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The Role of the RST in Enhancing Runway Safety: The Singapore Experience

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CAAS
Civil Aviation Authority of Singapore

Scope

- Introduction
- Changi Airport Runway Safety Programme
- Runway Safety Enhancements / Measures
- Runway Safety Reporting and Dissemination
- Runway Safety Culture and Promotion

Introduction

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Introduction

Changi Aerodrome

- Code 4
- Can handle up to Code F aircraft
- 2 parallel runways
- RFF Cat 10
- CAT II Low Visibility Operations

In 2011,

Changi Airport

46.5 million
Passenger movements

301,544
Aircraft movements

1,865,000 tonnes
Airfreight Tonnage

Changi Airport
Runway Safety Programme

Civil Aviation Authority of Singapore

Changi Airport Runway Safety Programme

The 4 "C" Principles:

1) *Consultation*
2) *Cooperation*
3) *Collaboration*
4) *Communications*

Changi Airport Runway Safety Team (RST)

Objective: To assure the safety of aircraft on the runway surface and to mitigate problem areas where solutions are not immediately available

Formed in 2005
Chaired by Director, Air Traffic Services
Meets twice annually

Air Traffic Services

- *Director, Air Traffic Services*
- *Chief, Air Traffic Control Officer*
- *Chief, Changi Tower*
- *Chief, Seletar Tower*
- *Head(Standards Unit)*
- *Head(Safety Office)*
- *Deputy Chief, Changi Tower*

Aerodrome Operator

- *Airside Operations*
- *Engineering & Development*
- *Aerodrome Safety Unit*

Other stakeholders

- *Air Line Pilots' Association – Singapore*
- *Airline Pilots*

Terms of reference of Changi Airport RST

- The Changi Airport RST will assist in enhancing runway safety by:

  - Reviewing investigation/ incident reports to identify hotspots or problem areas at the aerodrome and suggest improvements where applicable

  - Working together to better understand the operating difficulties and suggest improvements where applicable

  - Analysing and commenting on proposed aerodrome works affecting the manoeuvring areas and if necessary, initiate new processes, procedures, methods, new equipment to ensure they are ICAO compliant

Runway Safety Enhancements / Measures

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Runway Safety Enhancements

- Visual Aids:
  - Ensure visual aids are ICAO-compliant and visible to pilots and drivers in all weather conditions
  - Examples are:
    - ✓ Enhanced taxiway centre line markings
    - ✓ Mandatory instruction markings (i.e. runway designation signs)
    - ✓ Controllable stop bars at runway-holding positions
    - ✓ Runway guard lights (Configuration A) at runway-holding positions

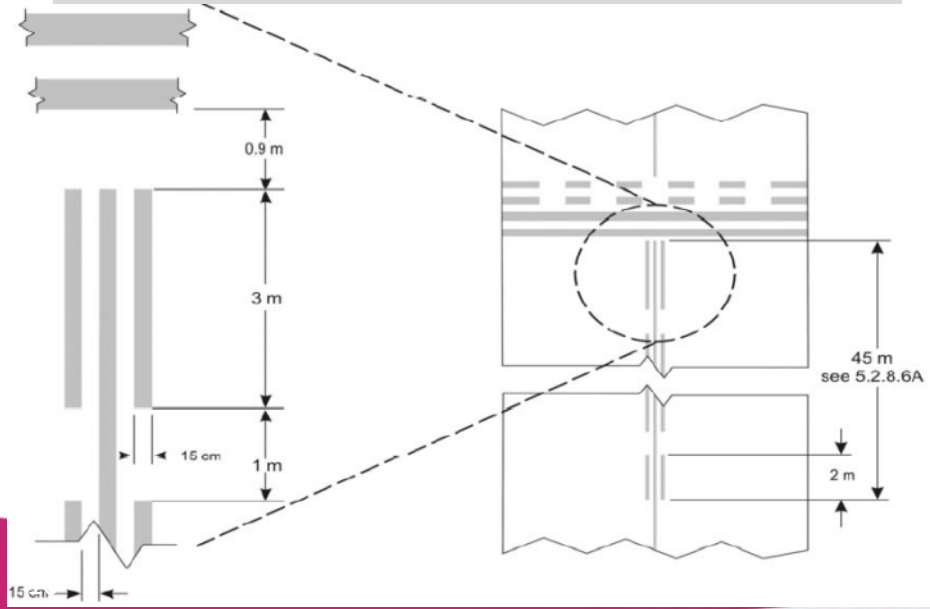
Enhanced Taxiway Centre Line & Mandatory Instruction Markings

