

**AIRPORT STANDARDS DIRECTIVE 106**

**[ASD 106]**

**RUNWAY SAFETY PROGRAMME**



**AIRPORT STANDARDS DIVISION  
DEPARTMENT OF CIVIL AVIATION  
MALAYSIA**

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## FOREWORD

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

To improve the situation with respect to runway safety and to encourage the implementation of relevant provisions, ICAO embarked on an education and awareness campaign which began with a comprehensive search for the best available educational material for inclusion in an interactive runway safety toolkit.

To address aerodromes, air traffic management and flight operations, among other subjects, ICAO also conducted a series of runway safety seminars in the ICAO regions, with the aim of disseminating information on the prevention of runway incursions.

The objective of this document is to give guidelines to aerodrome operators, air traffic service (ATS) providers and aircraft operators to implement runway safety programmes taking into account best practices already implemented by some other States, international organizations, aerodrome operators, ATS providers and airlines.

An evolution in safety thinking has led to a change in focus: from that of the individual to that of the organization as a whole. It is now acknowledged that senior management decisions are influential in shaping the operational contexts within which operational personnel perform their duties and discharge their responsibilities. It is also accepted that, regardless of the extent to which operational personnel excel in their job performance, they can never ultimately compensate for systemic deficiencies and flaws in the system that binds them. This new way of thinking is reflected in the following recent Standards and Recommended Practices (SARPs) on safety management which, for the first time, explicitly address the contribution and responsibility of senior management regarding safety.

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

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

Annex 14 — *Aerodromes* requires aerodrome operators to implement SMS, as a part of the certification process of an aerodrome, and recommends the same for already certified.

Such evolution in safety thinking notwithstanding, it is a fact that properly selected, trained and motivated operational personnel remain the true custodians of safety. When a system breaks down due to unanticipated deficiencies in design, training, technology, procedures or regulations, human performance is the last line of defence against latent conditions that can penetrate the aviation system defences and potentially result in compromised safety. Operational personnel are the true “gatekeepers” of the aviation safety system.

From this broad perspective, it is imperative to avoid the pitfall of focussing safety efforts on organizational issues exclusively, to the detriment of the human contribution to the success and failure of the aviation system. Active failures by operational personnel are sometimes a consequence of flaws in the system, sometimes a result of well-known and documented human limitations, but usually are a combination of the two. A true systemic approach to safety must consider latent conditions in the system as well as active failures on the front lines of operations. Such a systemic approach underlies this document.

## **INTRODUCTION**

1. In exercise of the powers conferred by regulation 167 (1) of the Civil Aviation Regulations 2016, the Director General makes this Airport Standards Directive.
2. This Airport Standards Directive is published by the Director General under section 24O of Civil Aviation Act 1969 [Act 3] – Amendment 2006.
3. Safety is the primary goal of the Department of Civil Aviation (DCA) Malaysia. Runway safety is a critical component of that goal. Nowhere are aircraft in closer proximity to other aircraft and obstacles such as vehicles, pedestrians and airport structures and equipment than when on the airport surface. The aim is to reduce the risk of runway incursions, runway excursions and wrong runway departures, as well as address the errors committed by pilots, air traffic controllers, vehicle operators and pedestrians by focusing on outreach, awareness, improved infrastructure and technology.

4. Several critical areas that need to be investigated and which had a relation to overall runway safety including :
  - [a] radiotelephony phraseology
  - [b] language proficiency
  - [c] equipment
  - [d] aerodrome lighting and markings
  - [e] aerodrome charts
  - [f] operational aspects
  - [g] situational awareness
  - [h] Human Factors
5. In 2005 ICAO developed the ICAO Runway Safety Toolkit CD-ROM and in 2007 Manual on the Prevention of Runway Incursions (Doc 9870). The objective of this manual is to help States, international organizations, aerodrome operators, ATS providers and aircraft operators to implement runway safety programmes taking into account best practices already implemented by some States, international organizations, aerodrome operators, ATS providers and airlines.
6. As the frequency and severity of runway excursion become more apparent it was considered appropriate to address all runway safety issues in a comprehensive manner.
7. ICAO Runway Safety Programme has evolved to include the prevention and mitigation of Runway Incursion, Runway Excursion and other occurrences related to runway safety.
8. ICAO and its member States are now working together on a series of concrete measures to minimize the risks of runway incursions, runway excursions and other events linked to runway safety by establishing, promoting and enhancing multi-disciplinary runway safety teams at individual airports.

