include:

- The runways in use;
- If airfield low visibility procedures are in force;
- Any significant works areas in place, or being established or removed that day;
- Stop bars that are inoperable making the taxiway unusable for runway entry or crossing.

Manoeuvring area drivers should also ensure they carry an up to date airfield map in the vehicle and ensure that situational awareness is maintained.

Vehicle Standards

- Responsibility to ensure vehicle used is fit for purpose and task e.g. vehicles airside should have fitted and drivers should use flashing yellow lights (ideally all of airside, but at a minimum those driven on the manoeuvring area);
- Requirements for daily inspection prior to operating on the manoeuvring area;
- Particular attention to the display of obstruction and general lights;
- Serviceability of all essential communications systems with ATC and base operations.

Aerodrome Layout

- Particular emphasis on standard ICAO signs, markings and lights used on the manoeuvring area;
- Special emphasis on those signs, markings and lights used to protect the runway;
- Description of equipment essential to air navigation such as ILS;
- Description of protected zones related to ILS antenna;
- Description of ILS protected areas and their relation to runway holding points;
- Description of runway instrument/visual strip, cleared and graded area;
- Description of lights used on the manoeuvring area with particular emphasis on those related to low visibility operations e.g. particular care should be taken if a contingency procedure to be used in Low Visibility Operations or at night turns off the green taxiway centreline lights linked to and inoperable stop bar.

Hazards of Manoeuvring Area Driving

- Engine suction/ingestion and blast, vortex, propellers and helicopter operations;
- Requirements for driving at night;
- Requirements for operations in low visibility and other adverse weather conditions;
- Procedures for vehicle and or radio becoming unserviceable whilst on manoeuvring area;
- Rights of way for aircraft, towed aircraft and Rescue and Fire Fighting Service vehicles in emergency.

Emergency Procedures

- Actions to be taken in event of vehicle accident/incident;
- Actions to be taken in event of aircraft accident/incident;
- Actions to be taken if FOD or other debris is found on runways and taxiways;
- Procedures to be used by vehicles if lost or unsure of position;
- Local emergency telephone number.

Aircraft Familiarisation

- Knowledge of aircraft types and ability to identify all types normally operating at the aerodrome;
- Knowledge of Airline call signs;
- Knowledge of aircraft terminology relating to engines, fuselage, control surfaces, undercarriage, lights, vents etc.

Practical Training (Visual Familiarisation)

- All runways (including access and exit routes), holding areas, taxiways and aprons;
- All signs, surface markings and lights associated with runways, holding positions, CAT 1/2/3 operations;
- All signs, surface markings and lights associated with taxiways;
- Specific markings that demarcate the boundary between aprons and manoeuvring area;
- Navigation aids such as ILS, protected area, antenna, RVR equipment and other meteorological equipment;
- Hazards of operating around aircraft landing, taking off or taxiing;
- Any locally used naming convention for particular areas or routes;
- Knowledge of standard taxi routes, primarily intended for aircraft.

Framework for a Radiotelephony (RTF) Training Programme

The movement of vehicles on the manoeuvring area is subject to authorisation by Air Traffic Control. 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.

All drivers of vehicles operating on the manoeuvring area should be expected to display a high degree of competence with respect to use of RTF phraseology and aviation English.

Hierarchy of Message Priority

- Message priorities, understanding of distress, alerting, control, information messages;
- When on the manoeuvring area, messages from ATC take priority.

Use of the Phonetic Alphabet

- Correct pronunciation of both letters, words and numbers.

Use of Standard Phraseology

- Emphasis on drivers using standard phraseology similar to pilots;
- Caution should be noted with certain phrases such as 'cleared', and 'go ahead'.

Use of Call Signs for Aircraft, ATC and Vehicles

- Understanding of terminology and acronyms used by ATC and pilots;
- Knowledge of the airline call signs used at the aerodrome;
- Vehicle call signs should be appropriate to function e.g. 'Operations', 'Fire', 'Engineer', where there is more than one vehicle the use of numbers e.g. 'Fire 2'.

Use of Read back Procedures

- Vehicle drivers should use standard read back in the same manner as pilots for instructions such as 'enter/cross the runway'.

Readability Scale

- Understanding and use of the readability scale from 1 - 5.

Aerodrome information

- Expect that ATC will provide real time significant aerodrome information which may affect operations on or near the runway when NOTAMS and ATIS (which are normally used to advise pilots of significant information regarding runway operations) are not available.

Lost or Uncertain of Position

- Understanding of local procedures for vehicles lost or uncertain of position on the manoeuvring area.

Vehicle Breakdown

- Local procedure for vehicle breakdown on runways and taxiways;
- Procedure for indicating to ATC of vehicle failure.

Radio Fail Procedure

- Understanding of the local procedure if radio failure occurs whilst on the runway or taxiway;
- Understanding of the light signals that may be used by ATC to pass instructions to vehicles.

Correct Transmitting Technique and RTF Use

- Understand the reasons for listening out prior to transmitting;
- Use of standard phraseology, aviation English;
- Words and sounds to be avoided;
- Correct positioning of microphones to avoid voice distortion;
- Avoidance of 'clipped' transmissions;
- Be aware of regional accents and variations of speech;
- Speed of delivery of RTF phraseology.

Use of Portable Radios

- Correct use of radios;
- Effective range and battery life;
- Screening/shielding effects on the aerodrome;
- Use of correct call signs, either related to vehicle or an individual person.

Safety whilst using Radios

- Local instructions regarding use of portable radios and hand held microphones whilst driving a vehicle;
- Local instructions on the use of mobile telephones (cell phone) whilst operating airside.

For more information about communication practices on the manoeuvring area, refer to [Appendix A Communication](#).

Summary

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

References

1. Airports Council International ACI (World) Airside Safety Handbook;
2. ACI (World) Apron Signs and Markings Handbook;
3. IATA Airport Handling Manual (AHM) current edition;
4. UK Civil Aviation Authority CAP 642 - Airside Safety Management;
5. UK Airport Operators Association - Airside Driver Training Scheme;
6. ICAO Annex 14, ch. 8, Aerodrome Vehicle Operations, and attachment A, para. 17 - Operators of vehicles;
7. ICAO Air Traffic Management (PANS ATM) ch. 7 Procedures for Aerodrome Control;
8. Airside Vehicle Drivers Guide Air Services Australia.

Useful Web sites

www.eurocontrol.int
www.airports.org
www.aci-europe.org
www.iata.org
www.caa.co.uk



APPENDIX D

FLIGHT CREW BEST PRACTICES

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

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

Principle points to highlight for pilots include:

- Runway incursions may lead to Go-Arounds and indecision about whether to go around or not;
- Inexperience, lack of practice with procedures or unclear procedures may lead to runway incursions;
- Air ground lighting is an important guidance when on or near a runway;
- Aerodrome infrastructure design is still important to building situational awareness;
- A current aerodrome chart is essential for accurate navigation on the ground;
- Errors of either Air Traffic Controllers, pilots or drivers are typically caught within their peers. Pilots play an important part in catching the errors they have made themselves, other pilots and air traffic controllers;
- In today's air traffic management system compliance with ICAO requirements to use aviation English on the manoeuvring area is a vital safety net;
- Failing to gather (see or hear) information clearly or correctly is a frequent cause of incursions when left unchallenged. An important communication factor in runway incursion incidents is incorrect or incomplete read-back by pilots or air traffic controllers, particularly when conditional clearances are used;
- Misunderstandings are more likely to arise when a pilot is doing other tasks, being head-down. Examples of this are conducting aircraft performance calculations, deferred checklist items, administrative tasks, starting an engine during an engine-out taxi, etc. Safety reports show that Public Address announcements to passengers or commercial announcements are a direct source of error in many events.

Sterile Cockpit for Safety

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

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

During movement of the aircraft the flight crew must be able to focus on their duties without being distracted by non-flight related matters. This includes public address announcements, performance (re)calculations, administrative tasks and briefings. Preferably these should all be completed before taxi-out.

Those checklists (or parts of checklists) that cannot be completed at that time are best completed when the aircraft is stationary. Ensure cabin crew are aware of this requirement if it is not a Standard Operating Procedure. The following definition of a 'Sterile Flight Deck' is offered as a reference:

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

It is generally accepted that the sterile flight deck applies as follows:

- a. Departure: when the aircraft starts engine/s and ceases when the aircraft reaches 10,000' above the departure aerodrome elevation;
- b. Arrival: when the aircraft reaches 10,000' above the arrival aerodrome elevation until the engine/s are shut down after landing;
- c. Any other times decreed by the flight crew. (e.g. in flight emergency, security alert etc).

During taxi preferably both pilots should be looking outside. The pilot not flying should only handle essential check list reading and communication. Both pilots should check the taxi routing and the aerodrome chart. If a runway change or intersection change or performance recalculation is required, then it is advised to stop the aircraft and do the required items after the parking brakes are set. Advise ATC in advance of stopping and ATC should accept this as a normal procedure.

Disturbances that can be avoided may include, but not be limited to, calls received from non-operational areas (e.g. company), entry onto the flight deck (e.g. cabin crew) and extraneous conversations not related to the current phase of flight. Public Address e.g. welcome announcements by flight deck, should be transferred from the taxi phase to a moment before engine start-up or push back. Operational calls on the company frequency cause the other pilot to be isolated in the flight deck. These calls and announcements should, if at all possible, be avoided while taxiing, and above all, when approaching the active runway.

Communications

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

Expect that ATC will use the ICAO read-back procedure (including Drivers and other personnel who operate on the manoeuvring area) *to confirm that the message is correctly understood.*

Improve situational awareness, when practicable, by conducting all communications associated with runway operations using aviation English.

Improve situational awareness, when practicable, by conducting all communications associated with runway operations on a common frequency.

This allows situational awareness of other traffic for you and the other traffic and can only be achieved when a message is understood by all meaning that all communications are conducted using aviation english on the runway frequency.

(note - Aerodromes with multiple runways may use a different frequency for each runway)

Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would have missed an ATC call or is in doubt, it is a good practice to request it again. Similarly, if one crew member has a different perception of a situation or clearance to the other, ATC should be asked to clarify.

Situational awareness

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

If Pilots have any doubt as to their exact position on the surface of an aerodrome, they should stop and contact ATC and follow the associated ICAO procedure (PANS-ATM, Doc 4444). Proper crew resource management indicates that when in doubt, all available sources should be consulted. When one of the pilots would doubt on the situational awareness, a good practice would be to stop the aircraft taxiing or get immediate clarification by ATC. Normally ATC is very familiar with the particular aerodrome and in the best position to help re-establish the situational awareness.