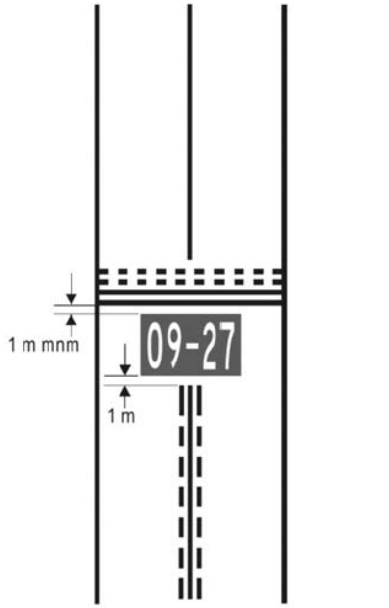
5.2.8.4 *Recommendation.— **Where it is necessary** to denote the proximity of a runway-holding position, enhanced taxiway centre line marking should be provided.*

*Note.— The provision of enhanced taxiway centre line marking may form **part of runway incursion prevention measures**.*

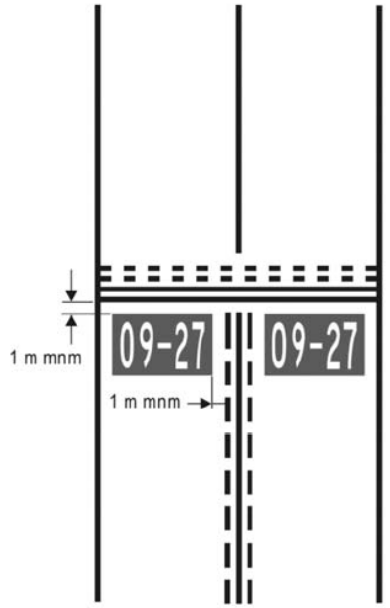
5.2.8.5 **Where provided**, enhanced taxiway centre line marking shall be installed at **all** taxiway/runway intersections at that aerodrome.

*5.2.16.2 Recommendation. — Where operationally required, such as on taxiways exceeding 60 m in width, **or to assist in the prevention of a runway incursion**, a mandatory instruction sign should be supplemented by a mandatory instruction marking.*





a) Taxiways of code letters A, B, C or D



b) Taxiways of code letters E or F

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Enhanced Taxiway Centre Line & Mandatory Instruction Markings