## **OBJECTIVE**

9. The objective for Runway Safety Programme at aerodromes in Malaysia is to prevent and mitigate as far as reasonably practicable the followings :-
  - [a] Runway Incursion
  - [b] Runway Excursion
  - [c] Other occurrences related to runway safety.

## **ESTABLISHMENT OF RUNWAY SAFETY TEAM**

10. A Runway Safety Programme shall start with the establishment of runway safety teams at individual aerodromes.
11. The runway safety team shall be established by the Aerodrome Operator. The roles and responsibilities of the team are as mentioned in paragraph 10 to 19 of this directive.
12. The runway safety team shall comprise of representatives from the following disciplines :
  - [a] aerodrome operator
  - [b] aircraft operator
  - [c] air traffic service provider
  - [d] ground service provider
13. The members of Runway Safety Team shall be approved by National Runway Safety Programme Committee which is chaired by Director of Airport Standards Division, Malaysia or any other person who is appointed by him.
14. The runway safety team meeting shall be chaired by Airport Manager or Head of Operation of that particular aerodrome.
15. The chairman of Runway Safety Team shall submit the Runway Safety Programme and shall regularly report to Airport Standards Division, DCA.
16. The Aerodrome Operator shall conduct a minimum of four [4] Runway Safety Team meetings at each aerodrome every year.
17. The Aerodrome Operator shall submit the minutes of Runway Safety Team meeting to Airport Standards Division, DCA Malaysia within two weeks after the meeting.
18. The primary role of a local runway safety team shall be to develop an action plan for runway safety, advise management as appropriate on potential runway incursion/excursion issues and recommend strategies for hazard removal and mitigation of the residual risk. These strategies may be developed based on local occurrences or combined with information collected elsewhere.

19. The runway safety team shall establish goals that will improve the safety of runway operations, inter alia:
- a) to improve runway safety data collection, analysis and dissemination;
  - b) to check that signage and markings are ICAO-compliant and visible to pilots and drivers;
  - c) to develop initiatives for improving the standard of communications;
  - d) to identify potential new technologies that may reduce the possibility of a runway incursion / excursion;
  - e) to ensure that procedures are compliant with ICAO Standards and Recommended Practices (SARPs); and
  - f) to initiate local awareness by developing and distributing runway safety education and training material to controllers, pilots and personnel driving vehicles on the aerodrome.

### **GENERIC TERM OF REFERENCE FOR RUNWAY SAFETY TEAM**

20. Suggested generic terms of reference for a runway safety team are to assist in enhancing runway safety by:
- a) determining the number, type and, if available, the severity of runway incursions / excursions;
  - b) considering the outcome of investigation reports in order to establish local hot spots or problem areas at the aerodrome;
  - c) working as a cohesive team to better understand the operating difficulties of personnel working in other areas and recommending areas for improvement;
  - d) ensuring that the recommendations contained in the *Manual on the Prevention of Runway Incursions* (Doc 9870) are implemented;
  - e) identifying any local problem areas and suggesting improvements;



- f) conducting a runway safety awareness campaign that focuses on local issues, for example, producing and distributing local hot spot maps or other guidance material as considered necessary; and
  - g) regularly reviewing the airfield to ensure its adequacy and compliance with ICAO SARPs.
21. The local runway safety team will assist in enhancing runway safety by :
- a) Considering the outcome of investigation reports to establish local hot spot or problem areas at the aerodrome;
  - b) Working as a combined team to better understand the operating difficulties of those working in other areas, and suggest items for improvement;
  - c) Co-ordinating with the organisations or teams they represent on the implementation of the recommendations that have been assigned to the local teams during the Runway Safety Team meeting;
  - d) Identifying any local problem areas and making any suggestions for improvement that are considered necessary;
  - e) Running a local Runway Safety Awareness Campaign, that focuses on local issues, for example by producing and distributing local hot spot maps or other guidance material as considered necessary;
  - f) Confirming that communications between the ANSP and Aircrew/Drivers are satisfactory, or if any improvements could be suggested. For example, although standard ICAO phraseology may be utilised, some messages from ATC may be overlong or complex, which may have the potential to confuse drivers or aircrew; and
  - g) Driving on the airfield on a regular basis to ensure that all markings and signage are understandable by all parties, and that no possible ambiguity exists.