Pilots should be “head-up” for a continuous watch while taxiing. Promote best practices on flight deck procedures while taxiing and during final approach - to include the “Sterile flight deck” concept.

All access to a runway (even if inactive) should take place only after receiving a positive clearance and providing a correct readback, and after the stopbar (where provided) has been switched off; entering a runway without a valid ATC clearance will create a runway incursion.

Pilots shall not cross illuminated red stop bars when lining up or crossing a runway, unless contingency procedures are

in force, e.g. to cover cases where the stop bars or controls are unserviceable.

Stop bars and runway status lights provide a clear red signal to stop taxiing.

Ensure that flight deck procedures contain a requirement for specific clearances to cross any runway, this includes non-active runways.

Ensure a means to indicate receipt of landing / line-up / take off / crossing clearances in the cockpit. Proper crew resource management indicates that when in doubt, all available sources should be consulted. Especially for runway operations it is essential that both pilots are fully aware of the factual clearance. ATC should cooperate as long as it takes for the crew to understand what ATC advises.

During taxi for departure or during approach, Pilots should refrain from accepting a runway change proposal if time to re-brief is not sufficient. This includes a change of departure intersection. It is tempting to save time, fuel, capacity enhancement and for environmental reasons to accept a last minute change for another runway or runway entry. Pilots should be fully aware that this could lead to the hurry-up syndrome. A rushed crew is prone to make errors. Therefore it is absolutely imperative to make sure that enough time is available before accepting a last minute change. ATC should be aware to avoid the hurry –up syndrome.

Flight Crew should not enter a runway for departure if not ready to take off. This avoids the possibility that an aircraft is “forgotten” on an active runway. Advise ATC accordingly.

Avoid accepting rapid exit taxiways for runway entry. A rapid exit taxiway is designed to be an exit, not an entry. Using it as an entry hampers visibility, poses a threat for exact performance calculations and does not guarantee adequate visual aids.

Pilots should turn on aircraft forward facing lights when in receipt of a take-off clearance. The moment of switching proves to be an important aid for vehicle drivers or others on an active runway.

The flight deck traffic display (TCAS) could also be a good tool to detect traffic approaching and departing a runway. Remember, an aircraft may be departing from an intersection closer to the landing threshold out of sight, due to restricted visibility, or line of sight limitations.

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

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

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

Navigating on the ground - Visual aids

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

Reports to ATC and the airport should be made when factual situations differs from procedures or published information.

Use of aircraft lights

It is a widely held belief that the use of aircraft external lights could be an effective tool as part of a runway incursion prevention programme.

The following guidelines have been developed by the IFALPA Aerodrome & Ground Environment Committee. The suggestions made in these guidelines should help to improve the visibility of aircraft operating in the manoeuvring area of an airport they should not be seen as replacing proper monitoring of radio and other communications.

The captain is responsible for ensuring operating limitations and established operating procedures are observed. The captain always has the final authority to use the aircraft lights as deemed necessary for the safe execution of flight (including ground movement operations).

Clearly, there are issues associated with the use of external lights which must be addressed for example the impact of dazzle effect from strobes, landing lights and some high power taxi and runway turn off lights especially in certain weather conditions (snow, fog etc.) and the impact of external light use on others must always be considered.

Guidelines for the use of aircraft lights during ground operations: To the extent possible and consistent with aircraft equipment, operating limitations, and flight crew procedures, the illumination of aircraft exterior lights day or night should be as follows:

FLIGHT CREW PROCEDURES

BEFORE STARTING

Anti Collision lights / rotating beacon	ON
LOGO lights (according to Operator policy)	ON or OFF

TAXI-OUT (Moving on own power) (Note 1)

Taxi light	ON (Note 2)
Navigation / Position lights	ON (night);
Operators Policy (day) Turnoff lights	ON (Note 2)

CROSSING ANY RUNWAY (Note 3)

Strobe lights	ON
Turnoff lights	ON
Landing lights	ON

ENTERING RUNWAY FOR TAKE OFF

Strobe lights	ON
Take off clearance received:	
Landing lights	ON

TAXI-IN (runway vacated) (Note 1)

Landing lights	OFF
Strobe lights	OFF
Runway Turn off lights	ON (Note 2)

Note 1: To signal intent to other pilots, consider turning taxi and runway turn off lights off when stopped, yielding, or as a consideration to other pilots or ground personnel.

Note 2: Runway turn-off and taxi lights should always be ON during taxi. Outside the runway they may be temporarily switched off to avoid the blinding or dazzling effect, they should always be used when crossing a runway.

Note 3: When crossing a runway, the factual status of the runway, active or not, does not have any affect on the use of lights. Operators or Captains should consider turning ALL exterior lights on when crossing any runway.

You CAN HELP TO PREVENT RUNWAY INCURSIONS!

How?

1. It is essential to adhere strictly to all existing ICAO Standard Operating Procedures and phraseologies.
2. Flight crews need to ensure that they follow the clearance or instructions that are actually received, and not the one the flight crew is expecting to receive
3. A good planning of the ground operations can decrease the workload during taxi.
4. The flight and its associated risk start during the preparation for taxi. Dissemination of relevant information for a specific flight, which would likely effect the safe operation of aircraft, is the responsibility of all parties involved. Aircraft operators are encouraged to provide pilots with a specific means to obtain current safety significant airport information at each station.
5. Good situational awareness is the top priority during taxi. All crew members should be involved here. It is strongly advised to restrict all the other flight deck duties to an absolute bare minimum, only relevant for the safety of the flight, in order to facilitate crews to fully concentrate on taxiing. E.g. it is highly recommended to perform all checks and procedures, wherever possible, prior to taxiing or after standstill.
6. Application of the "Crew Resource Management" principles during taxi is as important as during the other phases of flight.
7. Even the most professional and experienced people make mistakes. By being defensive and letting the built-in safety nets do their work, a single mistake should not lead to a serious incident or accident.

Training

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

Best Practices Planning of Airport Ground Operations

(Refer to Recommendation 1.4.6)

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

1. Familiarise yourself with the airport

- Prepare the necessary charts for taxi and have them available for use during taxi;
- Take some time to study the airport layout. The naming of taxiways and other airport infrastructure can be misleading;
- Remember to review the latest NOTAM for both the Departure and Arrival airport for information concerning construction or taxiway/runway closures;
- Standard taxi routes are used more often at busy airports. Review the routes you can expect. Use the ATIS information and your previous experience to determine the possible taxi routes;
- Pay special attention to the location of HOT SPOTS. These are unique or complex intersections and runway crossings where runway incursions have taken place in the past, or areas of the runway or associated taxi ways which are not visible from the Control Tower;
- Know what runways you will encounter between where you are and where you are going;
- Visualise this information on the charts;
- Plan timing and execution of check-lists, so that no distractions occur when approaching and/or crossing runways; i.e all eyes outside during this phase.

2. Briefing

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

3. Taxiing – navigating on the ground

- Have the necessary aerodrome charts or an equivalent electronic device available for use during taxi, this includes when operating at the home aerodrome. Even a familiar home base could become difficult as a consequence of non-standard operations;
- Write down taxi route;
- Be alert for mandatory signs, markings, stop bars and runway guard lights;
- Look for visual aids (Taxiway lights, location information and destination signs);
- Assign crew member to look for and report signs/markings and keep track of location against the aerodrome chart;
- A crew member who is in doubt or does not agree with the situation must speak-up;

- Expect that ATC will provide ‘real-time’ significant aerodrome information which may affect operations on or near the runway when NOTAMS and ATIS which are normally used to advise pilots of significant information regarding runway operations are not available;
- Flight Crew must advise ATC on first contact with the Tower if additional time on the runway is required for operational reasons, this might be the case when e.g. in winter an engine run-up for shedding ice could be required;
- When a pilot not taxiing the aircraft focuses on the instruments in the flight deck, he/she is not able to monitor the progress of the aircraft. Before undertaking head-down actions advise the other pilot, so that added emphasis can be placed by the navigating pilot on maintaining navigational accuracy and situational awareness;
- Do not rush. The higher your ground speed, the less time you have to react, manoeuvre the plane and avoid an obstacle. Avoid being rushed by accepting last minute changes, especially during near runway operations. Time can be your ally and your enemy; use it wisely. Taxi defensively, this is being prepared for the errors of others.

4. Communication

- Check your audio box and volume adjustment whenever a frequency change is made;
- Take extra care accepting a “monitor xxx.xxx frequency” clearance. When after some period this new frequency keeps silent, suspect a wrong entry, first check communication and, if there is no response, then, refer back to the previous frequency;
- If necessary request progressive taxi instructions;
- If you need to leave the ATC frequency, then notify your other flight crew members. Afterwards, be briefed by the other crew member of what you have missed;
- The use of Aviation English in a busy and complicated environment should be encouraged, improving situational awareness;

- Speaking slowly is essential when operating in foreign regions;
- Be proficient with the language used for communication;
- Use standard ICAO compliant radio phraseology at all times. Only strict adherence to standard phraseology avoids miscommunications;
- Read back all runway crossing or hold short clearances using correct radio phraseology;
- Read back, the complete instruction must be read back and must be clear, "Roger" is not a read-back. Always include:
 - a) your full aircraft call sign to avoid call sign confusion;
 - b) ATC route clearances;
 - c) clearances and instructions to enter, land on, take off on, hold short of, cross and backtrack on any runway;
 - d) the runway designator to avoid wrong runway selection; and
 - e) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.
- Listen to clearances issued to other aircraft. Be extra attentive when another aircraft with similar call sign is on the frequency;
- Both pilots should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, enter, line up, take-off and land on a nominated runway. Any misunderstanding or disagreement should be cleared up immediately by contacting ATC for clarification: ASK;
- The use of headsets increases the readability of communications with ATC and within the flight deck;

- Ensure all flight crew are on the appropriate frequency until all runways have been vacated after landing;
- After the landing, vacate the runway as soon as possible, but not by turning onto another runway, unless specifically instructed to do so;
- When the aircraft has vacated the active runway, be prepared to stop to resolve any questions about the ATC clearance or about the aircraft position.

