# A E R O N A U T I C A L   C I R C U L A R
# CIVIL AVIATION AUTHORITY – MACAO, CHINA

**SUBJECT:**

***Macao Runway Safety Programme***

**EFFECTIVE DATE:**

30 September 2014

**CANCELLATION:**

AC/GEN/006R00

**GENERAL:**

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, establishes this Aeronautical Circular (AC).

**APPLICABILITY:**

1. This Aeronautical Circular (AC) contains requirements concerning runway and airside safety at aerodromes, as detailed in Appendix 1 – Macao Runway Safety Programme.

2. These requirements are applicable to the aerodrome owner/operator and airlines in Macao.

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- *END* -

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澳門特別行政區
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU

民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

# Appendix 1

## Macao Runway Safety Programme

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## Runway Safety Programme

## Part 1 - Introduction

1.1    Landing and take-off are critical phases of flight and runway is an area where landing and departing aircraft may have the opportunities to interact with other taxiing aircraft, ground vehicles, personnel, animals and foreign objects.   Given the speed of aircraft and its limited ability in exercising avoiding action on the runway especially during take-off and landing roll, the potential hazard as may be created by runway incursions or presence of foreign objects have become a deep concern to aviation safety in many countries. International Civil Aviation Organization (ICAO) has specified standards and recommended practices relating to airport system operation and development of operational procedures for the purpose of achieving runway safety. We are pleased to note that appropriate measures have been introduced by individual airlines, airport operator and air navigation service provider in order to comply with the ICAO requirement. However, with the predicted growth of air traffic and increasing complexity in airport operation, it is our view that the commitment to runway safety should also be addressed by a more systematic approach to ensure consistent and harmonized application of ICAO provisions with clear goals and common understanding shared by all stakeholders.   This perspective is in line with the requirement of Annex 14.   With the aforesaid objective in mind, the Macao Runway Safety Programme serves to provide management guidelines and recommendations to stakeholders for enhancing runway safety.   The Programme is distributed to aircraft and airport operators as well as air navigation service providers who are requested to observe the guidelines through continuous system improvement and adoption of industry best practice.

1.2    The Civil Aviation Authority of Macao is responsible for periodic review of the Programme taking into consideration the current international requirements, the airport development, the growth in air traffic and technological advancement that in turn may help to better equip the airport in achieving a high level of runway safety.

## Part 2 – Airport Operations

2.1     Favorable operating environment and prevention of runway incursions are important factors that contribute to runway safety.  With these basic principles, an aerodrome operator should establish procedures to monitor the conditions of runways and ground aids which must be supported by effective maintenance programme to ensure system integrity.  Logical layout, simplicity and avoidance of runway crossings should be included as elements in the design and introduction of new aerodrome infrastructure.  Human factors shall be considered in setting up aerodrome procedures with the objectives of minimizing human errors and respecting user-friendliness when used by pilots, vehicle drivers and air traffic controllers.

### Annex 14 Provisions

2.2     An aerodrome operator is required to fully implement at high priority the ICAO provisions relevant to runway safety.  Their compliance forms the basis for consideration of certifying aerodromes. Appropriate additional safeguards should be taken into account to avoid runway incursion.

### Runway Maintenance Programme

2.3     A maintenance programme, including preventive maintenance where appropriate, shall be established for the aerodrome to maintain runway in a condition which does not impair the safety of aircraft operations. A robust maintenance programme should be implemented to prevent failure or degradation of runway facilities.

2.4     The design and application of the maintenance programme should observe Human Factors principles. Guidance material on Human Factors principles can be found in the ICAO Human Factors Training Manual (Doc 9683).

### Pavement Maintenance

2.5     The surface of pavements (runways and adjacent areas) shall be kept clear of loose stones or other objects that might cause damage to aircraft structures or engines, or impair the operations of aircraft systems. In this connection, a comprehensive runway inspection and sweeping programme should be incorporated into the standard operation procedures of aerodrome operators.

2.6     The surface of runways shall be maintained in a condition so as to provide good friction characteristics and low rolling resistance. Standing water, mud, dust, sand, oil, rubber deposits and other contaminants shall be removed as rapidly and completely as possible to minimize accumulation. On every landing, the runway touch-down zone is heavily loaded and rubber from aircraft tyres would be inevitably deposited on runway surface. The adverse effect as a result of rubber deposit should be continuously monitored and addressed.