## **RUNWAY SAFETY INCIDENT REPORTING**

22. It shall be ensured that all reportable occurrences (accident, incident, deficiency etc) including runway incursion / excursion incidents are reported and investigated in sufficient detail to identify specific causal and contributory factors (see the reporting forms in Appendices F and G of ICAO Doc 9870 – *Manual on Prevention of Runway Incursions*).
23. The Aerodrome Operator, airlines and air traffic service provider shall record any safety incident occurred at their respective aerodromes.
24. They shall conduct safety investigation for any incident/accident occurred and shall produce a safety investigation report.
25. RST should promote a safety culture that embraces the concept of just culture and non-punitive safety reporting. RST members should also provide an avenue for confidential reporting (reporters identity).
26. RST Team shall discuss the outcome of safety investigation reports from various disciplines and focus on implementation of recommendation made.
27. The safety investigation report shall be submitted to Airport Standards Division, Department of Civil Aviation, Malaysia as soon as possible after the incident/accident occurred. If safety critical recommendations are deemed necessary, a preliminary report should be provided within 48 hours.

## **HOT SPOT**

28. 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.”
29. The criteria used to establish and chart a hot spot are contained in the PANS-ATM (Chapter 7) and Annex 4 — Aeronautical Charts (Chapters 13, 14 and 15).
30. The Aerodrome Operator shall produce “Hot Spot Chart” which identify any area at their respective aerodrome that require a more detail concern by pilot and any of airside users to avoid any

unwanted incident/accident. The chart shall be regularly updated in AIP and shall be submitted regularly to Airport Standards Division, DCA Malaysia.

31. Hazards associated with hot spots shall be mitigated as soon as possible and so far as is reasonably practicable.
32. Examples of how hot spots are shown on charts are provided in Figures 3-1, 3-2 and 3-3 ICAO Doc 9870 Manual on the Prevention of Runway Incursions.
33. Aerodrome charts showing hot spots shall be produced locally, checked regularly for accuracy, revised as needed, distributed locally, and published in the Aeronautical Information Publication (AIP).
34. Once hot spots have been identified, suitable strategies should be implemented to remove the hazard and, when this is not immediately possible, to manage and mitigate the risk. These strategies may include:
  - a) awareness campaigns;
  - b) additional visual aids (signs, markings and lighting);
  - c) use of alternative routings;
  - d) construction of new taxiways; and
  - e) the mitigation of blind spots in the aerodrome control tower.

## **RUNWAY SURFACE CONDITION**

35. The Aerodrome Operator should ensure runway surface condition always in good physical condition. For this purpose, the Aerodrome Operator shall conduct recommended physical inspection and test as recommended by ICAO Doc 9137 Part 2 : Airport Service Manual – Pavement Surface Conditions every year and shall submit the result to Airport Standards Division, DCA Malaysia.
36. The Aerodrome Operator should take action as necessary to remove contaminants from the movement area as rapidly and completely as possible so as to minimize their accumulation and, thus, to provide good friction characteristics and low rolling resistance.

37. The Aerodrome Operator should ensure the pavement surface to be kept clear of any loose stones or other debris that might cause damage to aeroplane structures or engines or might impair the operation of aeroplane systems.
38. The Aerodrome Operator should comply with the requirement to assess the condition of the pavement whenever it has not been possible to fully clear the contaminants and to make this information available to the appropriate units at the airport.
39. The Aerodrome Operator should comply with the requirement to measure periodically the friction characteristics of the runway and take appropriate actions whenever the friction characteristics are below certain levels specified by the Department of Civil Aviation, Malaysia.
40. The Aerodrome Operator should ensure that adequate measures are taken to overcome problems resulting from contaminants or debris on, or weathering of, the movement area.
41. Runway surface friction/speed characteristics should be determined under the following circumstances:
  - a) the dry runway case, where only infrequent measurements may be needed in order to assess surface texture, wear and restoration requirements;
  - b) the wet runway case, where only periodical measurements of the runway surface friction characteristics are required to determine that they are above a maintenance planning level and/or minimum acceptable level. In this context, it is to be noted that serious reduction of friction coefficient in terms of viscous aquaplaning can result from contamination of the runway, when wet, by rubber deposits;
  - c) the presence of a significant depth of water on the runway, in which case the need for determination of the aquaplaning tendency must be recognized; and
  - d) the slippery runway under unusual conditions, where additional measurements should be made when such conditions occur.
42. The Aerodrome Operator should, for dry and wet runway conditions, consider corrective maintenance action whenever the runway surface friction characteristics are below a maintenance planning level. If the runway surface friction characteristics are below a minimum

acceptable friction level, corrective maintenance action should be taken, and in addition, information on the potential slipperiness of the runway when wet should be made available.