5. Crossing or entering a runway

- When cleared to line up and/or when crossing any runway, position the aircraft at a right angle with the runway where possible, in order to better observe the other traffic, both arriving and departing.
- If you are cleared to "line up and wait", then only a short delay on the runway should be anticipated. If you find yourself in this position for a more extended period, advise about your position and seek clarification: ASK.
- If instructed to follow other traffic, be aware this does not automatically include the clearance to enter or cross a runway. Each aircraft requires a specific clearance to enter or cross any runway.
- If there is any doubt when receiving a clearance or instruction, clarification should be requested immediately from ATC.
- Cancel check list activity when crossing and entering runways.
- Avoid stopping on a runway unless specifically instructed to do so.

Be aware that the expectations established during the pre-taxi or pre-landing planning can be significantly altered with a different and unexpected clearance.

References

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

Annex 2 Chapter 3

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

Annex 14 - Aerodromes Volume I

5.3.17.9 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.

5.4.3.35 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.

Annex 15 Chapter 5

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

Doc 4444 7.15.7 Stop bars

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

Other References

ICAO. Procedures for Air Navigation Services – Air Traffic Management, Doc 4444, Ed. 14, 2001

ICAO. Air Traffic Services, Annex 11, Ed. 13, 2001

ICAO. Procedures for Air Navigation Services – Aircraft operations, Doc 8168, Ed. 4, 1993

FAA. Federal Aviation Regulations / Airman's Information Manual, 2002

ICAO NACC Regional office, OPS guidelines for the prevention of runway incursion, Jan Jurek, 2002

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

FAA, Runway safety: It's everybody's business, Kim Cardosi, Ph.D., 2001

FAA, Runway Safety Blueprint 2002-2004, 2001

FAA/IATA Runway Incursion Prevention Program



APPENDIX E

AIR TRAFFIC CONTROLLER BEST PRACTICES

Incorrect and Incomplete Read-backs

Go-Arounds/Missed Approach - Runway Incursion Events

Take-Off without Clearance

Procedures, Practices and Documents

Issue of en-route clearance

Read-Back requirements

Taxi instructions

Multiple line-ups on the same runway

Stop Bars

Contingency

Take-off procedures

Hand-over

Briefing Sessions

Training

APPENDIX E

AIR TRAFFIC CONTROLLER BEST PRACTICES

Runway incursions happen when a pilot or driver enters a runway without a valid ATC clearance. Often a misunderstanding/communication breakdown between operational staff e.g. pilots, vehicle drivers on the manoeuvring area and air traffic controllers leads to a loss of situational awareness and a ground navigation error. The majority of runway incursions occur during taxiing out and departure operations.

Air Navigation Service Providers are invited to review the materials put forward, and where necessary, amend their Standard Operating Practices with regard to ground operations.

Principle points to highlight for air traffic controllers include:

1. The most frequently occurring contributory factor is misunderstanding.
2. Failing to see or hear information clearly or correctly is a frequent cause of incursions when left unchallenged.
3. Who Saves the Day
Air Traffic Controllers typically catch the errors of pilots, drivers and their peers. Pilots also make a contribution to catching the errors that they have made themselves and of other colleagues such as other pilots and air traffic controllers.
4. Communication
In today's air traffic management system, compliance with ICAO requirements to use aviation English on the manoeuvring area is a vital safety net. A major contributory factor of runway incursions is the use of non standard ICAO phraseology.
5. Incomplete or incorrect read-backs feature frequently when conditional clearances are used, see separate section for examples .
6. Conditional clearances on the manoeuvring area.
There has been a general reduction in all RT Phraseology related incursions following ICAO provisions to limit the use of conditional clearances and the number of subjects being instructed. Lining up out of sequence, has also reduced at high complexity airports.
7. There is an increased risk of incursion or other ground navigation error such as a taxiway departure when there is a change to an air traffic control instruction near the runway.
8. Reference to other aircraft in an instruction is a cause of pilot confusion whether it is by airline name or aircraft type. Certain phrases such as "follow" should be used with care.
9. Misuse of air ground lighting e.g. stop bars, can lead to runway incursions and loss of situational awareness.
10. ICAO compliant signage helps to obtain situational awareness on the ground. Some Towers place photographs of hot spots near to the working position so that Air Traffic Control can relate to what a lost pilot or driver is seeing.
11. Transition into and out of Low Visibility Operations is a concern. Low cloud where the visibility under the cloud is good can be misleading, and aircraft exceed their clearance limits into the localiser sensitive area.
12. Go-around/missed approach events are a regular feature of runway incursions, see next page.
13. Shift handover may create information gaps, especially at locations where all handovers are made at the same time i.e. approach, tower, ground.
14. Landing Without a valid ATC Clearance. In the cases of landing without a valid ATC clearance, the subject aircraft had either not been transferred to the Tower frequency, had forgotten to check in on the Tower frequency when transferred, selected the wrong frequency or not received the instruction for some reason even though they were on the correct frequency (communication error).
15. Crew involved in take off without a clearance are quite often private pilots, on flight training details. There is a link between these types of occurrences and departure clearances, or amended clearances, being passed whilst aircraft are taxiing, backtracking or lining up (e.g. an aircraft expecting to follow a SID climb to altitude 6000 ft for traffic reasons is passed a tactical amendment to maintain 3000 ft. The crew having acknowledged this

as they line up then take off without a clearance). For great awareness of Sterile Cockpit guidance available to pilots, see [Appendix D](#), Flight Crew Best Practices, Sterile cockpit.

16. Work in progress changes the surface of the aerodrome temporarily or permanently. The infrastructure you leave behind you at the end of your shift or flight, may be different when you return. Controllers should expect to provide 'real-time' significant aerodrome information which may affect operations on or near the runway when NOTAMS and ATIS which are normally used to advise pilots of significant information regarding runway operations are not available.

Incorrect and Incomplete Read-backs

Approximately half of all reported runway incursions involving a conditional clearance, also reported an incomplete read-back. It is important to differentiate between an incomplete read-back and an incorrect read-back.

For example:

Air Traffic Control: "XXX123, AFTER THE Busy bee A320, LEFT TO RIGHT, TAXI TO..."

XXX123: "ROGER, AFTER THE Blue sky 737, TAXI TO..."

With an incomplete read-back, the controller has not received a signal that there is a misunderstanding.

Everything he/she has heard is technically correct. This confirms the belief that their plan is in place and all participants understand their instructions. However, some details are missing and it is related to these missing parts than an error can occur.

For example:

Air Traffic Control: "XXX123, AFTER THE Blue sky A320 FROM RIGHT TO LEFT, TAXI TO HOLDING POINT..."

XXX123: "AFTER THE A320, ROGER" OR "AFTER THE Busy bee, TAXI TO HOLDING POINT..."

When the aircraft then follows a different A320 or Busy bee aircraft to the one specified and moves out of sequence, the controller is taken by surprise.

In each situation, the controller believed that the clearance issued was unambiguous; the controller had a clear idea of his or her plan and believed that it had been delivered correctly. The information contained in the subsequent read-back, although incomplete, was correct.

Go-Arounds/Missed Approach - Runway Incursion Events

Go-around/missed approach events are a regular feature of runway incursions:

- The majority of Go-Arounds are ordered by the Runway Controller.
- Few Go-Arounds are decided by the Pilot.
- Note that not all Go –Around instructions are executed

Example 1:

Runway Controller initiated & Go-around carried out

XXX123 crossed a CAT 1 hold and went onto the runway having had line up/take off clearance cancelled by the Runway Controller prior to approaching the holding point. XXX456 having been given prior clearance to land by the Runway Controller was then instructed to carry out a missed approach.

Example 2:

Almost immediately after entering LVP's the RIMCAS alert sounded to warn of an infringement within the localiser sensitive area around the vicinity of a work site. The Runway Controller instructed the next aircraft on final approach, XXX123, to execute a missed approach. The runway was closed for approximately 15 minutes whilst the work site, which had not been evacuated during safeguarding, was cleared of all vehicles and personnel.

Example 3:

The Runway Controller thought that XXX123 had vacated the runway after landing and then cleared XXX456 to land. However, the rear of XXX123 was still obstructing half the width of the runway. There was no immediate reply from XXX456 but shortly afterwards the Pilot reported initiating a missed approach.

Example 4: Go-around not carried out

A Runway Controller noticed that the separation between XXX123 and the following aircraft XXX456 was reducing. He instructed XXX123 to expedite vacating the runway and then cleared XXX456 to land. XXX456 was instructed to reduce to minimum approach speed and was warned to expect a late landing clearance.

When XXX456 was on short final, the Runway Controller decided that he would not be able to issue a safe landing clearance and issued a go-around instruction. Although it was intended for XXX456, it was addressed to 'YYY456'. Despite this error, the Captain of XXX456 replied that he was going around.

However, the Co-Pilot who was the handling Pilot, decided that the go around instruction was not directed at his aircraft and because he could see that XXX123 was about to vacate the runway, decided to land.

When XXX456 landed, XXX123 had vacated the runway.

Take-Off without Clearance

Best Practice procedures now encourage controllers to pass air traffic control clearances before the pilot begins to taxi, when possible. However, there is still the potential for confusion when a late-notice tactical change to the clearance has to be issued when the aircraft is lining up or has lined up.

For aircraft that are still taxiing, 'Best Practice' is for air traffic control to reiterate the requirement to hold at the clearance limit, after having passed the amended clearance.

Procedures, Practices and Documents

In the majority of runway incursions, although the respondents were trained to carry out procedures, they were not experienced in their use.

Issue of en-route clearance

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 taxiing due to the possibility of distraction.

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

Read-Back requirements

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

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

The Air Traffic Controller is responsible for checking the completeness and accuracy of the read-back.

The following items shall always be read-back:

- a. ATC route clearances;
- b. Clearances and instructions to enter, land on, take off on, hold short of, cross and backtrack on any runway; and
- c. Runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition level;
- d. Other clearances or instructions, including conditional clearances, shall be read-back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

An aircraft must include its call sign in the read-back, and a failure to do this shall be challenged by the controller.

It is NOT possible for a person to understand two things at once. In attempting to do so the brain processes a single audible input at a time and switches between inputs many times per minute, filling in the 'gaps' from each audible input with what is believed to be the missing data. When simultaneously listening to RTF, telephone and direct face to face exchanges, the perception that a complete or correct read-back has been received may not be reliable. **For this reason, Controllers should not allow themselves to be interrupted when listening to read-backs.**

Taxi instructions

Taxi instructions issued by a controller will always contain a clearance limit / reporting point, 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 position 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 positions shall be clearly stated by ATC.

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

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.