2.7     An aerodrome operator shall establish a programme to measure the friction characteristics of runway. Different levels of friction corresponding to the level of maintenance required, including rubber removal, should be defined. Pertinent information should be made available to air traffic control (ATC) for onward transmission to pilots if necessary.

**Visual Aids**

2.8     A system of preventive maintenance of visual aids shall be adopted to ensure the availability and reliability of the runway lighting and marking systems. Guidance on preventive maintenance of visual aids is given in the ICAO Airport Services Manual, Part 9 (Doc 9137 Part 9).

2.9     The system of preventive maintenance employed for a precision approach runway should include at least the following checks:

● visual inspection and in-field measurement of the intensity, beam spread and orientation of lights included in the approach and runway lighting systems;

● control and measurement of the electrical characteristics of each circuitry included in the approach and runway lighting systems; and

● control of the correct functioning of light intensity settings used by the air traffic control unit.

2.10    The frequency of measurement of lights for a precision approach runway should be based on traffic density, the local pollution level and the reliability of the installed lighting equipment. The results of the in-field measurements should be continuously assessed and subject to audit by Civil Aviation Authority.

**Runway works**

2.11    An aerodrome operator shall plan and implement works to be carried out at an aerodrome so as not to create any hazard to aircraft operations or confusion to pilots. A works plan should be developed whereby the work items are thoroughly co-ordinated amongst aerodrome users, air traffic control and other service providers after suitable consultations.

2.12    An aerodrome operator shall make arrangement to inspect the works areas, as circumstances require, to ensure aviation safety during and immediately after any period of construction or repair of runway facility or equipment that is critical to the safety of aircraft operations, and at any other time when there are conditions on the runway that could affect aircraft operations.

2.13    An aerodrome operator shall not close the runway to aircraft operations due to pre-planned aerodrome works unless an Aeronautical Information Manual (AIP) Supplement or a Notice to Airmen (NOTAM) giving notice of the closure has been issued in advance before the closure takes place.

2.14    An aerodrome operator shall appoint a person responsible for the safe and proper execution of each item of runway works. This person is responsible to ensure that the works information is widely promulgated to airport users by way of Airport Circular, AIP Supplement or NOTAM.

2.15    Runways or taxiways sections that are closed as a result of the aerodrome works being carried out shall be suitably delineated with marker boards and lit in accordance with the appropriate aerodrome standards.

2.16    All obstacles including vehicles and plants created as a result of the aerodrome works being carried out shall be marked and lit in accordance with the appropriate aerodrome standards.

2.17    Vehicles used by works parties carrying out aerodrome works on the movement area should be equipped with a radio for two-way communications with air traffic control and the unit responsible for airfield control.   The drivers of these works vehicles should be properly trained and briefed about the works details prior to each works session.

## Safety Management System (SMS)

2.18    An aerodrome owner/operator shall implement an SMS with coordination and monitoring the implementation of SMS of the airport services providers in accordance with the provision in Annex 14 and relevant requirements including AC/GEN/005. Facilities, equipment and procedures used to support runway operations shall be designed and operated in a way that the combination of the probability of occurrence and the seriousness of the consequences of the hazard occurring must not result in a level of risk that is unacceptable. Risk assessment matrices facilitate the determination of acceptable levels of risks taking into account the probability of occurrence and seriousness of consequences.

## SMS Implementation

2.19    The implementation of the SMS should include the introduction of:

- **Quantitative safety levels**– an acceptable level of safety in respect of runway operations should be specified;
- **System safety assessment**– safety assessment exercises should be performed whenever changes, additions or replacements of runway facilities are introduced.  All records should be documented;
- **Safety committee**– forum with members from pilot community, air traffic controllers, aerodrome operator, airline representatives and relevant franchisees with operations associated with runway operations should be formed to discuss issues on runway safety;
- **Safety competency scheme** – a scheme should be developed to assess the safety competency on staff involved in runway operations;
- **Safety audit** – periodic safety audits are to be performed to confirm the compliance with the safety requirements and the principles of the safety management system;
- **Safety monitoring and reporting system** – suitable monitoring and reporting mechanism should be developed for identifying undesirable trends in runway safety performance for further remedial action;
- **Safety information dissemination** – a system of information dissemination should be developed to keep aerodrome staff notified whenever a potential safety threat is discovered for enhancing their awareness; and
- **Continuous safety promotion**– efforts should be made to nurture a safety culture amongst the airport community.