43. The Aerodrome Operator should report the presence of water on a runway, as well as to make an assessment of the depth and location of water. Reports of assessment of contaminant depth on a runway will be interpreted differently by the operator for the take-off as compared with the landing. For take-off, operators will have to take into account the contaminant drag effect and, if applicable, aquaplaning on take-off and accelerate-stop distance requirements based on information which has been made available to them. With regard to landing, the principal hazard results from loss of friction due to aquaplaning, while the drag effects of the contaminant would assist aeroplane deceleration.
44. The Aerodrome Operator should report the presence of water within the central half of the width of a runway and should make an assessment of water depth, where possible. In order to report with some accuracy on the conditions of the runway, the following terms and associated descriptions should be used:
  - Damp** — the surface shows a change of colour due to moisture.
  - Wet** — the surface is soaked but there is no standing water.
  - Water patches** — significant patches of standing water are visible.
  - Flooded** — extensive standing water is visible.
45. The information that, due to poor friction characteristics, a runway or portion thereof may be slippery when wet should be made available since there may be a significant deterioration both in aeroplane braking performance and in directional control.
46. It is advisable to ensure that the landing distance required for slippery runway pavement conditions, as specified in the Aeroplane Flight Manual, does not exceed the landing distance available. When the possibility of a rejected take-off is being considered, periodic investigations should be undertaken to ensure that the surface friction characteristics are adequate for braking on that portion of the runway which would be used for an emergency stop. A safe stop from V<sub>1</sub> (decision speed) may not be possible, and depending on the distance available and other limiting conditions, the aeroplane take-off mass may have to be reduced or take-off may need to be delayed awaiting improved conditions.

47. The provisions in Annex 14, Volume I, Chapter 2, 2.9, require that the appropriate authority assess the conditions of pavements whenever it has not been possible to clear the contaminants fully, and make this information available to the appropriate units at the airport.
48. Before take-off or landing, the pilot should be given information on all aspects of an airport, its aids and operational facilities. In many cases, an adverse combination of available take-off or landing distance, tail or cross-wind components, visibility and poor friction characteristics will make a take-off or landing impossible.
49. The Aerodrome Operator should ensure the runway friction test conducted at least once a year. The Aerodrome Operator should submit the result of runway friction test two weeks after the test is being conducted.
50. The runway should be periodically tested to ensure that its friction characteristics are above an acceptable level. In addition, runways with friction characteristics below the minimum acceptable level should be identified and pilots informed accordingly.
51. A NOTAM should be issued whenever the runway surface friction characteristics do not meet the minimum acceptable level by ICAO as mentioned in ICAO Doc 9137 Part 2 : Airport Service Manual – Pavement Surface Conditions. The NOTAM shall be issued until such time as corrective action has been taken by the Aerodrome Operator.
52. In addition to the periodic runway friction testing mentioned above, when a runway is known to become slippery under unusual conditions, additional measurements should be made when such conditions occur. It is intended that information on the runway surface friction characteristics be made available to the appropriate units when these additional measurements show that the runway or a portion thereof has become slippery.

## **RUBBER DEPOSIT REMOVAL**

53. The Aerodrome Operator shall ensure rubber deposit removal conducted when the measurement for Runway Friction Test falls under acceptable level or the runway markings being erased by the thickness of rubber deposit. The Aerodrome Operator shall submit the report for rubber deposit removal work to Airport Standards Division, DCA Malaysia two weeks after the work is being completed.

54. Rubber deposited in the touchdown zone by tires of landing aeroplanes obliterates runway markings and, when wet, creates an extremely slick area on the runway surface. The removal of rubber should be carried out by means of:
- a) chemical solvents;
  - b) high-pressure water blasting;
  - c) chemical solvents and high-pressure water blasting; and
  - d) hot compressed air.
55. In assessing the effectiveness of any system for rubber removal, the objective must be clearly understood, i.e. to restore a good coefficient of friction in wet conditions so as to provide safe operational conditions for all aeroplanes. A change in surface colour, for example, from black to grey on cement concrete or tarmac can be very misleading, because even a small amount of residual rubber in the pores of the pavement can produce low friction values, while giving an overall clean appearance. It is therefore essential to quantify the friction coefficient by means of a reliable friction-measuring device.
56. In most cases, high-pressure water blasting is reasonably effective on lightly contaminated areas, but its effectiveness decreases as the depth of contamination increases. Depending upon the type and volume of traffic, cleaning may be required twice a year. A modern practice is to dissolve rubber deposits with chemical solvents followed by thorough flushing with high-pressure water blasting.
57. In order to determine the amount of rubber needed to be removed from the pavement to provide an acceptable surface condition, it is recommended that a test area be used to predetermine the water pressure and rate of travel required to produce this acceptable surface. Observed productivity of high-pressure water blasting during normal working conditions indicates a rate of 278 m<sup>2</sup> per hour per unit while cleaning. Refilling of a typical water tank accounts for approximately two hours in each shift. Therefore, one touchdown zone 900 m × 24 m would require approximately 100 hours per unit.
58. The hot compressed air technique uses high temperature gases to burn away the rubber deposits left by aeroplane tires and can be used on both cement concrete and asphaltic concrete runways. It has been claimed that as no mechanical action takes place at the runway surface, there is little danger of the surfacing material becoming loose

and causing foreign object ingestion. However, caution should be exercised and the condition of the pavement should be closely monitored when using this technique on asphaltic concrete runways.