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

Pilots require a general overview of the expected taxi routing. For more complicated taxi instructions, it may be appropriate to provide the overview and then divide the message into segments, placing the clearances and instructions in sequential order, to avoid the possibility of pilot misunderstanding, while still providing the complete picture.

Further guidance on this subject can also be found in [Appendix A - 'Communications Guidance'](#).

It should be noted that the ICAO phraseology "taxi to holding point and hold ..." may be misunderstood by some pilots due to the use of non ICAO phraseology within the North America, where "taxi into position and hold..." is used by ATC when issuing a line up clearance. There have been a number of runway safety occurrences due to this misunderstanding, and the read-backs should be very carefully monitored.

Multiple line-ups on the same runway

Line-up instructions may be issued to more than one aircraft at different points on the same runway, using the ICAO criteria contained in ICAO Doc7030. In addition to the standard phraseology in Chapter 12 of PANS-ATM the following ATC phraseology shall be used:

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

A/C **LINING UP AND WAIT RUNWAY 22, INTERSECTION ALPHA ONE, NUMBER 2, KLM123**

Stop Bars

All access to a runway (even if inactive) should take place only after giving a positive clearance and receiving a correct read-back, and after the stop bar (where provided) has been switched off; providing a clearance in a timely manner, as the aircraft is approaching the relevant runway, will help to prevent runway incursions.

Recommendation 1.5.6 states that an Aircraft shall not be instructed to cross illuminated stop bars when entering or crossing a runway unless contingency measures are in force. The objective of this recommendation is to maintain the integrity of the stop bars, which are intended to protect the runway at any airport the pilot may fly to.

Contingency

Contingency plans and suitable instructions should be implemented in the case of a stop bar failure and could include, for example:

When an alternative, suitable taxiway is equipped with a functioning stop bar, and is available, close the taxiway where the failure happened, use the taxiway with the functioning stop bar.

Exceptionally aircraft may be instructed to enter or cross a runway with an inoperable stop bar if taxiing behind a follow-me car, if available, with RTF confirmation.

The communication used is to leave the manoeuvring area driver and / or pilot in no doubt that the crossing instruction applies only to the faulty stop bar. Conditional clearances should not be used.

Take-off procedures

At aerodromes with separate GROUND and TOWER functions, aircraft shall be transferred to TOWER at or approaching the holding position.

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

Hand-over

It is apparent that a number of runway safety occurrences take place soon after a controller hand-over takes place (either of the operational watch or a single operational position). There is evidence that a significant percentage of incidents involving ATC operational errors take place around this time. To ensure that the complete traffic situation is included in a hand-over, the use of a hand-over check-list should be considered.

Briefing Sessions

Recommendation 1.5.13 in this document, states that Runway Safety Issues should be included in team briefing or debriefing sessions that may occasionally be held at unit level, as part of a lesson learning process. From best practice, this should include not only the scenarios that have led to actual runway occurrences, and also other situations that almost resulted in a runway incursion.

Training

Air Traffic Controller training, ab initio and refresher, should include information about how to prevent runway incursions.

Adequate practical training should follow theoretical training in runway safety procedures.



APPENDIX F

OVERSIGHT ACTIVITIES FOR REGULATORS

APPENDIX F

OVERSIGHT ACTIVITIES FOR REGULATORS

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

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

Where applicable the Regulator in co-operation with the National Supervisory Authority and/or Military Authority should conduct safety regulatory audits and inspections on aerodromes operations.

The regulatory oversight of aerodrome operators by their Regulator may include, but is not limited to:

- Ensuring that an aerodrome has an effective runway incursion prevention programme that meets ICAO or national requirements;
- Joint/ coordinated audits and inspections to examine the interfaces between the aerodrome agencies involved in runway incursion prevention; e.g. coordination between ATC, aircraft operators, aerodrome operators and in particular procedures to manage contractors during aerodrome work in progress;
- Reviewing the airside driver training programme to ensure the adequacy of driver training for the staff of all organisations operating airside;
- Reviewing Low Visibility Procedures from a runway incursion perspective;
- Reviewing incident prevention program, including occurrence reporting relating to runway incursions;
- Reviewing aerodrome design changes, including vehicular traffic routes that cross taxiways;

- Reviewing runway safeguarding, including entry and exit points, runway, taxiway holding points, stop bars, illuminated signs and lights;
- Reviewing procedures for third party contractors during any work in progress on the manoeuvring area.

In addition to the regulatory oversight described above, it may benefit the Regulator to keep a high level, national focus on the risk of runway incursions. This can be achieved by establishing a national runway incursion prevention steering group. Membership of the group could include representatives from industry such as aerodromes, airline flight operations, air traffic services, industry safety groups, Local Runway Safety Team members and appropriate representatives from the regulatory authority.

Terms of reference for such a steering group might be to:

- Address specific, hazards identified nationally, coordinating this through sub-groups or external agencies as required;
- Promote good practice, share information and raise awareness through publicity and educate industry;
- Actively enhance work continuing in industry;
- Act as a coordination point for industry;
- Identify and investigate which technologies are available that may reduce runway incursion risks;
- Review current aerodrome, ATC and aircraft operational policies and if necessary make recommendations on future policy to reduce the risk of incursions;
- Make recommendations for guidance and advisory material for industry on aerodrome, aircraft and ATC operational issues to reduce the risk of incursions;
- Oversee and promote the reporting of runway incursion incidents;
- Ensure the thorough analysis of data to identify and examine specific areas of concern.

Regulators should actively support and promote the European Action Plan for the Prevention of Runway Incursions as part of the State Safety Program activities. Although the action plan is guidance material and contains recommendations only, regulators should ensure that it is given a continuous priority in its oversight activities wherever possible by:

- Promoting awareness of the European Action Plan for the Prevention of Runway Incursions guidance material;
- Conducting a gap analysis to ensure that all recommendations are implemented where possible;
- Ensuring that runway safety and the prevention of runway incursions are addressed in regular audit inspections;
- Ensuring that the recommendations arising from audits are implemented wherever possible.



APPENDIX G

SAFETY MANAGEMENT SYSTEMS

General

Safety management systems

Implementation of a SMS at an aerodrome

APPENDIX G

SAFETY MANAGEMENT SYSTEMS

General

A Safety Management System (SMS) is a management tool for the management of safety by a service provider¹, aimed to ensure that safety is managed systematically and consistently. In summary, safety management:

- Includes the entire operation;
- Focuses on processes, making a clear differentiation between processes and outcomes;
- Is data driven;
- Involves constant monitoring;
- Is strictly documented;
- Aims at gradual improvement as opposed to dramatic change; and
- Is based on strategic planning as opposed to piecemeal initiatives.

The International SMS framework

ICAO publishes SARPs on safety management across the Annexes, with those relating to air navigation service providers and aerodromes detailed in Annexes 11 and 14 respectively.

For the relevant discipline these SARPs require States to:

- a. Establish a safety programme in order to achieve an acceptable level of safety;
- b. Establish the acceptable level(s) of safety to be achieved.

Additionally, the SARPs require that States shall require aerodrome operators and air navigation service providers each to implement a safety management system acceptable to the State that, as a minimum:

- a. Identifies safety hazards;
- b. Ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

- c. Provides for continuous monitoring and regular assessment of the safety level achieved; and
- d. Aims to make continuous improvement to the overall level of safety.
- e. Clearly defines lines of safety accountability throughout the organisation, including a direct accountability for safety on the part of senior management.

To support the SARPs ICAO has published ICAO Document 9859 – Safety Management Manual with the aim to harmonise safety management systems implemented in the aviation sector. ICAO recommends a framework for the implementation and maintenance of a SMS by an organisation. The implementation of the framework should be commensurate with the size of the organisation and the complexity of the services provided.

Within Europe requirements for safety management systems are contained in common Requirements and ESARRs (EUROCONTROL Safety Regulatory Requirements), notably:

- Commission Regulation (EC) No. 2096/2005 laying down common requirements for the provision of air navigation services;
- Commission Regulation (EC) No. 1315/2007 on safety oversight in air traffic management and amending Regulation (EC) No. 2096/2005;
- ESARR3 Safety Management Systems in ATM and its related guidance material;
- ESARR4 Risk Assessment and Mitigation in ATM and its related guidance material.

¹ - The term "service provider" refers to any organisation providing aviation services. The term encompasses air traffic service providers and certified aerodromes as well as approved training organisations that are exposed to safety risks during the provision of their services, aircraft operators, approved maintenance organisations, organisations responsible for type design and/or manufacture of aircraft, as applicable.

Safety management systems

The ICAO framework includes the following four components and twelve elements, representing the minimum requirements for SMS implementation:

1. Safety policy and objectives
 - 1.1 Management commitment and responsibility;
 - 1.2 Safety accountabilities;
 - 1.3 Appointment of key safety personnel;
 - 1.4 Coordination of emergency response planning;
 - 1.5 SMS documentation.
2. Safety risk management
 - 2.1 Hazard identification;
 - 2.2 Safety risk assessment and mitigation.
3. Safety assurance
 - 3.1 Safety performance monitoring and measurement;
 - 3.2 The management of change;
 - 3.3 Continuous improvement of the SMS.
4. Safety promotion
 - 4.1 Training and education;
 - 4.2 Safety communication.

Note:

Refer to Appendix 1 to Chapter 8 of ICAO DOC 9859 for detailed information on the four components and twelve elements.

Implementation of a SMS at an aerodrome

Single Organisation

Where one operator is responsible for the aerodrome and its ATM services, the organisation will have to implement a Safety Management System compliant with ICAO Annex 11 and Common Requirements for its ANS services and compliant with ICAO Annex 14 for its aerodrome operations. A single SMS covering both aerodrome and ANS would be an advisable approach.

Two Organisations

When ATM services and aerodrome operations are provided by two different organisations, two separate SMS may be found, but not exclusively. In such circumstances effective interface arrangements must be in place unless a common SMS is established.

It should be noted that defining and allocating safety responsibilities is key in any SMS and may be complicated by working across two independent organisations. An appropriate definition and allocation of responsibilities requires a clearly established organisational framework. The same considerations apply to the definition, adoption and review of safety policies and safety objectives.

Reference material

ICAO Annex 1;
ICAO Annex 6, Parts I and III;
ICAO Annex 8;
ICAO Annex 11;
ICAO Annex 13;
ICAO Annex 14; and
ICAO DOC 9859 Safety Management Manual.

Commission Regulation (EC) No. 2096/2005 laying down common requirements for the provision of air navigation services.

