

**Kingdom of Saudi Arabia  
General Authority of Civil Aviation  
Safety and Economic Regulation**

**Safety Department**

**Aerodrome Safety and Standards Division**

**KSA Runway Safety Program**

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# KSA Runway Safety Program

## 1. Purpose

1.1 This Safety Leaflet provides information related to the establishment of an integrated Runway Safety Program in the Kingdom of Saudi Arabia (KSA). The program will be supported by education and training material distributed on a regular basis, and will be facilitated through the KSA airport Local Runway Safety Teams.

1.2 This Safety Leaflet provides information for:

- Aerodrome Operations (Section 3)
- Aircraft Operations; (Section 4)
- Airside Vehicle Operations (Section 5); and
- Air Traffic Control Operations (Section 6)

1.3 Readers are encouraged to review all sections to gain a greater understanding of the overall runway safety program and the inter-relationship between stakeholders in ensuring runway safety.

1.4 **Nothing in this safety leaflet shall prevent pilots-in-command from exercising their best judgment and full authority in the choice of the best course of action to resolve a traffic conflict or avert a potential collision.**

## 2. Introduction

2.1 Landing and take-off are critical phases of flight. The runway is an area where landing and departing aircraft have significant opportunities to interact with other taxiing aircraft, ground vehicles, personnel, animals straying onto the runway, and temporary fixed or mobile foreign objects.

2.2 Given the speed of an aircraft - and its limited ability to take avoiding action on the runway (especially during take-off and landing roll) - the potential hazard created by runway incursions or the presence of foreign objects is of deep concern to aviation authorities around the world.

2.3 The International Civil Aviation Organization (ICAO) has specified standards and recommended practices (SARPs) and guidance relating to airport system operation and development of operational procedures for the purpose of achieving runway safety. ICAO has issued a manual which addresses the subject of runway incursion prevention as it relates to the safe operation of aircraft, air traffic management, vehicle movement on the manoeuvring area and aerodrome management.

2.4 To comply with ICAO Runway Safety requirements, appropriate measures have been introduced by GACA, individual airlines and airports operators.

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2.4 However, with the predicted and expected growth of air traffic - and associated increase in complexity in airport operations - it is GACA's view that the commitment to runway safety should also be addressed by a more effective and systematic approach. This is to ensure consistent and harmonized application of ICAO provisions and common understanding shared by all stakeholders.

2.5 GACA's Runway Safety Program (RSP) provides management guidelines and recommendations to stakeholders for ensuring and enhancing runway safety. The program is distributed to aircraft and airport operators as well as ATS units who are requested to observe the guidelines through continuous system improvement and adoption of industry current best practice.

2.6 The Airport Standards and Safety Division (ASSD) of the Safety Department (SD) of the Safety and Economic Regulation Sector (S&ER) is responsible for periodic review of the program taking into consideration the current international requirements, regional initiatives, airport developments, the growth in air traffic and technological advancement and development that in turn may help to better equip airports in achieving a high level of runway safety.

### 3. Airport Operations

3.1 A safe operational environment and effective runway incursion prevention are important factors that contribute to runway safety. With these basic factors, an aerodrome operator should establish procedures to monitor the conditions of manoeuvring areas, runways and ground visual aids which must be supported by effective maintenance program to ensure system integrity.

3.2 Logical layout, simplicity and avoidance of runway crossings should be included as elements in the design and introduction of new aerodrome layout changes and infrastructure.

3.3 Human factors must be considered in setting up aerodrome procedures with the objectives of minimizing human errors, misleading and respecting user-friendliness when used by pilots, vehicle drivers and air traffic controllers.

#### *GACA Regulation & Annex 14 Provisions*

3.4 An aerodrome operator is required to fully implement - at high priority - the applicable ICAO provisions relevant to runway safety. Such compliance forms the basis for aerodrome certification. Appropriate additional safeguarding measures should be taken into account to avoid runway incursion. This may include, but is not limited to, safeguarding of runway entry and exit points, improving taxiway holding points, installation of lights and stop bars, illumination of signs and so on.