## **FOREIGN OBJECT DEBRIS/DAMAGE**

59. Foreign Object Debris is a substance, debris or article alien to an airplane or its system which would potentially cause damage to the airplane. Foreign Object Debris (FOD) at airports includes any object found in an inappropriate location that, as a result of being in that location, can damage equipment or injure personnel. FOD includes a wide range of material, including loose hardware, pavement fragments, catering supplies, building materials, rocks, sand, pieces of luggage, and even wildlife. FOD is found at terminal gates, cargo aprons, taxiways, runways, and run-up pads.
60. FOD causes damage through direct contact with airplanes, such as by cutting airplane tires or being ingested into engines, or as a result of being thrown by jet blast and damaging airplanes or injuring people. The resulting damage is estimated to cost the aerospace industry \$4 billion a year.
61. The Aerodrome Operator shall ensure the runway at their respective aerodrome is always clear from any Foreign Object Debris (FODs). For this reason, the Aerodrome Operator shall conduct regular cleaning of runway and submit the report of regular cleaning job being done to Airport Standards Division, DCA Malaysia. The Aerodrome Operator shall record any FODs found or reported and shall conduct the analysis based on the data collected. The record and analysis shall be submitted to Airport Standards Division, DCA Malaysia once every two months.
62. The defenses to mitigate the effect of FOD should include the following:
  - a) Regular and frequent inspection of the airfield, including aircraft manoeuvring areas and adjacent open spaces;
  - b) Suspension of runway operations upon notification to ATC about FOD on or near the runway until FOD has been removed and the runway inspected, as necessary



- c) Regular and frequent inspection of the airfield buildings and equipment and immediate repair or withdraw from service of items likely to create FOD;
- d) Inspection of the parking gate to ensure that it is free of FOD, including ground equipment and other material capable of reducing braking action, is normally the responsibility of the airline representatives; and
- e) All aerodrome users should make their best effort to ensure no FOD are left behind and to observe the presence of FOD is removed during their duty in the airfield; and
- f) Removal of FOD as soon as it is identified.

63. Typical scenarios resulted from FOD are as following :

- a) Debris falls onto the runway from an aircraft or vehicle. An aircraft taking off passes over the debris, causing damage to its landing gear.
- b) A rubbish bag falls from a vehicle while an aircraft is being replenished and enters an aircraft engine.
- c) Ground servicing equipment is not withdrawn behind the safeline on the apron and is struck by an aircraft entering the stand, causing damage to the aircraft and equipment.
- d) A loose piece of fencing material blows onto the apron, striking passengers walking to the aircraft.

64. The contributory factors which may cause the existence of FOD onto the airfield are as following :

- a) Poor maintenance of buildings, equipment and aircraft;
- b) Inadequate staff training;

- c) Pressure on staff not to delay movements for inspection;
  - d) Weather (e.g. FOD may be created by strong winds or may be blown onto the airfield);
  - e) Presence of uncontrolled (e.g. contractors') vehicles on the airfield.
65. A program to control airport FOD is most effective when it addresses four main areas:
- a) Training;
  - b) Inspection by airlines, airport and aircraft ground handling personnel;
  - c) Maintenance; and
  - d) Coordination.
66. The Aerodrome Operator shall ensure all bays are clear of FOD and fit for aircraft usage. The Aerodrome Operator shall conduct periodic apron sweeping to ensure all movement areas are free of FOD. At the same time, the Ground Handlers/Airlines shall also ensure that the bay is clean and clear of any FOD. Ground Handlers/Airlines may call upon the Aerodrome Operator to clear the FOD before the arrival of aircraft at the bay.
67. Ground Handlers/Airlines shall ensure that the bay and taxilane are clear of FOD before an aircraft arrives at the designated bay. Before an aircraft being pushed out from the bay, Ground Handlers/Airlines shall ensure that the bay is cleaned and clear of FOD for the next aircraft use. It is the responsibility of the Ground Handler/Airlines to ensure the bay is fit for aircraft usage and clear of all FOD before an aircraft docks in. The Ground Handler/Airlines shall clear all FODs in the bay during their usage to ensure that next arriving aircraft which uses the same bay will not face any potential FOD hazard.