Commission Regulation (EC) No. 1315/2007 on safety oversight in air traffic management and amending Regulation (EC) No. 2096/2005.

ESARR3 Safety Management Systems in ATM and its related guidance material.

ESARR4 Risk Assessment and Mitigation in ATM and its related guidance material.



APPENDIX H

AERONAUTICAL INFORMATION MANAGEMENT GUIDANCE

EAPPRI Recommendations 1.8.1 -> 1.8.6

APPENDIX H

AERONAUTICAL INFORMATION MANAGEMENT GUIDANCE

Accurate aerodrome charts showing relevant information for the pilot, manoeuvring area driver and aerodrome controller is fully acknowledged as an important contributor to the prevention of runway incursions. Errors contained in aerodrome charts have led to a loss of situational awareness and ground navigation errors by pilots and have been documented in runway accident reports. The following guidance material is intended to explain further the recommendations it refers to, contained in the European Action Plan for the Prevention of Runway Incursions, and complement the relevant ICAO provisions.

Time critical aerodrome information which may affect operations on or near the runway shall be provided to pilots in 'real-time' using radiotelephony communication, through the Flight Information Services in accordance to ICAO Annex 11(Ch 2 and 4), see the recommendations in the Communication section of this action plan. All other relevant services who obtain knowledge of conditions which may affect operations on or near the runway shall inform the Flight Information Services without delay to enable operational staff working on the manoeuvring area to react appropriately to their actual working environment. A number of recommendations are made in support of this objective.

EAPPRI Recommendation 1.8.1 concerns the provision of adequate, timely, and quality aeronautical information

Quality assurance (QA) procedures shall be implemented by the ANSP/AISP. Adequate QA should also be implemented by any other organisation that originates numerical data supporting aeronautical data elements.

EUROCONTROL has developed guidelines supporting the implementation of Quality Management Systems in accordance with ISO 9001..

More info:

http://www.eurocontrol.int/aim/public/standard_page/qm_qa.html

The aerodrome services responsible for the provision of raw data shall take into account data quality requirements, in particular on accuracy and integrity as stated in the relevant ICAO SARPS (Annex 15 – Ch 3, Annex 4, Annex 11- Ch 2 and Annex 14, VOL I – Ch 2).

Reference documents

ICAO Annex 4, 11, 14, 15 and Doc 8126.

Managing change

For promulgation of changes, AIS needs the adequate time for preparation, production and issue of relevant material for information. Close coordination is therefore required between those services concerned to ensure timely provision of information.

Of particular importance are changes that affect charts (e.g. AD Chart, AD Ground Movement Chart) and qualify to be notified by AIRAC.

The predetermined AIRAC effective dates shall be observed by the responsible AD services when submitting aeronautical information/data to AIS.

For notification of temporary changes by appropriate means of IAIP, considering the period of validity, AIS should follow the operating procedures as described by ICAO Doc 8126, Ch 5 and EUROCONTROL OPADD, Ch 2 (Operating Procedures for AIS Dynamic Data).

NOTAMs and AIP Supplements

NOTAMs should not remain in force for more than three months. When a temporary change issued by NOTAM unexpectedly exceeds the three month period, a new or replacement NOTAM may be issued, but only in those cases where a condition is expected to last for a further period of a maximum of one to two months. If it is expected that the condition will last for a longer period of time, an AIP Supplement must be issued.

Reference documents

ICAO Annex 4, 14 and 15,
ICAO Doc 8126
EUROCONTROL OPADD

Monitoring

Data quality content of the AIP (Aeronautical Information Publication) published by ECAC States is monitored on a constant basis through the EUROCONTROL monitoring tools (e.g. AMMON for critical and essential data). AIS should monitor the departure/arrival time of the AIS products and the time required for postal delivery, in order to adhere to the AIRAC system (e.g. using EUROCONTROL tool Tracker).

More info:

http://www.eurocontrol.int/aim/public/standard_page/qm_ammon.html

http://www.eurocontrol.int/aim/public/standard_page/ptracker.html

Data consistency & completeness

European AIS Database (EAD) enables aeronautical information providers to enter and maintain their data in the repository and enables data users to retrieve and download AIS data and AIP charts in a digital format. The quality of data is enhanced by using international standards and data checking procedures, including validation and verification. EAD performs regular data quality/completeness reviews and reports results to data providers.

More info:

www.eurocontrol.int/ead

The Implementing Rule on Aeronautical Data and Information Quality (ADQ IR) developed by EUROCONTROL and adopted by the European Commission (January 2010) is now referred to as the Commission Regulation (EU) No 73/2010. The Regulation is laying down the requirements on the quality of aeronautical data and information for the single European sky, in terms of accuracy, resolution, integrity and timeliness. The actual scope goes beyond the ANSPs/AISPs to include non-ANSP entities. In terms of scope, the aeronautical data/information process chain extends from original data sources (e.g. surveyors, procedure designers, AD, etc.), through AIS (publication) to the end use, either by human users or aeronautical applications. Concerning AD Operators, it applies for those aerodromes for which IFR or Special-VFR procedures have been published in national AIPs, as such procedures demand higher data quality.

More info:

www.eurocontrol.int/adq

www.eurocontrol.int/ses

ec.europa.eu/transport/air/single_european_sky/

This is linked to the ESSIP objective INF05-Improve end-to-end integrity of aeronautical data, with a planned completion date by end 2009. It will be superseded by the new SES-related regulatory implementation objective (ITY-ADQ Ensure quality of aeronautical data and aeronautical information - under development) which is derived from the Commission Regulation (EU) 73/2010.

More info:

www.eurocontrol.int/essip

EAPPRI Recommendation 1.8.2 concerns data integrators / post-AIS data providers

Processes between providers of aeronautical data bases and charts (data integrators) and AISP should be in place, with the objective to ensure that aeronautical data is processed according to the relevant standards.

Reference documents

EUROCAE ED76/RTCA Do 200A, Standards for processing Aeronautical data

EUROCAE ED 77/RTCA Do 201A, Standards for Aeronautical Information

EAPPRI Recommendation 1.8.3 concerns the user feedback process

AISPs should establish procedures, as part of the Quality Management System (QMS) allowing for the users to provide feedback. A mechanism should also be in place to ensure that the users' queries are addressed accordingly.

Post-Flight Information

Additional current information/data relating to the aerodrome of departure and any inadequacies observed shall be reported by Aircraft Operators (Annex 6, Part 1 - Ch 4 and Part II, Section II - Ch 2) and collected to enable AIS processing of Post-Flight information without delay (Annex 15 and Doc 8126 – Ch 8 and Annex 14 – Ch 9).

Arrangements shall be made at the aerodromes to receive this information. Pilots should adhere to the established procedures and reporting mechanism.

Reference documents

ICAO Annex 6, 14 and 15

ICAO Doc 8126

Communication tools

EUROCONTROL has means in place to facilitate communication:

-“AIS AGORA” is an aeronautical information online forum recognised globally.

www.eurocontrol.int/aisagora

-“European @is online” is a collection of links about the AIS and aeronautical information resources available on the Internet.

http://www.eurocontrol.int/aim/public/standard_page/web_eur.html

Recommendation 1.8.4 concerns user friendliness of the AIP Charts

Aerodrome charts are provided in a wide variety of formats. Some formats are user friendly and some may compromise pilots as they fly from one State to another, requiring extra effort to ensure correct understanding of the important information they contain. In particular, Hot Spots at aerodromes need to be clearly communicated.

Designation and publication of Hot Spot(s) in States AIP

The respective aerodrome operator shall designate, whenever necessary, a location or several locations on the movement area of the aerodrome as Hot Spot(s). A hot spot(s) shall be published in the AIP on the relevant charts for those aerodromes with a history where there is a potential increased risk of collision or runway incursion and where heightened attention by pilots/drivers is necessary. The criteria used to establish a hot spot on a chart and the symbols to be used are contained in Annex 4, with more guidance provided in Annex 14 and Doc 9870.

Note:

ICAO Definition of a Hot Spot: A location on an aerodrome movement area with a history or potential risk of collision or RWY incursion, where heightened attention by pilots/drivers is necessary (ICAO Annex 4).

Publication of Runway holding positions in States AIP

ICAO defines the required publication resolution for runway holding positions (Annex 15, App. 7 and Annex 4, App. 6), for insertion on relevant aeronautical charts. This data element is stated as critical in the ICAO Aeronautical Data Quality Requirements tables.

ICAO Annex 15 (App. 1) does not contain a requirement to publish the latitude /longitude of runway holding positions in the State AIP, Part3 AD, AD 2.

Nevertheless, timely and accurate information of established runway holding positions is vital for runway incursion prevention, and their publication in the AIP and on (electronic) charts. Therefore geographical coordinates of Runway holding positions should be published in States AIP.

Similar ambiguity in ICAO SARPS, where quality requirements have been defined but no publication required, is observed in relation to some essential aerodrome data elements such as geographical coordinates of taxiway centre line points, taxiway intersection marking line, and taxiway/runway shoulder width.

Reference documents

ICAO Annex 4, 14 and 15

ICAO Doc 9870

The ICAO AIS-AIM Study Group has acknowledged a need to update the ICAO Doc 8697 Aeronautical Chart Manual to enhance ergonomics of maps and charts, to reflect user needs and technical developments. EUROCONTROL actively supports this activity.

More info:

<http://www.icao.int/anb/AIM/>

EAPPRI Recommendation 1.8.5 concerns Digital Aeronautical Information Management

The availability of digital aeronautical information depends upon the move towards a networked data centric environment based on common data exchange models as developed in the context of the transition from AIS to AIM. The Aeronautical Information Exchange Model (AIXM), developed by EUROCONTROL and FAA, supports the ICAO and user requirements for aeronautical data including obstacles, terminal procedures and airport mapping databases. It contains an exhaustive temporality model that enables the provision of digital NOTAM. In turn, this enables the update of digital charts on the ground and in the air with the latest information about the aerodrome surfaces.

More info:

http://www.eurocontrol.int/aim/public/standard_page/aixm.html

www.aixm.aero

Airport Mapping Databases (AMDB) is one of the fundamental developments to runway incursion prevention. Requirements on States to provide core airport mapping data are envisaged to be included in ICAO SARPS. This should enable AISPs, Airlines and Aerodromes to move towards a business driven collaborative information sharing environment.