## Part 3 – Aircraft Operations

3.1     Pilots play an important role in contributing to runway safety.   Aircraft operators are therefore requested to review the suggestions put forward in this document and adopt these guidelines where necessary in order to refine their ground operation procedures.

### Pilots Training

3.2.    Pilots should be given training on visual aids, for example, aerodrome signage, lightings and markings, to assist in determining positions. Emphasis should be given to maintaining a high level of awareness in observing and complying with signs and markings.   A sound knowledge of all the symbols, signs and colour of lightings that can be anticipated at aerodromes is vital.

### Cockpit management during ground operation

3.3     The taxi phase should be treated as a 'critical phase of flight', which requires careful planning.

3.4     Pilots should be familiar with the airport that they operate to.   Airfield charts and NOTAMs should be reviewed prior to commencement of taxi and before top of descent.   Special attention should be paid to the location of HOT SPOTS if known, i.e. complex intersections and runway crossings where runway incursions have taken place in the past.

3.5     Pilots should monitor the aircraft's position against the aerodrome chart so as to ensure that instructions received from ATC are being followed correctly.   Any uncertainty must be resolved through clarification and assistance from ATC.

3.6     Cockpit instruments, such as compass heading display or Instrument Landing System (ILS) localizer, should be used as supplement to visual observation, for confirming correct taxiway or runway alignment especially at complex intersections and where the take-off ends of two runways are close to one another.

3.7     Pilots should exercise extra caution when being instructed to taxi into position and hold, particularly at night or in poor visibility.   Remaining in position and holding on the departure runway for an extended period without direct communication with ATC should be avoided.

3.8     When crossing or entering runways, all flight crew members should assign full concentration on the runway condition.   In addition to visual checking, other available means, such as monitoring of ATC frequency,

aircraft radar may be used to obtain a better picture on the traffic situation.

3.9        Prior to entering a runway, each flight crew member must cross check and positively confirm with the other the runway identification signage and that the aircraft heading aligns with the designated runway.

3.10       After landing and exiting the runway, non-essential communications and non-essential flight crew actions should not be initiated until clear of all runways, in accordance with sterile cockpit procedures.

## Communication with air traffic control

3.11       It is vital that pilots follow the clearance or instructions that are actually received, and not the one that they expected to receive.

3.12       Standard phraseology should be used as far as practicable.

3.13       Clearance should be read back in its full content with the aircraft callsign included.   The runway designator should be included in case of hold short, runway crossing, take-off, or landing.
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3.14       The receipt of a clearance to taxi to a point beyond a runway does not automatically include the authorization to cross that runway.   Each taxi clearance beyond a runway should contain an explicit clearance to cross the runway or an instruction to hold short of that runway.

3.15       An ATC instruction to follow other traffic does not automatically imply that permission to enter or cross a runway is given.   Each aircraft requires a specific clearance to enter or cross any runway.   Flight crew should seek clarification from ATC if in doubt.

3.16       Flight crew members should pay extra attention to ATC messages when another aircraft with a similar callsign is on the frequency.

3.17       All pilots are required to attain at least ICAO Level 4 in the language proficiency test.

## Crew resource management

3.18       Flight crew members should support each other in managing the cockpit. All flight crew members should monitor the frequency and agree upon the acceptance of a clearance to taxi, cross a runway, and take-off or land on a nominated runway.   Any misunderstanding or disagreement among flight crew on flight deck duties should be resolved immediately by contacting ATC for clarification.

3.19    All the visual information that is available should correlate with the actual position.   The gathering of visual information, allowing a critical review and cross-checking of position, is the task of the entire flight crew.   Any crew member who is uncertain or in doubt about the current aircraft position must speak up and resolve that uncertainty.

## Part 4 – Vehicle Operations in Airside

4.1     Runway incursion by vehicles has caused considerable concern in daily operation at airfields.   An aerodrome operator therefore should establish comprehensive procedures to regulate the quality and discipline of airside drivers.   Suitable measures should be introduced to promote a safety culture in general and arouse the situation awareness of drivers and aircrew.

### Control of Airside Driving and Airside Driving Certification

4.2     In order to ascertain drivers' competency for operating vehicles at airside, an aerodrome operator shall administer an airside driving permit (ADP) system for the aerodrome.

4.3     The numbers of drivers permitted to drive on the manoeuvring area should be kept to the minimum necessary.   The driving operations should be related to the functions of their duties.