## **RUNWAY INCURSION PREVENTION**

### **68. DEFINITION OF A RUNWAY INCURSION**

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

69. Runway incursions have sometimes led to serious accidents with significant loss of life. Although they are not a new problem, with increasing air traffic, runway incursions have been on the rise.
70. Aviation safety programmes have a common goal — to reduce hazards and mitigate and manage residual risk in air transportation. Runway operations are an integral part of aviation; the hazards and risks associated with runway operations need to be managed in order to prevent runway incursions that may lead to accidents.
71. A number of factors are likely to be responsible for the continuing increase in runway incursions, including traffic volume, capacity-enhancing procedures and aerodrome design. The report concluded that:
- a) as traffic volume increases, the likelihood of a runway incursion increases more rapidly when capacity-enhancing procedures are in effect than when they are not;
  - b) if traffic remains the same, the potential for a runway incursion increases when capacity-enhancing procedures are put into operation;
  - c) many aerodrome improvement projects have resulted in a more complex aerodrome layout which, together with inadequate aerodrome design standards, signage, markings and lighting, and the lack of standard taxi routes and availability of improved aerodrome diagrams, has worsened the situation; and
  - d) increasing environmental pressure can compromise safe air traffic control (ATC) practices by requiring too many configuration changes.

The above factors, combined with inadequate training, poor infrastructure and system design and inadequate ATC facilities, can lead to an increased risk of runway incursions.

72. The recommendations for the prevention of runway incursions are as listed in Appendix I of this Directive.

## **RUNWAY SAFETY PROMOTION**

73. The Aerodrome Operator should regularly produce and distribute brochures for “Best Practice in aerodromes” and shall disseminate them to all relevant aerodrome stakeholders. A copy of the brochures should be given to Airport Standards Division, DCA Malaysia.
74. The Aerodrome Operator should conduct regular in-house runway safety related trainings to all their staff and submit the lists of staff who have attended the training to Airport Standards Division, DCA Malaysia.
75. The individual Runway Safety Teams should produce an annual report to the National Runway Safety Programme Committee which the committee will use to prepare a National Runway Safety Programme Report. The report should be submitted to Airport Standards Division, DCA Malaysia before the end of every year.
76. A National Runway Safety Programme meeting will be conducted twice a year to discuss all runway safety related matters and all the matters listed above. This meeting will be chaired by Director of Airport Standards Division, DCA Malaysia or any other person who is appointed by him. The minutes of the meeting and the results of any discussion of the meeting will be submitted to Director General of Civil Aviation Malaysia for further action.
77. The objective of National Runway Safety Programme is to mentor the formation and then oversee the activities of Runway Safety Teams in Malaysia. Membership of this committee is by invitation by Director of Airport Standards Division, DCA Malaysia and shall consist of representatives from each of the disciplines involved in Runway Safety Team activity:
- Pilots
  - Air Traffic Controller
  - Airport Operators
  - Ground Handling Service Providers

The National Runway Safety Programme Committee will meet officially twice a year except when mentoring the formation of teams across the nation, when it will meet as and when required.

78. The Appendices to this Directive shall be taken, construed, read and be part of this Directive.

**DATO' SRI AZHARUDDIN ABDUL RAHMAN**  
**Director General**  
**Department of Civil Aviation**  
**Malaysia**

**Dated : 20 APRIL 2016**

## APPENDIX I

# RECOMMENDATIONS FOR THE PREVENTION OF RUNWAY INCURSIONS

## 1. INTRODUCTION

- 1.1 The following recommendations are the result of a systemic analysis of a number of runway incursions, the purpose of which was to identify the causes and contributory factors, both as active and latent failures, that led to the incidents that took place.
- 1.2 These recommendations will enhance the safety of runway operations through the consistent and uniform application of existing ICAO provisions, leading to predictability and greater situational awareness.

## 2. COMMUNICATIONS

- 2.1 The full aircraft or vehicle call sign should be used for all communications associated with runway operations.
- 2.2 Standard ICAO phraseologies should be used in all communications associated with runway operations.
- 2.3 Periodically it should be verified that pilots, drivers and air traffic controllers are using standard ICAO phraseologies in all communications associated with runway operations.
- 2.4 The readback procedures in the *Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)* should be used and should include communications with vehicles operating on the manoeuvring area.
- 2.5 All communications associated with runway operations should be conducted in accordance with ICAO language requirements for air-ground radiotelephony communications (Annex 10 — *Aeronautical Telecommunications*, Volume II, Chapter 5, and Annex 1 — *Personnel Licensing*, Chapter 1 and Appendix 1, refer). The use of standard aviation English at international aerodromes will improve the situational awareness of everyone listening on the frequency.