In order to enable future collaborative runway incursion prevention applications, it is recommended to create common on-line aerodrome mapping services based on the EUROCAE ED99A Aerodrome mapping standard. The implementation should follow a services oriented approach as envisaged by Digital AIM (D-AIM). This will enable on-line access of shared Hot Spot information and electronic display in on-board Electronic Flight Bags.

More info:

www.d-aim.aero

www.eurocontrol.int/aim

Reference documents

EUROCAE ED-99/RTCA DO-272 document "User requirements for airport mapping"

It specifies the user requirements for aerodrome mapping database content and quality. The document forms the basis for an RTCA/EUROCAE specification effort related to the creation of a common database interchange standard for aerodrome mapping.

More info:

<http://www.eurocae.org/>

ICAO AIS-AIM Study Group is identifying SARPS and guidance material related to an appropriate presentation of digital Aeronautical Information to the end user, including eAIP Specification, electronic charts and use of AMDB. EUROCONTROL actively supports this activity.

More info:

<http://www.icao.int/anb/AIM/>

EAPPRI Recommendation 1.8.6 concerns working arrangements between data originators and AISP to improve quality of the originated aeronautical data and its management.

Formal arrangements allow a solid baseline against a data provider and a data receiver may reasonably expect the exchange of aeronautical data/information to take place.

Formal arrangements should be established between AISP and aerodrome authorities responsible for aerodrome services to report to the responsible AIS Unit with a minimum of delay. This would include information on AD conditions the serviceability and operational status of associated facilities, visual and non-visual navigation aids and the state of the manoeuvring area (Annex 14, Ch 2).

To ensure promptness and accuracy in the provision of aeronautical information, liaison should be arranged between AISP and data providers being responsible for the origination of current information/data.

Reference documents

ICAO Doc 8126, Annex 14 and Annex 15

Formal arrangements between data providers and ANSP/ AISP (e.g. in a form of a contract or Service Level Agreements - SLA) should be introduced to support and enable the relevant data exchange.

The Commission Regulation (EU) No. 73/2010 (ADQ) addresses interoperability between the data supply chain actors from original data sources through AIS to the next intended user. Post-publication functions will be addressed by ADQ-II in the near future.

Reference documents

ICAO Annex 14

Commission Regulation (EU) No 73/2010

More info:

www.eurocontrol.int/adq

EUROCONTROL has developed guidance about how to facilitate the establishment of SLAs between aeronautical data originators/providers and AISP, with the purpose to set agreed required quality levels of the data, the timeframe of delivery and their format. Guidance is provided by the following CHAIN (ref. CHAIN - Controlled and Harmonised Aeronautical Information Network). Deliverables:

- Enhanced guidance material;
- Implementation support and training.

More info:

http://www.eurocontrol.int/aim/public/standard_page/chain_sla.html
<http://www.eurocontrol.int/chain>

Reference Documents

ICAO Annex 4 Aeronautical Charts

ICAO Annex 6 Operation of Aircraft

ICAO Annex 11 Air Traffic Services

ICAO Annex 14 Aerodromes

ICAO Annex 15 Aeronautical Information Services

ICAO Doc 8126 Aeronautical Information Services Manual

ICAO Doc 8697 Aeronautical Chart Manual

ICAO Doc 9870 Manual for Preventing Runway Incursions

EUROCONTROL OPADD



APPENDIX I

GUIDANCE FOR JOINT-USE CIVIL/MILITARY AERODROMES

Background

One approach to increasing airport capacity, as demonstrated by a number of new low-cost aircraft operators, is to operate from joint-use aerodromes. In addition joint-use aerodromes may be used for the training/flight checking of airline pilots or as bases for technical and test flights.

There are already numerous joint-use aerodromes, hosting different types of military aviation within ECAC. A number of air forces share aerodrome facilities with civil entities accommodating traffic which is both military and civil, domestic and international.

To support overseas operations, the military, very often as a part of multinational operations, use civil aerodrome facilities either as short-term refuelling stop aerodromes or as temporary bases.

The regulatory position varies from State to State. There is no agreed pan-European definition of a joint-use aerodrome; actual use differs among the States.

However, amended the European Union Regulation (EC) 216/2008 in the field of aerodromes, air traffic management and air navigation service refers to the military (in particular, equipment, and organisations that are controlled by the military¹). Member States shall, as far as practicable, ensure that any military facilities open to public use, (aerodrome or part therefore) or services provided by military personnel to the public (ATM/ANS), offer a level of safety that is at least as effective as that required by the essential requirements of the European Union.

In addition, the EUROCONTROL Guidelines Supporting the Civil Use of Military Aerodromes (CUMA) highlights the key institutional, legal, financial, technical and operational issues. CUMA proposes a set of recommendations to support the national decision making process.

For the purposes of this document, a joint-use aerodrome is either a civil aerodrome used regularly by military traffic or a military aerodrome used regularly by civil traffic. An aerodrome (ICAO term) and an airfield (military term) should be considered as synonyms.

Military aviation and runway incursions

The military aviation community is not immune from runway incursions. EUROCONTROL collects runway incursion reports on a yearly basis. The operational data collected since 2006 confirms the involvement of military aircraft in runway incursions within the ECAC area. The reports verify the military aircraft's involvement regardless of types of operations and types of flight rules.

Military personnel can therefore contribute to the prevention of runway incursions. Like all staff operating on the manoeuvring area, military personnel, need to be aware of the potential hazards.

ICAO Annex 13 defines responsibility for the investigation of runway incursions involving civilian assets/persons. The reporting of runway incursions in civil aviation is mandated for EU members⁵.

The prevention / investigation / reporting of runway incursions involving only military is a state responsibility.

In accordance with ESARR 2,⁶ reporting is mandated for the military in all occurrences where:

- Civil Air Traffic Services is providing service to military aircraft, and
- Military Air Traffic Services and/or Air Defence are providing service to civil aircraft.

1 - See Article 1 of (EC) 216/2008.

2 - **FAA Runway Safety Report, FY 2000 – FY 2003.**

3 - Australian Transport Safety Bureau, Runway Incursions: 1997 to 2003 (June 2004).

4 - Directorate of Flight Safety, Canada, Department of National Defence Trend and Analysis Report: Runway Incursions 2000-2004.

5 - Directive 2003/42/EC of the European Parliament and of the Council of 13 June 2003 on occurrence reporting in civilian aviation [Official Journal L 167/23 of 4.7.03].

6 - EUROCONTROL Safety ATM Regulatory Requirements.

EAPPRI and military

In respect of the application of EAPPRI recommendations, the military should be involved as:

- Regulator: military aviation authority (MAA) or equivalent national regulatory body;
- Aerodrome operator: military aerodrome and military unit co-located with a civilian aerodrome;
- ANSP: where the military provides aerodrome air traffic services to civil airspace users;
- Aircraft operator: military aircraft operator based/operating at joint use aerodromes, i.e. where the aerodrome operator is civilian and the Air Traffic Services provider is civilian.

Note that for some States there is one regulator responsible for all ATM matters, civil and military, and in others there may be two regulators with discrete civil or military responsibilities.

With the support of civil and military stakeholders, EUROCONTROL has identified some specific factors causing and contributing to runway incursions at joint-use aerodromes, by collecting experiences on a voluntary basis. The current EAPPRI recommendations have been reviewed in the light of the needs of joint-use aerodromes and recommendations for the Prevention of Runway Incursions at Joint-Use Aerodromes developed.

1. Aerodrome Operator

There are three main areas at aerodromes where civil and military operations interact: the apron, the manoeuvring area and approach/terminal airspace.

There are joint-use aerodromes where one aerodrome operator (civil or military) is wholly responsible for manoeuvring area operations. There are also joint-use aerodromes where more than one aerodrome operator is responsible for a specific segment of the aerodrome movement area⁷.

To clarify roles and responsibilities, one of the aerodrome operators should take the lead in the coordination of the application of EAPPRI recommendations.

When implementing CUMA, the civil aerodrome operator should verify and assess differences between the existing services and infrastructure and the related ICAO provisions; such differences should be notified by means of Aeronautical Information.⁸

The civil and/or military aerodrome regulator may perform the task of re-certifying an aerodrome, and may clarify roles and responsibilities.

2. One aerodrome two authorities

One characteristic of joint-use aerodromes is the responsibility of two regulatory and supervisory authorities, one civil and one military. Although different States have different relationships between their military and civil regulators, military authorities are in most cases independent of their respective civil aviation authorities (CAAs).

In certain cases, as a consequence, two auditing / oversight authorities perform audits at the same aerodrome independently. There is an opportunity to perform a coordinated inspection/audit and propose common conclusions and recommendations.

3. Mixed Type of flight

Joint-use aerodromes facilitate both types of flights, civil and military. The majority of applicable ICAO provisions are identical, although differences may be found regarding procedures for formation flying or other military functions. The application of different types of procedure could create confusion during aerodrome operations.

7 - That part of an aerodrome intended for the surface movement of aircraft, including the manoeuvring area and aprons.

8 - EUROCONTROL Guidelines Supporting the Civil Use of Military Aerodromes.

For instance, during surface movement, a formation of aircraft is considered as a single aircraft in terms of right-of-way. When an individual aircraft and a formation are on a converging course, a formation of aircraft should be treated as one entity.

At present, the application of mixed aerodrome operations requires a safety assessment by each State at each joint-use aerodrome.

Timely and effective coordination between the various airport entities responsible for ground operations is important. One of the practices at joint-use aerodromes is regular coordination between civil and military entities facilitating mixed types of operations. The means of coordination can range from a joint civil-military coordination body to a liaison officer assisting with daily coordination. In certain cases, the representative of a flying unit is present in the tower during military operations.

4. Mixed type of aircraft

Civilian pilots may not be able positively to identify military aircraft types. ATC instructions involving specific military aircraft types, e.g. "Follow F 1", should be avoided.

5. Radio equipment and procedures

Even though the majority of military aircraft are VHF/UHF radio equipped, military aircraft very often operate using UHF. Civilian aircraft use VHF only.

Simultaneous aerodrome operations using different frequencies are a known practice at joint-use aerodromes, and may lead to communication breakdowns and reduced situation awareness.

Special procedures are applied, e.g. TWR/GND transmission on both VHF and UHF frequencies, or cross-coupled VHF and UHF frequencies.

Military pilots and controllers may use non-standard ICAO phraseology. Very often, a domestic language is in use at joint-use aerodromes. There are also instances in which approved R/T phraseology means different things to civil and military pilots.