4.4     All drivers should be trained and assessed initially and be provided with refresher training at agreed intervals for re-examination to ascertain their competency.

4.5     Where responsibility for the training of vehicle drivers is delegated to a third party provider, the aerodrome operator should institute a programme of audits/examinations, as part of its SMS, to ensure that agreed standards are being maintained.

### Airside Driving Training

4.6     An aerodrome operator should introduce a formal driver training and assessment programme.   Training guidelines should be provided and a set of agreed standards on driver competency should be developed in administering the programme.

4.7     Training material should cover general aerodrome layout including:

- runway, taxiway, apron, roads, crossings, runway holding points, etc.
- all aerodrome signs, markings and lights for both vehicles and aircraft
- specific reference to signs, markings and lights used to guard runways and critical areas and
- specific reference to low visibility operation.

**Airside Driving Discipline**

4.8      Airside drivers must be given a clear message that ATC instructions must be followed at all time. Without ATC's authorization, drivers must not enter the runway. 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. Vehicle drivers should immediately contact the unit responsible for airfield control or ATC when uncertain of their exact position on an aerodrome.

4.9      Vehicle drivers experiencing radio problems while on manoeuvring area must immediately vacate the manoeuvring area. Driver with vehicle breakdown on runways and taxiways must report to airfield control or ATC immediately.

**Language Proficiency in respect of Radiotelephony (RTF) Communication**

4.10      Standard phraseology should be used for communication among drivers, controllers and airfield control personnel. Vehicle driver or his team members who communicates with air traffic controller should read back all instructions pertaining to entering, leaving or crossing runways.

**Situational Awareness**

4.11      On the part of airside drivers, situational awareness is about knowing where they are and where they want to go, as well as knowing the traffic in the surrounding. Drivers should be encouraged to exercise extra vigilance when operating in the vicinity of runways. Close references should be made with any visual cues, lightings and signage especially at times of darkness and poor visibility.

## Part 5 – Air traffic control operation

5.1     One of the primary objectives of air traffic control is to prevent collision on the ground between aircraft and between aircraft and vehicles.   In the situation of Macao, the skills and procedures for achieving this objective have long been included in the basic training and proficiency assessment of air traffic control personnel.   However, air traffic service provider are advised to make continuous effort to promote runway safety through service quality assurance, excelling of operational management and improvement of air traffic control facilities through utilization of state-of-the-art technology.

### Safety Management System

5.2     The top management of an air traffic service provider (ATSP) should make full commitment in promoting runway safety.   Safety Management for Air Traffic Services is generally specified in AC/GEN/005 and AC/ATS/003. ATSP shall implement the necessary Safety Management provisions and practices stated therein and make effort to arouse the safety awareness of its staff and motivate a safety culture within the organization.

### Airfield Surveillance

5.3     In addition to the basic skills of aerodrome control, controllers should be advised through training or periodic briefing on the importance of visual surveillance with particular emphasis on vigilance in determining aircraft and vehicle positions.   Restrictions to the visibility from the control tower that may have a potential impact to the ability of controllers to see the runway should be assessed and clearly made known to aerodrome controllers.

5.4     Other airport units may be requested to provide supplementary surveillance from their locations or vehicles on aircraft/vehicle positions if necessitated by circumstances such as at night or in time of poor visibility.

5.5     Surveillance equipment (such as advanced surface movement guidance and control system, surface movement radar or close-circuit TV) should be provided as aids to controllers in determining aircraft and vehicle positions.   Some models of surface movement radars, by virtue of its design, are prone to signal attenuation by heavy precipitation.   The system limitations, if applicable, must be made known to controllers so that caution is exercised during equipment utilization.

## Operational Management

5.6      Oversight of daily aerodrome operation should be exercised by competent supervisory staff. The workload of individual control positions in the tower should be closely monitored to ensure that it is within the manageable limit.

5.7      In the situation of Macao, low weather minima operations do not occur frequently. ATSP management should ensure that aerodrome control staff are familiar with the Low Visibility procedures through refresher training, periodic briefing or discussion during proficiency examinations.

5.8      A system or work practice serving the purpose of a memory aid to indicate that the runway is being occupied by towing aircraft, vehicles or maintenance personnel, etc., should be developed and provided for use by aerodrome control staff.