- 2.6 All communications associated with the operation of each runway (vehicles, crossing aircraft, etc.) should be conducted on the same frequency as utilized for the take-off and landing of aircraft.
- 2.7 Short and simple messages should be used in ATC communications.
- 2.8 Appendix A of *ICAO Doc 9870 - Manual on the Prevention of Runway Incursions* contains more detailed guidance on communication best practices based on ICAO provisions.

### **3. AIRCRAFT OPERATORS**

- 3.1 Pilots should be thoroughly trained on aerodrome signage, markings and lighting.
- 3.2 A requirement to obtain an explicit clearance to cross any runway should be included in the flight deck procedures. This includes runways not in use.
- 3.3 Best practices for pilots' planning of ground operations should be promoted.
- 3.4 The concept of a sterile flight deck while taxiing should be adopted. Information on this concept is contained in Appendix B of *ICAO Doc 9870 Manual on the Prevention of Runway Incursions*.

### **4. PILOTS**

- 4.1 Pilots should never cross illuminated red stop bars when lining up on, or crossing, a runway unless contingency procedures are in use that specifically allow this.
- 4.2 Pilots should not accept an ATC clearance that would require them to enter or cross a runway from an obliquely angled taxiway.
- 4.3 If lined up on the runway and held more than 90 seconds beyond anticipated departure time, pilots should contact ATC and advise that they are holding on the runway.
- 4.4 Pilots should turn on aircraft landing lights when take-off or landing clearance is received, and when on approach.

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

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

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

- 4.6 If there is any doubt when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.
- 4.7 If pilots have any doubt as to their exact position on the surface of an aerodrome, they should contact ATC and follow the associated ICAO procedure (PANS-ATM, Doc 4444).
- 4.8 Pilots should be “head-up” for a continuous watch during aerodrome surface operations.
- 4.9 Appendix B contains detailed guidance on flight crew best practices including the concept of the sterile flight deck.

## **5. AIR TRAFFIC SERVICE PROVIDERS AND AIR TRAFFIC CONTROLLERS**

- 5.1 Safety management systems that are in accordance with ICAO provisions should be implemented.
- 5.2 ATC should always use a clear and unambiguous method on the operating console to indicate that a runway is temporarily obstructed.
- 5.3 ATC should, whenever practical, give ATC en-route clearance prior to taxi.
- 5.4 Stop bars should be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.
- 5.5 Aircraft or vehicles should never be instructed to cross illuminated red stop bars when entering or crossing a runway. In the event of unserviceable stop bars that cannot be deselected, contingency measures, such as follow-me vehicles, should be used.
- 5.6 It should be ensured that ATC procedures contain a requirement to issue an explicit clearance including the runway designator when authorizing a runway crossing or to hold short of any runway. This includes runways not in use.



- 5.7 It should be ensured that ATC procedures contain a requirement to include the runway designator when an instruction to hold short of any runway is issued.
- 5.8 Standard taxi routes should be developed and utilized to minimize the potential for pilot confusion.
- 5.9 Where applicable, progressive taxi instructions should be used to reduce pilot workload and the potential for confusion. Progressive taxi instructions must not infer a clearance to cross a runway.
- 5.10 Existing visibility restrictions from the control tower which have a potential impact on the ability to see the runway should be assessed and any such areas should be clearly identified on a hot spot map.
- 5.11 Environmental constraints should not compromise safety, e.g. regular, multiple changes to the runway configuration.
- 5.12 It should be ensured that runway safety issues are included in the training and briefings for ATC staff.
- 5.13 Any hazards should be identified and any risks associated with runway capacity enhancing procedures (intersection departures, multiple line-ups, conditional clearances, etc.), when used individually or in combination, should be evaluated. If necessary, appropriate mitigation strategies should be developed.
- 5.14 Line-up clearance should not be issued to an aircraft if that aircraft will be required to hold on the runway for more than 90 seconds beyond the time it would normally be expected to depart.
- 5.15 When conditional clearances are used, specific training should be provided to ensure that such clearances are used strictly according to ICAO provisions.
- 5.16 When using multiple or intersection departures, oblique or angled taxiways that limit the ability of the flight crew to see the landing runway threshold or final approach area should not be used.
- 5.17 Controllers should be "head-up" for a continuous watch on aerodrome operations.