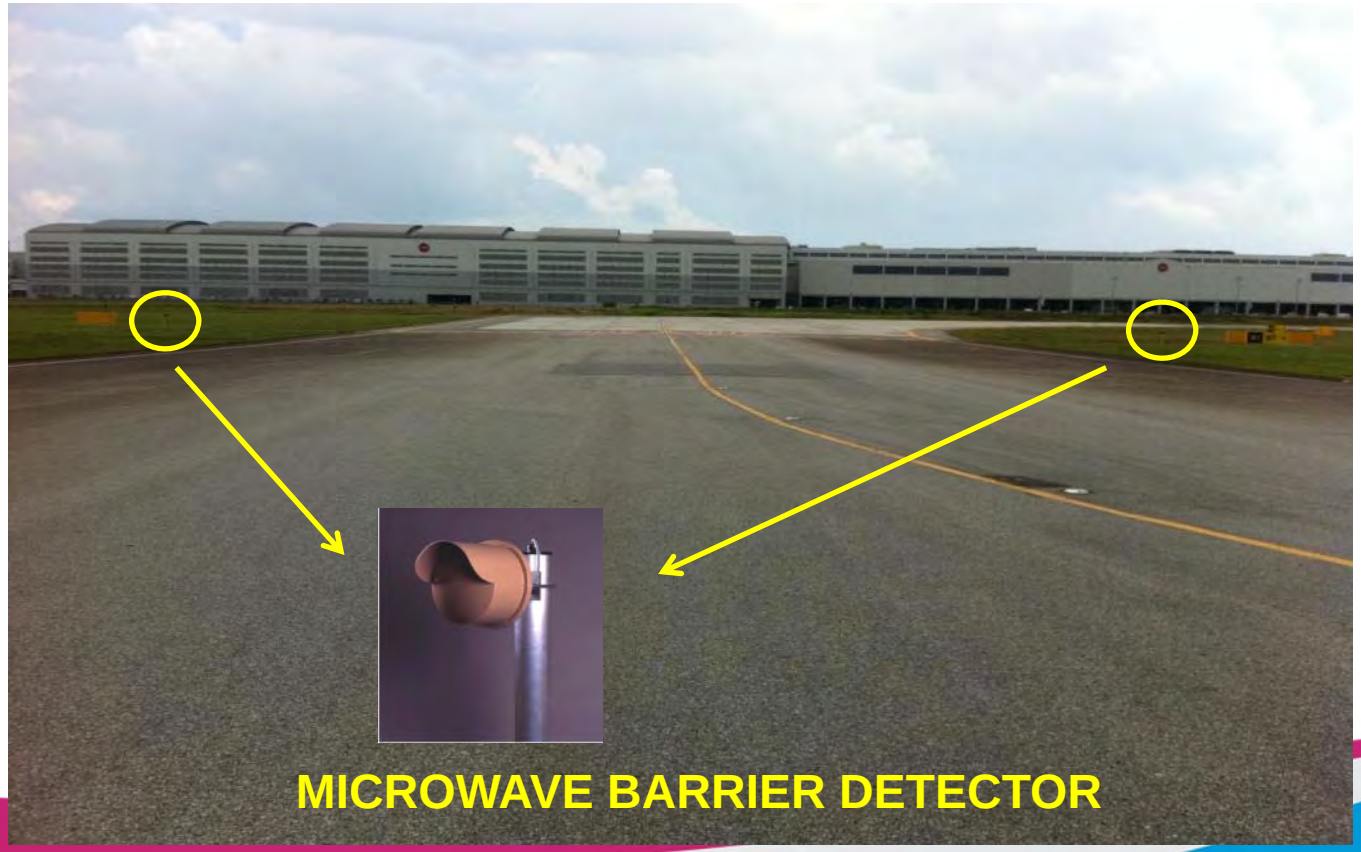
Former Centreline Marking

Enhanced Centreline Marking

Enhanced and Mandatory Instructions Markings in Changi airport

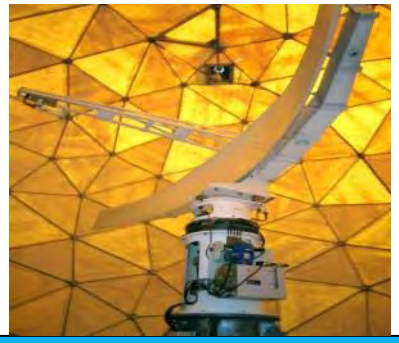
Runway Safety Enhancements

- Technologies:
  - **Microwave Barrier Detectors (MBDs)** – Detect unauthorised aircraft, vehicle or person entering active runway



Multilateration System

- **Part of A-SMGCS –** Detect and identify all Mode S equipped aircraft and vehicles moving on the movement area even during bad weather conditions such as heavy rain



Ground Sensor

Surface Movement Radar

Multilateration System

A-SMGCS Display (4 at tower, 2 at Firestations)

Approach Radars

LORADS II ATC System

FIDS (CAG)

DPS (Data Processing & Display System)