#### *Runway Maintenance Program*

3.5 A maintenance program, including preventive maintenance where appropriate, must be established for the aerodrome to maintain runway in a condition which does not impair the safety, regularity or efficiency of aircraft operations. A robust maintenance program should be implemented to prevent unexpected failure or degradation of runway facilities.

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

#### *Pavement Maintenance & inspection procedures*

3.7 The surface of pavements of the manoeuvring areas (runways, taxiways and adjacent areas) must be kept clear of loose stones or other objects or debris that might cause damage to aircraft structures or engines, or adversely affect the operations of aircraft.

3.8 A comprehensive program for regular and runway periodic inspections and sweeping should be incorporated into the standard operating procedures of aerodrome operators. The regular inspections should be planned so as to ensure that an appropriate level of vigilance is maintained at all times.

3.9 The surface of runways and taxiways must be maintained in a condition that provides good friction characteristics and low rolling resistance. Standing water, mud, dust, sand, oil, rubber deposits and other contaminants or debris must be removed as rapidly and completely as possible to minimize accumulation.

3.10 Contaminants and debris material should also be removed as completely as possible from apron stands.

*Note: Sand used to clean fuel and oil spillage from aprons is a potential cause of aircraft engines damage and should be removed immediately after use.*

3.11 On every landing, the runway touchdown zone (TDZ) is heavily loaded and rubber from aircraft tyres is inevitably deposited on runway surface. The adverse effects of rubber deposits should be continuously monitored and addressed.

3.12 An aerodrome operator must establish a program to measure the friction and drainage characteristics of runway surface. 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*

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

3.14 The system of preventive maintenance of visual aids 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 component included in the approach and runway lighting systems; and

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- control of the correct functioning of lights and light intensity settings used by the air traffic control unit.

3.15 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 regular inspection by the airport operator and to audit by GACA S&ER.

#### *Aerodrome works*

3.14 An aerodrome operator must plan and implement works to be carried out at an aerodrome so as not to create any hazard or adverse impact on aircraft operations, or confusion to pilots. A comprehensive works plan should be developed and the work items should be thoroughly coordinated with aerodrome users, air traffic control and other service providers.

3.15 The aims of such coordination and consultation should be the identification of all potential hazards, and necessary measures for the work to be undertaken safely - and the early notification to all who need to know about any resulting operational changes.

3.16 Before starting work, practical checks of proposed arrangements must be made by staff having a comprehensive understanding of the program and its operational implications. This will normally be the aerodrome operations unit or equivalent.

3.17 Where significant changes to markings or lighting are being made, it may be necessary for the aerodrome to conduct a preliminary flight check in order to make sure that the changes have been correctly implemented and are functioning as intended. It should also be understood that changes to marking or lighting may give different perceptual effects at different times of the day or night, or in different weather conditions.

3.18 An aerodrome operator must make arrangement to inspect the works and surrounding areas, as circumstances require, to ensure aviation safety during and immediately after any period of development work, including changes to the physical characteristics, aerodrome lighting and other visual, and at any other time when there are conditions on the runway that could affect aircraft operations.

3.19 An aerodrome operator must appoint a person responsible for the safe and proper monitoring of work-in-progress on the manoeuvring area. This person is responsible for ensuring that the works information and planning is widely promulgated to airport users.

3.20 An aerodrome operator must ensure that promulgation of aeronautical information on the change of the aerodrome operational state, temporary withdrawals of facilities, or runway closures for planned works is issued and distributed in timely manner. The aeronautical information can be an AIP amendment, an AIP supplement or a Notice to Airmen (NOTAM).

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

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3.22 Any temporary work on the manoeuvring area must be suitably and clearly delineated and marked and lit in accordance with the appropriate aerodrome standards. The work areas must be notified as unavailable for use.