## Operational Practices

5.9      The radio equipment used for communication with pilots and airport ground vehicles must be thoroughly evaluated to ensure that it provides adequate coverage for runway operation.

5.10     All aerodrome controllers are required to attain at least ICAO Level 4 in the language proficiency test.

5.11     Standard radio-telephone phraseology should be used as far as practicable.

5.12     Instructions for aircraft or vehicles to enter/exit the runway shall be issued in a clear and unambiguous manner.   Full callsign of aircraft or vehicles and runway designator should be used to avoid confusion.

5.13     All clearances for operation on the manoeuvring area should be read back by the receivers.

5.14     In the interest of situation awareness, all communications associated with runway operations should be conducted on a common frequency when practicable.

5.15     If the taxi route is expected to be long and complex, controller should use where applicable progressive taxi instructions to reduce pilot workload and the likelihood of confusion.

5.16    Where practicable, en-route clearance should be passed before leaving the gate to avoid distraction to pilots during taxiing.

5.17    The application of stop bar:
        a)  Stop bars should be switched on to indicate that all traffic shall stop and switched off to indicate that traffic may proceed.
        b)  Aircraft or vehicles should never be instructed to cross illuminated red stop bars when entering a runway. In the event of unserviceable stop bars that cannot be deselected, contingency measures should be used.

5.18    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.

5.19    When there are separate ground control and aerodrome control functions, aircraft may be transferred to the tower at or approaching the holding point.  Care should be taken to ensure that the phraseology employed during the taxi manoeuvres cannot be interpreted as a take-off clearance.

5.20    To ensure that the complete traffic situation is included in a control position handover, the use of a standardized handover checklist should be considered.

## Part 6 – Runway Safety Team (RST)

**Goals and general description**

6.1     The primary role of a runway safety team, which shall be coordinated by the aerodrome operator, shall be to develop an action plan for runway safety, advise management as appropriate on potential runway safety 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.

6.2     The RST is not intended to replace any required component of a Safety Management System (SMS), the RST programme is designed to improve and support runway safety by integrating the safety systems of the participating organizations. RST can serve as a tool for managing runways safety related risk identified by the service provider programme. In addition, the service provider SMS process shall be used to evaluate possible risk posed by operational changes resulting from RST proposed corrective actions.

6.3     The RST shall include (but not limited to) representatives from the following groups:

(a)  aerodrome operators;

(b)  air traffic services; and

(c)  commercial air operators.

The team may also include:

(a)  the regulatory authority;

(b)  support services (catering, ground handling, etc.);

(c)  emergency response service providers;

(d)  subject matter experts (meteorologists, ornithologists, accident investigation authority, etc.) (upon invitation);

(e)  representatives of flight crew familiar with the aerodrome;

(f)  members from the general aviation community;

(g)  technical experts of controller associations;

(h)  technical experts of pilots associations; and

(i)  consideration may be given to periodically inviting members of other RSTs to enable sharing of information and learning.

In addition to the normal RST members, service providers operating at the aerodrome may participate in the RST process to address operational hazards identified by their internal SMS. In this regard, the service providers will interface with the RST as needed to address the specify concern.

6.4     The RST programme is built on the principles of a formal Hazard Identification and Risk Management (HIRM) process in accordance with ICAO Doc 9859 — Safety Management Manual (SMM) and covers a wide range of issues related to runway safety, including (but not limited to) the following ICAO occurrence categories:

- Abnormal runway contact;
- Bird strike;
- Ground collision;
- Ground handling;
- Runway excursion;
- Runway incursion;
- Loss of control on ground;
- Collision with obstacle(s);
- Undershoot / overshoot, aerodrome

**Terms of Reference / Memorandum of Understanding**

6.5     To facilitate effective decision-making, organizations seeking to establish an RST shall agree to a set of procedural rules governing the actions of their representatives. Once formally documented and accepted, these rules are referred to as either the "Terms of Reference" (ToR) or the "Memorandum of Understanding" (MoU).

*Note – this AC uses ToR to refer to these rules.*

The ToR shall include (but not limited to) the following:

(a)  Objectives, scope of oversight, and expected frequency of RST meetings.

(b)  Membership selection processes.

(c)  Roles and responsibilities of individual RST members.

(d)  Processes governing and protecting the sharing of safety data, safety reports, and safety information from the participating organizations.

      (e)  Processes and formal agreements governing the protection of the sources of information shared within the RST (protection form inappropriate use and protection against disclosure).