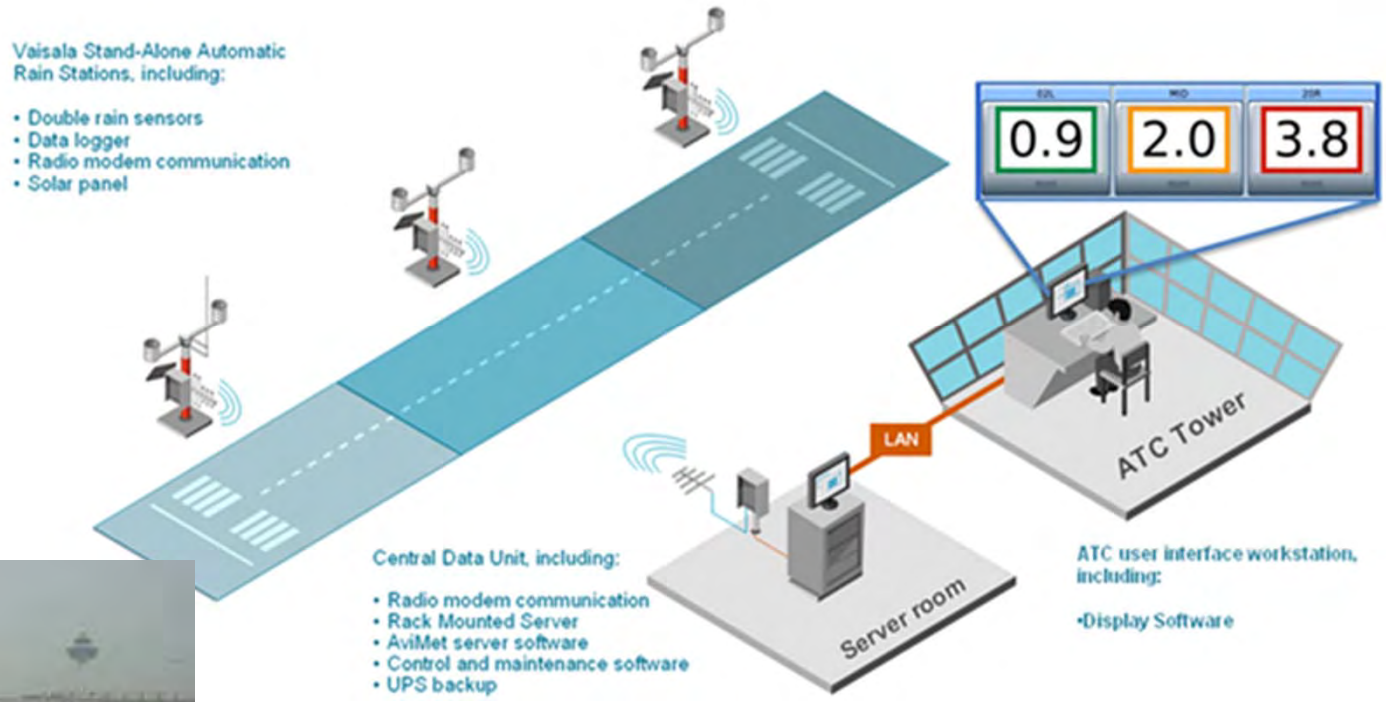
CAAS

FOD Detection System

- Detect and identify foreign objects and debris on active runway

NEW: Runway Water Level Indicator System (RWLIS)

- Provide information on water level to pilots thus assisting them in making better safety assessment for landings and take-off during adverse weather conditions



Control of Aerodrome Works on Runway

- Minimise the possibility of runway incursions by project and maintenance contractors
- Examples:
  - ✓ Scheduled runway closures for inspections and maintenance
  - ✓ Runway access and work procedures are established for works on runway (e.g. set up lighted marker boards, crosses; conduct pre-runway closure briefing in native tongue for foreign workers; procedures for normal/emergency opening of runway)


Marker boards

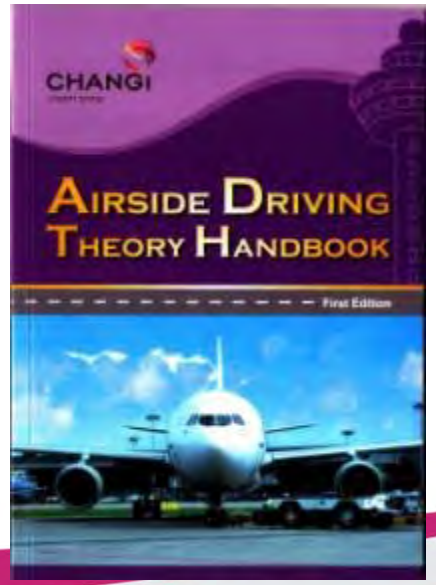

Setting up of lighted cross


Lighted cross (Night time)

Control of Airside Drivers

- Control measures implemented to ensure airside safety:
  - ✓ Education and testing of airside drivers
    - ✓ Possess a State license, Class 3
    - ✓ Attend and complete Airside Rules and Regulation Course
    - ✓ Require to pass a theory test and an Airfield Driving Safety Practical Test
    - ✓ Attend Refresher Course – once every two years before renewal