Both practices could cause a breakdown in communication and reduce situation awareness.

6. Aerodrome markings

A number of markings around military aerodromes may be different from the ICAO standards. Some of them are outside the movement area for civil aircraft; however, those which are visible to civil pilots/drivers could lead to pilot or vehicle driver navigation error.

7. Use of the Runway lights

The technical characteristics and operational procedures for air-ground lighting at joint-use aerodromes may deviate from ICAO Annex 14.

The application of different light-operating procedures may reduce situation awareness on or around the runway.

8. Ad hoc allocation of military unit at civil aerodrome

Military pilots and ground personnel, coming from all around the world, may not be familiar with ICAO flight rules, phraseology, aerodrome signs, lights and markings. They will also be unfamiliar with local aerodrome procedures.

Moreover, because of the regular rotation of military personnel, local familiarisation training is required.

Conclusion

- Military aviation is not immune from runway incursions. Military personnel can therefore contribute to the prevention of runway incursions. One way of achieving appropriate awareness is through participation in a local runway safety team.
- Even though the majority of ICAO recommendations are directly applicable, there are some particular points with regard to joint-use aerodromes covered by EAPPRI only.
- The civil and military authorities responsible for flight safety at the aerodrome should identify the potential risk regarding the unauthorised use of the runway and other portions of the manoeuvring area and implement measures to prevent events resulting in potential or actual runway incursions.
- States may consider implementing recommendations and guidance material identified in EAPPRI for their application at joint-use aerodromes.

Reference

- Australian Transport Safety Bureau, Runway Incursions: 1997 to 2003 (June 2004)
- Directive 2003/42/EC of the European Parliament and of the Council of 13 June 2003 on occurrence reporting in civilian aviation [Official Journal L 167/23 of 4.7.03]
- Directorate of Flight Safety, Canada, Department of National Defence Trend and Analysis Report: Runway Incursions 2000-2004
- European Action Plan for the Prevention of Runway Incursions; Edition 1.1
- EUROCONTROL Guidelines Supporting the Civil Use of Military Aerodromes; Edition 1.0
- EUROCONTROL Safety ATM Regulatory Requirements
- FAA Runway Safety Report, FY 2000 – FY 2003
- ICAO ANNEX 13
- ICAO Doc. 4444, Part IV
- Regulation (EC) 216/2008



APPENDIX J

USE OF AERONAUTICAL GROUND LIGHTING THAT PROTECTS THE RUNWAY

Introduction

Light Colours and Their Meanings at Runway Entrances

Future Development of Lights Protecting the Runway

Conclusion

Introduction

1. Runway incursions have been a hazard in the aviation industry for some time. Recent technological advances have allowed air navigation service providers (ANSP's) and airport operators to invest in the development of warning systems with the aim of preventing incursions and/or mitigating the effects of an incursion. These systems range from traditional runway guard bars ("red stop bars") operated by air traffic services (ATS) personnel, to more advanced autonomous systems that are deployed or under evaluation at various airports.
2. The use and colours of lights are widely accepted across the aviation world. Clear requirements exist for the exterior lighting of airframes to assist pilots in situational awareness and collision avoidance. There are protocols for the lighting of vehicles on aerodromes, obstacle and obstruction lighting and for the use of warning lights on the flight deck.
3. Although ICAO Annex 14 provides for the use of certain types of lighting to protect the runway, no specific priority or meaning is attached to these lights. A proposed definition and priority is the purpose of this appendix.

Light Colours and Their Meanings at Runway Entrances (see table below)

1. **RED** lights ahead of an aircraft or vehicle mean: it is unsafe to proceed beyond the RED lights. This is the case regardless of whether the lights are fixed, alternating or flashing and is independent of an ATC clearance. RED means stop.
2. **AMBER** lights are used to convey a similar but less distinct message. They indicate that a potential hazard exists beyond the lights, but that in conjunction with an appropriate ATC clearance it will be safe to proceed.
3. **GREEN** lights are often used to indicate the route to be followed by an aircraft or vehicle, particularly at night or in periods of reduced visibility. In all cases green lights are a routing aid and must only be followed in conjunction with an ATC clearance.

Light Colour (in order of priority)	ATC operational use	Meaning for the pilot or manoeuvring area driver	Example
RED	May be manually or automatically switched and/or deselected in conjunction with ATC clearance	Stop Pilots and drivers should contact ATC and await or confirm clearance; never cross red lights.	Runway stop bars
AMBER	None	Caution Runway ahead, do you have an ATC clearance to proceed?	Runway guard lights
GREEN	May be manually or automatically switched and/or deselected in conjunction with ATC clearance	Proceed Only in conjunction with an appropriate ATC clearance	Taxi centreline guidance

Future Development of Lights Protecting the Runway

1. Lights on runways and at runway holding points have been developed to deliver warnings and status indications to pilots and manoeuvring area vehicle drivers.
2. Stakeholders have identified a requirement to define the following more closely:
 - The nomenclature used in describing such systems;
 - The type of alerts provided;
 - The expected flight crew, ATC and vehicle driver actions in response to an alert.
3. Lights on or near a runway that prevent or mitigate the effect of a runway incursion should be operated according to the meaning and priority of lights described here.

Conclusion

1. Air Traffic Control, together with Aerodrome Operators, should operate the lights on or near a runway so that a pilot or manoeuvring area vehicle driver is never instructed to enter, cross, or use a runway counter the meaning of the lights described here.
2. Pilots and manoeuvring area vehicle drivers shall never cross red lights nor enter, cross, or use a runway without a valid ATC clearance to do so.
3. The present lack of clarity or internationally recognized standards leaves flight crews, manoeuvring area drivers and air traffic controllers with a lack of procedures and associated training regarding the use of lights that protect the runway. Defining the meaning and priority of lights as described in this [Appendix I](#) is the first step in identifying categories and types of system.
4. To achieve the main aim of this work, the delivery of a consistent level of service regarding the use of lights that protect the runway around the world, next steps include the:
 - Promotion of international standards for the use of lights that protect the runway and associated procedures;
 - Development of global requirements necessary to ensure consistent use of lights that protect the runway;
 - Enhancement of procedures and relevant training for all operational staff working on the manoeuvring area;
 - Coherent integration of ground, ATC and aircraft systems in the future.

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APPENDIX K

AERODROME DESIGN GUIDANCE FOR THE PREVENTION OF RUNWAY INCURSIONS

Introduction

Recommendation 1.2.12 from the European Action Plan for the Prevention of Runway Incursions states “New aerodrome infrastructure and changes to existing infrastructure should be designed to prevent runway incursions”. Poor infrastructure design has contributed to the quantity and severity of previous runway incursions.

Good aerodrome design can directly reduce the potential for runway incursions whilst maintaining operating efficiency and aerodrome capacity.

The design principles suggested in this guidance material can be applied to new aerodrome infrastructure and changes to existing infrastructure. Enhancement to existing infrastructure may be especially effective at hot spots i.e. areas vulnerable to ground navigation errors which may lead to runway incursions, wrong runway selection, taxiways mistakenly used as runways.

Whatever the infrastructure, it should be easy to understand and so minimize the potential for pilot and manoeuvring area vehicle driver distraction or confusion.

Aerodrome Design Principles - Taxiways

Entry

Flight crew need an unobstructed view of the runway, in both directions, to confirm that the runway and approach is clear of conflicting traffic before proceeding to enter or line up. To achieve this clear view, runway entrances should be at right angles to a runway.

Where the aerodrome has more than one runway, ensure that runway ends are clearly identified as separated. This may be achieved through visual aids or taxiway design.

Use standard taxiway widths, suitable for a wide range of aircraft, including the largest type expected to use the aerodrome.

Wide (non standard) taxiway entrances reduce the effectiveness of signs and markings as aids to prevent ground navigation error and wrong runway selection. Use islands or barriers to avoid disorientation at large expanses of pavement.

Crossing

Avoid designs that include crossing a runway to access a taxiway or another part of the aerodrome.

Limiting the number of aircraft crossing an active runway can be achieved through the use of perimeter taxiways.

Perimeter taxiways (that run around the runway ends) avoid aircraft having to cross a runway. Perimeter taxiways can reduce runway occupancy times, taxi times and congestion on the manoeuvring area, as the time taken to cross a busy runway can be considerable.

Sufficient space is required between the landing threshold and the taxiway centreline where it crosses under the approach path, to enable the largest code aircraft to pass under the approach without violating the approach surface. The requirement for Runway End Safety Areas, and possible interference with the ILS should also be taken into account. The perimeter taxiway should route traffic behind the localiser antenna, not between the localiser antenna and the runway, due to the potential for severe ILS disturbance, noting that this is harder to achieve as the distance between the localiser and the runway increases.

Perimeter roads should also be provided for vehicles wherever possible.

Where perimeter taxiways and roadways are not possible, intersections used for crossing a runway, should be perpendicular to the runway. This will allow flight crew an unobstructed view of the runway, in both directions, to confirm that the runway and approach is clear of conflicting traffic before proceeding to cross that runway. Avoid using mid-runway (high energy) crossing points, because the departing aircraft has too much energy to stop, but not enough speed to take-off.

Taxiway fillets should be used to allow the aircraft to be perpendicular to the runway, thereby assuring clear line of sight to the runway ends.

If runway crossing cannot be avoided then, minimise the potential for runway entry at an unintended location by providing only essential entrances.

It is important to have a consistent design of runway entrances and exits with the same ICAO compliant format for visual aids at each taxiway to ease navigation on the ground.

Multiple taxiway entrances at one location, e.g. Y-shaped connectors present opportunities for ground navigation errors such as runway incursions and for aircraft vacating one runway to enter a wrong taxiway or a different runway. Limiting the options available to pilots on each entrance or exit helps to avoid runway confusion.

Exit

Rapid exit taxiways (RET) are designed to be runway exits only. The geometry of the taxiway/runway intersection of a rapid exit taxiway does not allow the crew to see the runway is clear of conflicting or other traffic in both directions. NO ENTRY signs should be used to avoid entering the runway via a rapid exit taxiway.

Where possible, do not mix high speed (RET) and taxi speed runway exits. If RETs are provided, have a series of RETs without interruption by other taxiway, entrances or exits. Avoid a crossing runway in between exit taxiways.

RETs should be of sufficient length to be effective in allowing the aircraft to slow to an appropriate taxi speed and should terminate onto a parallel taxiway. RETs should not terminate directly on to a parallel runway. Runway/taxiway separations must be sufficient to permit space for effective RETs.