      (f)  Consultation, decision-making and conflict resolution processes.

      (g)  Documentation and reporting requirements.

## Continuous improvement process

6.6      The RST programme shall be constantly monitored for areas in need of improvement and/or failure to achieve the standards set forth in the ToR. Additionally, the team shall allocate time during a regularly scheduled meeting to discuss each item on the checklist found in Appendix A. Their responses shall be recorded and maintained as part of the documentation system for at least five years.

## Hazards and associated consequences

6.7      Once the team members are identified, the Chairperson selected, and the ToR and schedule are agreed to, the RST shall begin with the hazard identification process as identified through their respective SMS or other aviation safety relevant systems (arising mostly from safety reporting, investigation and audit activities). Hazards identified through the SMS of service providers who may not be participating in person at the meeting should be presented for evaluation. Guidance material on hazard identification is available through ICAO Doc 9859.

6.8      RST shall also conduct periodic visits to various airport locations (i.e., tower facility, construction areas, taxiway intersections, etc.) and solicit input especially from organizations without formal representation at the meeting. These may include corporate operators, industry organizations, ground services and others. By casting a wide net, the RST shall develop a deeper understanding of the operational complexity associated with the airport environment and, therefore, be better able to identify hazards and determine operational risks.

6.9      All "consequences" of damaging potential hazard shall be framed in realistic operational, as opposed to extremely remote and unlikely outcomes. The top-level (or generic) hazard shall be identified, in order to list the related

specific hazards and associated consequences. Hazardous conditions can sometimes combine, to result an even greater severity and/or probability of outcome.

**Safety risk assessment**

6.10    Safety risk assessments shall be conducted to provide the RST with a method for appropriately managing the risks of identified hazards, developing effective risk mitigation strategies, and prioritizing their workflow.  The RST shall determine which areas require its immediate attention to reduce the runway safety risk to As Low As Reasonably Practicable (ALARP).   The risk assessment shall also determine the level of acceptable risk.

6.11    Safety risk assessment and management shall be in line with the guidance available in ICAO Doc 9859. Once the hazards have been identified, the objective is to determine the safety risk severity in the context of the local system accounting for the current defences and mitigations in place at the time. This information shall then be used to categorize the safety risk severity using predefined guidance in ICAO Doc 9859.

6.12    Based on the event of the worst consequences, the RST shall evaluate the relative probability (or likelihood) of that event occurring in the specific operational environment, after taking into account the current defences and risk mitigation strategies in place. The RST shall consult associated safety and hazard report databases, incident & accident investigation reports, flight data monitoring and analysis, operational audit data and other historical sources to determine the likelihood of the identified consequence occurring. Subsequently the RST shall through the assessment process to ensure the resulting level of safety risk is acceptable.

**Developing recommendations and action plan**

6.13    Following the safety risk assessment, the RST shall develop specific recommendations to reduce the risk, and an action plan to ensure the recommendations are implemented. The RST shall consider the following:

        a)   Prioritization

The RST shall ensure their solutions are prioritized according to the "safety risk tolerability" assessment.

b)   Control strategies

Safety risk is controlled by addressing either:

1.   the probability of the consequences occurring;

2.   the severity level of the consequences; or

3.   both simultaneously.

Key approaches to controlling safety risk include:

1.   Avoidance: The operation or activity is cancelled because the safety risk exceeds the benefit of continuing the operation or activity.

2.   Reduction: The frequency of the operation or activity is reduced, or action is taken to reduce the severity of the consequences of the risks.

3.   Segregation: Action is taken to isolate the effects of the consequences of the hazard or build in redundancy to protect against them.

c)   Evaluating alternative solutions

During the process, the RST shall explore several strategies for controlling safety risks. These strategies shall be evaluated against one another to find the most effective and efficient solution using objective and subjective measures. These measures may include criteria such as conducting a cost/benefit analysis, determining the enforceability of the proposal, assessing the acceptability to the affected stakeholder, and others. In all cases, however, the RST must conduct a risk assessment of their proposed solution and evaluate any potential hazards created by their strategy.

The effectiveness of the strategy in reducing the risk is measured by the residual or remaining risk once the strategy has been activated. A risk assessment should determine if the remaining (residual) risk is acceptable, or if more solutions and mitigations are required.

d)   Notification to affected stakeholder

If the RST determines that either a mitigation strategy is required or part of the operation shall be modified or suspended, it shall make a formal

recommendation to the organization responsible for that part of the operation and include the rationale and risk assessment.