## **6. AERODROME OPERATORS AND VEHICLE DRIVERS**

- 6.1 An important factor in preventing runway incursions is to limit the physical possibility for pilots and vehicle drivers to mistakenly enter runways. This basic principle includes, but is not limited to, the optimal use of perimeter taxiways, the avoidance of runway crossings, and simplistic and logical taxi/runway layouts in order to make the aerodrome instinctive, logical and user-friendly for vehicle drivers, air traffic controllers and pilots. Therefore, the Aerodrome Operator shall include those elements in the design and location of the aerodrome infrastructure.
- 6.2 Safety management systems should be implemented in accordance with ICAO provisions and continued focus on runway safety should be ensured.
- 6.3 The implementation of Annex 14 provisions should be confirmed, and maintenance programmes relating to runway operations (e.g. markings, lighting, and signage) should be implemented. It should be ensured that signs and markings are maintained and are clearly visible, adequate and unambiguous in all operating conditions.
- 6.4 During construction or maintenance, information about temporary work areas should be adequately disseminated and temporary signs and markings should be clearly visible, adequate and unambiguous in all operating conditions, in compliance with Annex 14 provisions.
- 6.5 A formal driver training and assessment programme should be introduced in accordance with the driver training guidelines contained in Appendix D or, where already in place, these guidelines should be reviewed.
- 6.6 Formal communications training and assessment for drivers and other personnel who operate on or near the runway should be introduced.
- 6.7 Taxiways should be named in accordance with the ICAO naming conventions in Annex 14.
- 6.8 If there is any doubt in the mind of a vehicle driver when receiving a clearance or instruction, clarification should be immediately requested from ATC before the clearance or instruction is enacted.

- 6.9 Vehicle drivers should immediately contact ATC when uncertain of their exact position on an aerodrome; if a driver realizes he/she is on the runway that driver should immediately vacate the runway.
- 6.10 Vehicle drivers should be “head-up” for a continuous watch during aerodrome operations.
- 6.11 Appendix D contains detailed guidance on airside vehicle driver best practices including communications training for drivers.

## **7. GENERAL AND REGULATORY RECOMMENDATIONS**

- 7.1 DCA Malaysia regulatory Sectors/Division should focus on runway incursion risk reduction in their oversight activities.
- 7.2 At each aerodrome, a runway safety team should be established and maintained in accordance with the terms of reference described in Part 8 to 17.
- 7.3 A local runway incursion prevention awareness campaign should be initiated at each aerodrome for air traffic controllers, pilots and drivers and other personnel who are involved in runway operations. The awareness campaign should be periodically updated to maintain interest and operational impact.
- 7.4 All infrastructure and procedures relating to runway operations should be in compliance with ICAO provisions. Where differences exist, they should be published in the national AIP as appropriate and notified to ICAO if ICAO Standards are involved.
- 7.5 Aerodromes should be certified according to the provisions of Annex 14.
- 7.6 Joint cross-training and familiarization (such as the aerodrome resource management training course — see Appendix E of ICAO Doc 9870 – *Manual on Prevention of Runway Incursions*) should be provided to pilots, air traffic controllers and vehicle drivers to increase their understanding of the roles and difficulties of personnel working in other areas. Where possible, visits to the manoeuvring area by all parties should take place for familiarization of signs, markings and aerodrome layout.

- 7.7 Best practices for regulators and air navigation service providers to consider when implementing strategies for preventing runway incursions by air traffic control are contained in Appendix C of ICAO Doc 9870 - *Manual on the Prevention of Runway Incursions*.

## **8. INCIDENT REPORTING AND INVESTIGATION**

- 8.1 It shall be ensured that all runway incursions are reported and investigated in sufficient detail to identify specific causal and contributory factors (see the reporting forms in Appendices F and G of ICAO Doc 9870 – *Manual on Prevention of Runway Incursions*).
- 8.2 To enhance lesson learning, related runway safety data should be shared with other aviation safety organizations both nationally and internationally.

## **9. AERONAUTICAL INFORMATION**

- 9.1 Time-critical aerodrome information that may affect operations on or near the runway should be provided to pilots in “real time” using radiotelephony communications.
- 9.2 The collection, provision and dissemination of aeronautical information should be in accordance with ICAO provisions.
- 9.3 Providers of aeronautical databases and charts should establish a process with aeronautical information services with the objective of ensuring the accuracy, timeliness and integrity of data. A process should be put in place to allow users to provide feedback on the accuracy of aeronautical information.