Exit taxiways should be long enough to assure an aircraft has adequately vacated the runway according to the category of operations and is clear of the ILS.

Other

The use of runways as taxiways should be avoided. If necessary, design out runway incursion hot spots.

When practicable, permanently disused taxiways and roadways should be removed to prevent ground navigation error. If left in place, the taxiway must be closed with ICAO compliant markings, signs and lighting and correctly shown and identified for navigation purposes on the aerodrome map / chart.

The Air Traffic Control Tower should be located such that it has good visibility of surface movements of aircraft and vehicles, without any visual restrictions.

Avoid designs that lead to backtrack operations for aircraft prior to take-off or after landing. Parallel to runway taxiways permit to minimize the time aircraft (and also vehicles) stay on the runway, so are a key element for safety and efficiency.

Aerodrome Infrastructure Naming Convention

Where possible, taxiways should be designated in a logical manner that is instinctive to pilots and manoeuvring area vehicle drivers.

Different taxiways on the same aerodrome should not have the same or similar designations.

Connecting taxiways (links between major traffic routes) should be designated in such a way that they cannot be mistaken as taxiways that connect to a runway.

Those taxiways that connect to the runway should be clearly designated. The naming of taxiways should follow ICAO recommendations.

Aerodrome Signs, Marking And Lighting

Ensure signs, marking and lighting, conform to ICAO Annex 14. The visual aids must be clear, in good condition and correctly located.

All visual aids must be visible to the pilot and driver from their respective aircraft type and vehicle type, from the angle of their approach to the visual aid in question e.g. stop bars that protect the runway.

Consider the benefits of using technology as a safety net to provide immediate and simultaneous runway and traffic proximity alerts for Pilots, Air Traffic Controllers and Manoeuvring Area Vehicles and to help to protect the runway.

Stop bars and runway guard lights that protect the runway should be ICAO compliant. Consider using stop bars and runway guard lights at all runway / taxiway intersections under all weather conditions (24 hours a day) to help prevent runway incursions.

Manage the length of time the stop bar is extinguished to ensure that aircraft and vehicles have crossed them prior to their re-illumination.

Manage the length of time stop bars are extinguished when conditional clearances are in use to avoid the incorrect presence of a second aircraft or other traffic on the runway.

Consider the use of LED lighting as they give superior luminance.

Lighting systems that provide taxiway routing guidance are considered beneficial to navigating on the ground by Pilots.

Aerodrome Operations

Flight crews and manoeuvring area vehicle drivers should not be instructed to cross illuminated red stop bars. In the event of stop bars failing in the illuminated state, appropriate contingency procedures are required, such as the use of alternative runway entry or crossing points, etc.

Stop bars that protect the runway should be individually selectable by the runway controller and co-located with the working position.

All access to a runway requires a specific ATC clearance to enter or cross the runway, regardless of whether the runway is active or not. An extinguished stop bar, or any other red light, is NOT a clearance to enter or cross a runway.

When warning systems can be installed, such as within a surface movement guidance control system (A-SMGCS), provide aural (word) warnings not just sounds, when practicable.

All staff working on the manoeuvring area should carry an up-to-date airport map/chart, including hot spots, to ensure awareness of areas that may be difficult to navigate correctly.

Works in Progress

When planning and carrying out works in progress on the manoeuvring area the aerodrome operator should:

- Ensure in the design stage that the changed layout does not increase the likelihood of runway incursions;
- Ensure that the layout changes are published in the AIP, NOTAMs or ATIS and local airfield notices in a timely fashion as appropriate;
- Ensure that the airfield signs, lights and markings are altered to reflect the changed layout;
- Ensure that air traffic control are aware of the changes;
- Ensure that the ground lighting and any associated control software are altered to reflect the new layout e.g. availability of green taxiway centre line lights linked to an unserviceable stop bar.

APPENDIX L BIBLIOGRAPHY

ICAO material

ACI material

EUROCONTROL material

Miscellaneous

Useful web sites

APPENDIX L - BIBLIOGRAPHY

ICAO Material

References to Runway Safety found in ICAO Documents and ICAO Guidance materials

ICAO Documents

Convention on International Civil Aviation

(Doc 7300), Notification of differences
Article 38

Annex 2 **Rules of the air**

Chap 3.2.2.7 Surface movement of aircraft
Chap 3.6.1.4 Air Traffic Control Clearance

Annex 3 **Meteorological Service for International Air Navigation**

Chap 2 General provisions
Chap 4 Meteorological observations and reports
Chap 5 Aircraft observations and reports
Chap 7 SIGMET and AIRMET information, aerodrome warnings and wind shear warnings
Chap 9 Service for operators and flight crew members
Chap 10 Information for air traffic services, search and rescue services and aeronautical information services
Chap 11 Requirements for and use of communications

Annex 4 **Aeronautical Charts,**

Chap 2.1 Operational requirements for charts
Chap 2.17 Aeronautical Data
Chap 13 Aerodrome/Heliport Chart
Chap 14 Aerodrome Ground Movement Chart
Chap 20 Electronic Charts

Annex 10 **Volume II Aeronautical Telecommunications**

Chap 5 Phraseology
Chap 7.2.1 Broadcast techniques

Volume III

Chap 5 & 6 Air-Ground data link

Volume IV

Chap 3 Surveillance Systems
Chap 5 Mode S extended squitter

Annex 11 **Air Traffic Services**

Chap 2.14 Establishment and identification of standard routes for taxiing aircraft
Chap 2.26 ATS Safety Management
Chap 3.3 Operation of ATS
Chap 3.7 Air Traffic Control Clearances (Read back)
Chap 3.8 Control of persons and vehicles at aerodromes
Chap. 7.1 Meteorological information
Chap 7.2 Information on aerodrome conditions and the operational status of associated facilities.
Chap 7.3 Information of operational status of navigation aids

Annex 13 **Aircraft Accident and Incident Investigation**

Chap 8 Accident Prevention Measures

Annex 14 **Volume I, Aerodrome Design and Operation**

Chap 2	Aerodrome data
Chap 2.13	Co-ordination between AIS and aerodrome authorities
Chap 5.2-5.4	Markings. Lights and Signs
Chap 7.1	Closed runways and taxiways, or parts thereof
Chap 8.3	Electrical systems, Monitoring and Fencing
Chap 9.7	Aerodrome vehicle operations
Chap 9.8	Surface movement guidance and control systems
Chap 10	Aerodrome Maintenance
Appendix 5	Aeronautical Data Quality requirements

Annex 15 **Aeronautical Information Services**

Chap 3	General
Chap 4, para 4.1.2 c	Aeronautical Information Publications (AIP). Notification of differences
Chap 5	NOTAM
Chap 6	Aeronautical Information Regulation and Control (AIRAC)
Chap 7	Aeronautical Information Circulars (AIC)
Chap 8	Pre-flight and Post-flight Information/data
Appendix 1, Part 3	Aerodromes

Doc 4444 **PANS-ATM - Air Traffic Management**

Chap 2	ATS Safety Management
Chap 4.5.1.3	Authority and ATC clearances
Chap 6.2	Essential Local Traffic
Chap 7	Procedures for Aerodrome Control Service
Chap 8.10	Use of Radar in Aerodrome Control Service
Chap 12	Phraseologies
Chap 15.3	Air-Ground Communications Failure
Chap 16.3	Air Traffic Report

Doc 8168 **Aircraft Operations**

ICAO Guidance Materials

Doc 8126	AIS manual
Doc 8168	Procedures for Air Navigation Services - Aircraft operations
Doc 9137	Airport Service Manual Part 9, Airport Maintenance Practices
Doc 9157	Aerodrome Design Manual, Part 4, Visual Aids
Doc 9157	Aerodrome Design Manual, Part 5, Electrical Systems
Doc 9184	Airport Planning Manual
Doc 9365	Manual on All-Weather Operations
Doc 9426	ATS Planning Manual
Doc 9432	Manual of Radiotelephony
Doc 9476	Manual Of Surface Movement Guidance And Control Systems (SMGCS)
Doc 9674	World Geodetic System – 1984 (WGS-84) MANUAL
Doc 9683	Human Factors Manual
Doc 9694	Manual on ATS Data Link Applications
Doc 9774	Manual on certification of aerodromes
Doc 9859	Safety Management Manual
Doc 9870	Manual for Runway Incursion Prevention
	Roadmap for AWO in the European Region ver 2.1
	ICAO Posters - Good Radiotelephony Checklist
	Taxiing Guidance Signs - Information Signs
	Taxiing Guidance Signs - Mandatory Instruction Signs
	ICAO State Letter SP 20/1-98/47 of 12 June 1998:
	Operational Requirements for A-SMGCS
	ICAO NACC Regional office, OPS guidelines for the prevention of runway incursion, Jan Jurek, 2002

ACI Material

- ACI Airside Safety Handbook
- ACI (World) Apron Signs and Markings Handbook

EUROCONTROL Material

- EUROCONTROL WEBSITE: www.eurocontrol.int/runwaysafety
- EUROCONTROL Safety Management Implementation Plan
http://www.eurocontrol.int/safety/GuidanceMaterials_SafetyPolicyImplementationGuide.htm
- EUROCONTROL Safety Regulatory Requirements
<http://www.mis.eurocontrol.be/sru-src/dgs/src/en/>
ESARR 2 - Safety Regulatory Requirement: Reporting and Assessment of Safety Occurrences in ATM
ESARR 3 - Use of Safety Management Systems by ATM Service Providers
ESARR4 - Risk Assessment and Mitigation in ATM
ESARR 5 - Safety Regulatory Requirement for ATM Services' Personnel
- Advanced Surface Movement Guidance and Control System (A-SMGCS)
Surveying of Navigation Facilities – EUROCONTROL Standard Document Ed 1, 007-97
- AIS AHEAD - <http://www.eurocontrol.int/ais>
- AIS AGORA Voicing Problems - Sharing Solutions: Improving communication among all aeronautical information stakeholders <http://www.eurocontrol.int/aisagora>

Miscellaneous

- UK Civil Aviation Authority CAP 642 - Airside Safety Management
- UK Airport Operators Association - Airside Driver Training Scheme
- University of Leiden, Human Factors in runway incursion incidents, Patrick Hudson

Useful web sites

www.faa.gov
www.airports.org
www.aci-europe.org
www.caa.co.uk
www.eurocontrol.int
www.iata.org
www.GASR.aero
www.tc.ca
www.easa.eu



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