A summary of the entire process shall include a master register of the hazards identified, current controls and defences, risk analysis and outcome, additional controls and mitigations, action plan for implementation (owner and timelines), and residual risk. Appendix B contains the Runway Safety Management Form, which can serve as the tool to accomplish the recording of hazard and associated mitigation processes.

## Record keeping – data sharing

6.14     Proper and structured record keeping of observed and identified hazards, safety events and corrective actions allow for trend analysis. The RST shall identify a gate keeper who is responsible for the maintenance of the data base and can present reports and analysis upon request of the RST members.

6.15     Data exchange and sharing amongst RST members enhances the effectiveness of the RST.  RST is encourage to share the data across various locations for supporting the teams in identifying proper mitigation strategies.

## Safety Communication

6.16     The RST shall develop and maintain a process that enhances the safety awareness through newsletters, posters, stickers and safety seminars/workshops, orientation program, etc. RST shall provide the runway safety material to key frontline employees periodically.

6.17     RST shall establish a communication channel to solicit safety related information from all airport users / organizations.

6.18     ICAO awareness material that may be helpful to runway safety teams is available from:

www.icao.int/fsix/res_ans.cfm

## APPENDIX A

## RUNWAY SAFETY TEAM SET-UP CHECKLIST

### 1.        Instructions

1.1        The following checklist is provided to assist both existing and new RSTs in determining if gaps exist in their programme, or if improvements can be made. Although not intended to be an exhaustive list, the items on the checklist are designed to identify gaps in the system that would hinder the RST from achieving their goal of improving runway safety.

Five main areas are included in the checklist:

1)   Terms of Reference;
2)   Hazard identification;
3)   Safety Risk Management;
4)   Communication; and
5)   Continuous improvement.

A negative response to any of the associated question indicates an area that should receive attention by all members of the RST (and the organizations they represent) until the gap is filled.

### 2.        Checklist

| Item | Question | Response | Comments |
|---|---|---|---|
| 1.   Terms of Reference (ToR) | | | |
| 1.1 | Is there a ToR agreement in place? | ☐Yes ☐No | |
| 1.2 | Does the ToR define the scope of work of the RST? | ☐Yes ☐No | |
| 1.3 | Does the ToR define the roles for members of the RST? | ☐Yes ☐No | |
| 1.4 | Does the ToR define a process for handling data/reports received from the participating organizations? | ☐Yes ☐No | |
| 1.5 | Does the ToR describe the decision-making process to be used by the RST? | ☐Yes ☐No | |

| Item | Question | Response | Comments |
|---|---|---|---|
| 1.6 | Does the ToR define a process for resolving disagreements between RST members? | ☐Yes<br>☐No | |
| 2. | Hazard identification | | |
| 2.1 | Does the RST have a formal safety data collection and processing system for documenting operational hazards? | ☐Yes<br>☐No | |
| 2.2 | Do all RST members contribute to the formal safety data collection and processing system by sharing identified operational hazards? | ☐Yes<br>☐No | |
| 2.3 | Does the RST define and document specific consequences for the operational hazards? | ☐Yes<br>☐No | |
| 3. | Safety Risk Management | | |
| 3.1 | Does the RST have a formal process to manage the operational risk? | ☐Yes<br>☐No | |
| 3.2 | As part of the risk management process, are the consequences of the operational hazards assessed in terms of probability and severity? | ☐Yes<br>☐No | |
| 3.3 | Is there a formalized process to determine the level of risk the RST is willing to accept? | ☐Yes<br>☐No | |
| 3.4 | Does the RST develop risk mitigation strategies to control the level of risk within the operational environment? | ☐Yes<br>☐No | |
| 3.5 | Is there a formalized process for the RST to make recommendations to applicable stakeholders? | ☐Yes<br>☐No | |
| 3.6 | Is there a formalized process to document the decisions made by the RST during the risk management process? | ☐Yes<br>☐No | |
| 3.7 | Are the decisions made by the RST periodically reviewed to determine if the desired effect was achieved by their mitigations/recommendations? | ☐Yes<br>☐No | |
| 4. | Communication | | |
| 4.1 | Does the RST have a formal process to communicate with applicable stakeholders? | ☐Yes<br>☐No | |
| 4.2 | Does the RST periodically provide runway safety material to key frontline employees? | ☐Yes<br>☐No | |
| 4.3 | Does the RST participate in information sharing activities with other locations? | ☐Yes<br>☐No | |
| 4.4 | Does the RST solicit safety-related information from all airport users /organizations? | ☐Yes<br>☐No | |
| 4.5 | Does the RST provide any materials to enhance the education and awareness? | ☐Yes<br>☐No | |