3.23 All obstacles including vehicles and plants used during work-in-progress in the movement area must be marked and lit in accordance with the appropriate aerodrome standards.

3.24 Vehicles used during work-in-progress on the movement area must be equipped with a radio for two-way communications with air traffic control and the unit responsible for airfield control. The drivers of these vehicles shall be properly licensed, trained and briefed. This should include, but not be limited to, information about:

- the aerodrome layout and the pre-defined itineraries from and to the work areas;
- the work areas and the rules of the aerodrome ground surface movement;
- the restriction of vehicular traffic and speed limitations; and
- the use and meaning of visual aids.

#### ***Safety Plan***

3.25 The planning process employed in the development of major construction projects at KSA international and regional airports must include a Safety Plan (and where required, a Safety Case) which details:

- how runway safety is maintained during periods of 'work-in-progress', particularly when contractors who are not familiar with the aerodrome or with aerodrome operations are involved; and
- the control measures that would be implemented should it be deemed necessary to continue both work-in-progress and aircraft operations during low visibility procedures (LVPs).

#### ***Safety Management System (SMS)***

3.26 Under GACA regulations, an aerodrome operator must implement a safety management system (SMS). An SMS is an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures, and forms the primary safety oversight mechanism covering the way an aerodrome manages safety. It also provides an identifiable and easily audited systematic control of the management of safety at an aerodrome. By applying lessons learned, an SMS should aim to make measurable improvements to the overall level of safety.

3.27 To address runway safety, an aerodrome operator must develop and maintain an effective process to identify safety hazards affecting operations. Hazard identification should be based on a combination of reactive (using safety data from an event that has happened), proactive (using safety data from a near miss report) and predictive (actively looking at normal day-to-day operations to see where potential problems could occur) methods of safety data collection.

3.28 The aerodrome operator must develop and maintain an effective process that ensures analysis and assessment of the safety risks in aerodrome operations, and must implement any remedial action necessary to maintain risks at a level that is as low as reasonably practicable. Risk assessments should be reviewed regularly, and when changes occur that may affect the safety hazards or the associated risks.

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3.29 Facilities, equipment and procedures used to support airport operations must be designed and operated in a way that the combination of the probability of occurrence and the severity 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 severity of consequences.

### *SMS Implementation*

3.30 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 (including runway safety team)** – 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 surveys**– periodic safety surveys are to be performed to confirm the compliance with the safety requirements and the principles, rules and procedures 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.

## **4. Aircraft Operations**

4.1 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*

4.2. Pilots should be given training on visual aids, (e.g., aerodrome signage, lighting 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 lighting that can be anticipated at aerodromes is vital.

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*Cockpit management during ground operation*

4.3 The taxi phase should be treated as a ‘critical phase of flight’, which requires careful planning.

4.4 Pilots should be familiar with the airports 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.

4.5 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.

4.6 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.

4.7 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.

4.8 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 – or where fitted a cockpit display of traffic information - may be used to obtain a better picture on the traffic situation.

4.9 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.

4.10 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*

4.11 It is vital that pilots follow the clearances or instructions that are actually received, and not those that they expected to receive (i.e., don’t anticipate).

4.12 Standard phraseology must be used as far as practicable.

4.13 A clearance must be read back in full - with the aircraft callsign included. The runway designator must be included in case of hold short, runway crossing, take-off, or landing.

4.14 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 must contain an explicit clearance to cross the runway or an instruction to hold short of that runway



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4.15 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.

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

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

#### *Crew resource management*

4.18 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.

4.19 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.

## **5. Airside Vehicle Operations**

5.1 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 raise the situation awareness of drivers and aircrew.

#### *Control of Airside Driving and Airside Driving Certification*

5.2 In order to determine a driver's competency for operating vehicles at airside, an aerodrome operator must administer an Airside Driving Permit (ADP) System for the aerodrome.

5.3 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.

5.4 All drivers should be trained and assessed initially and be provided with refresher training at agreed intervals, and regular re-examined to determine their competency.

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

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### *Airside Driving Training*

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

5.7 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*

5.8 Airside drivers must be given a clear message that ATC instructions must be followed at all times. Drivers must not enter the runway without ATC authorization. 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.

5.9 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*

5.10 Standard phraseology should be used for communication among drivers, controllers and airfield control personnel. The vehicle driver (or his radio operator team member) who communicates with air traffic controller must read back all instructions pertaining to entering, leaving or crossing runways.

### *Situational Awareness*

5.11 Situational awareness is about knowing where you are and where you want to go, as well as knowing the traffic in your surrounding area. Drivers should be encouraged to exercise extra vigilance when operating in the vicinity of runways. Close attention must be paid to visual cues, lightings and signage - especially at night, or in low/poor visibility.

## **6. Air Traffic Control Operations**

6.1 One of the primary objectives of air traffic control at an airport is to prevent collision between aircraft, and between aircraft and vehicles, on the maneuvering area.

6.2 In KSA, the skills and procedures for achieving this objective are included in the initial training, refresher training and proficiency assessment of air traffic control personnel. However, ATS units are advised to make

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continuous effort to promote runway safety through service quality assurance, ongoing enhancement of operational management, and improvement of air traffic control facilities through utilization of state-of-the-art technology.

### *Safety Management System*

6.3 GACA-ANS and the management of an ATS unit should fully commit to promoting runway safety and support any related activity. Safety management requirements for air traffic services are specified in GACA regulations.

6.4 ATS Units must implement the necessary safety management rules, procedures and practices stated in those regulations, and make efforts to conduct safety awareness of staff - and motivate and encourage a safety reporting and improvement culture.

### *Airfield Surveillance*

6.5 In addition to the skills and qualifications of aerodrome control, air traffic controllers should be educated - through training, periodic briefing and awareness sessions - on the importance of visual surveillance, with particular emphasis on vigilance in determining aircraft and vehicle positions.

6.6 Restrictions to the visibility from the control tower that may have a potential impact to the ability of controllers to see the runway - or a portion of it - should be assessed and clearly made known to aerodrome controllers.

6.7 To reinforce situational awareness about aerodrome ground surface movements, ATC may request other airport units to provide supplementary surveillance from their locations or vehicles on aircraft/vehicle positions if necessitated by circumstances e.g., at night or in time of poor visibility.

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

### *Operational Management*

6.9 Oversight and monitoring 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.

6.10 In KSA, low weather minima operations do not occur frequently. ATS unit management should ensure that controllers are familiar with the Low Visibility Procedures through refresher training, periodic briefing or discussion during proficiency assessments.

6.11 A system or work practice should be developed and provided for use by controllers, to provide a memory aid indicating that a particular runway is being occupied by towing aircraft, vehicles or maintenance personnel etc.

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### *Operational Communication*

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

6.13 All aerodrome controllers are required to attain at least ICAO Level 4 in the English language proficiency in accordance with GACA Regulations.

6.14 Standard radio-communication phraseology should be used as far as practicable.

6.15 Instructions for aircraft or vehicles to enter/exit the runway must be issued in a clear and unambiguous manner. Full call-sign of aircraft or vehicles and runway designator must be used to avoid confusion.

6.16 All clearances for operation on the manoeuvring area must be read back.

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

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

6.19 Where practicable, the en-route clearance should be passed to a pilot before the aircraft leaves the gate to avoid distraction to pilots during taxiing.

## **7. Further Information**

7.1 Further information on the Runway Safety Program may be obtained from:

Manager, Aerodrome Safety and Standards Division

Safety and Economic Regulation

General Authority of Civil Aviation

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## **8. Authorization**

Name/Position	Signature	Date
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