| Item | Question | Response | Comments |
|------|----------|----------|----------|
| 5. Continuous improvement | | | |
| 5.1 | Does the RST have a formal process to continuously improve their processes & products? | ☐Yes ☐No | |
| 5.2 | Does the RST engage in formal, periodic reviews of their programme to ensure they are improving runway safety? | ☐Yes ☐No | |
| 5.3 | Are the results of the continuous improvement programme documented? | ☐Yes ☐No | |

Intentionally left blank

# APPENDIX B    RUNWAY SAFETY MANAGEMENT FORM

| Runway Safety Management Form | | | | | | |
|---|---|---|---|---|---|---|
| **Reference:** | | **Date Opened** dd/mm/yy | | | **Date Closed** dd/mm/yy | |
| **General Information** | | | | | | |
| Airport: | | What area is affected: | ☐ runway | ☐ taxiway | ☐ ramp | ☐ general |
| Specific Identifier (runway/taxiway identifier): | | | | | | |

**Safety Outcomes**

| Safety Risk Type: | ☐ Runway Excursion | ☐ Runway Incursion - Aircraft | ☐ Wildlife Encounter |
|---|---|---|---|
| | ☐ Abnormal Landing | ☐ Runway Incursion - Vehicle | ☐ Birdstrike    ☐ Other (Specify) |

| Has an event occurred, or is this a hazard (potential outcome): | ☐ actual outcome (event occurred) | occurrence date |
|---|---|---|
| | ☐ potential outcome (no event occurred) | dd/mm/yy |

Description of actual or potrential outcome

Suppporting Document Type:    ☐ Accident Report    ☐ Incident Report    ☐ Audit Report    ☐ Other (Specify)

**Safety Issues**

| ☐ Navigation Aids | ☐ Meteorological | ☐ Approach Vectoring | ☐ Other |
|---|---|---|---|
| ☐ Runway/Taxiway Marking | ☐ Obstacles | ☐ Runway Surface Condition | |
| ☐ VASI / PAPI | ☐ Approach lights | ☐ Airport Construction | |
| ☐ Communications | ☐ Runway/Taxiway Lights | ☐ Procedures | |

*Once you have completed the identification of the safety issues - please submit the form to log this report.*

*During the runway safety team meeting you should address each of the reports as an item on the agenda.*

*The following sections are provided as a tool to manage the outcomes of the meeting.*

**Risk Assessment**

*(The risk assessment portion is to be completed as part of the runway safety team meeting)*

| What is the **Severity** of occurrence: | ☐ Catastrophic | ☐ Hazardous | ☐ Major | ☐ Minor | ☐ Negligable |
|---|---|---|---|---|---|
| What is the **Likelihood** of occurrence: | ☐ Frequent | ☐ Occasional | ☐ Remote | ☐ Improbable | ☐ Extremely Improbable |
| **Risk** Level (from below risk table): | ☐ High | ☐ Moderate | ☐ Low | | |

*If the risk level is Moderate or High, a corrective action plan is required*

| | | Likelihood | | | | |
|---|---|---|---|---|---|---|
| | | Certain / Frequent | Likely / Occasional | Possible / Remote | Unlikely / Improbable | Execptional / Impossible |
| **Severity** | Catastrophic | High | High | High | Moderate | Moderate |
| | Major | High | High | Moderate | Moderate | Moderate |
| | Moderate | High | Moderate | Moderate | Moderate | Low |
| | Minor | Moderate | Moderate | Moderate | Low | Low |
| | Insignificant | Low | Low | Low | Low | Low |

**Corrective Action Plan**

*(The corrective action plan is based on the recommendations of the Runway Safety Team and is to be completed as part of the Runway Safety Team meeting)*

| Action Plan Description: | | |
|---|---|---|
| Action Item Description: | | |
| Executing Body: | Implementation date: dd/mm/yy | Status: |
| Action Plan Description: | | |
| Action Item Description: | | |
| Executing Body: | Implementation date: dd/mm/yy | Status: |