State License - Sample



Control of Airside Drivers

- Control measures implemented to ensure airside safety:
  - ✓ Licensing of drivers (CAT I and CAT II Airfield Driving Permit (ADP)):
    - ✓ Employers to support and justify staff to apply for CAT I to enter the runway
    - ✓ Applicant must be a holder of CAT II ADP for 3 months before he can be allowed to apply for CAT I ADP
    - ✓ Applicant is required to attend at least 10 familiarisation trips to the runway and pass the test before he is issued with the CAT I ADP

ADP (Old)

ADP (Current)

Control of Airside Vehicles

- Control measures implemented to ensure airside safety:
  - ✓ Licensing of vehicles:
    - ✓ Vehicles need to be installed with RT sets
    - ✓ Vehicles need to comply with colour scheme
    - ✓ Vehicle callsign must be painted on top of the vehicle
    - ✓ Warning sticker “No entry to runway/taxiway except clearance from Control Tower” to be displayed inside the vehicle to remind driver

Without imprint of aircraft
Vehicles **cannot operate** on the runway and taxiway

With imprint of aircraft
Vehicles **are allowed to operate** on the runway and taxiway

Control of Airside Vehicles and Drivers

- Control measures implemented to ensure airside safety:
  - ✓ Enforcement of aerodrome regulations (Airport By-Laws 2009)
    - ✓ Dealing with non-compliances to rules and regulations
    - ✓ Examples:
      - ✓ Composition of fines,
      - ✓ Suspension/ revocation of ADP

Changi Airport By-Laws 2009 (Examples)

Permission to proceed

8. The driver of a vehicle who desires to proceed to any part of the manoeuvring area shall obtain prior clearance from the Duty Tower Controller before proceeding to his destination.

Suspension or cancellation of driving permits

80.—(1) The airport licensee may, at any time in its discretion, suspend for such period as it thinks fit or cancel any airfield driving permit, forklift driving permit or driving permit for a lightweight transport machine issued under this Part if it is satisfied that —

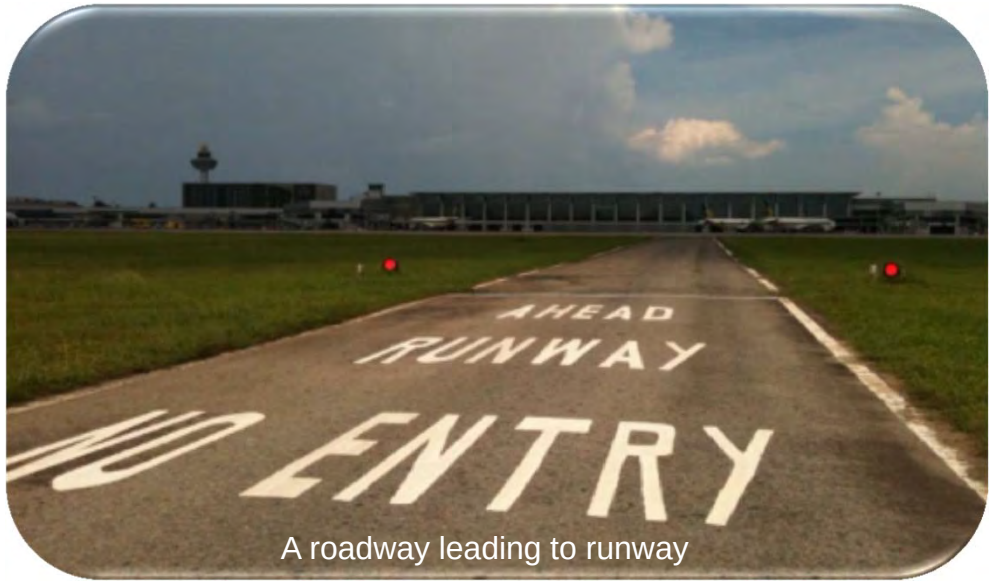
(*a*) there has been a contravention of any condition of the permit;

(*b*) the person to whom the permit has been issued is not competent to drive the relevant vehicle; or

(*c*) it would not be in the interests of public safety for him to hold a driving permit.

Control of Airside Vehicles and Drivers

- All roadways leading to runways are also armed with plastic chain barriers to prevent runway incursion



A roadway leading to runway


Plastic chain barrier (Day time)


Plastic chain barrier (Night time)

Runway Safety Reporting and Dissemination

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Runway Safety Reporting and Dissemination

- Aerodrome operator shall report all aircraft accidents and serious incidents to the Air Accident Investigation Bureau of Singapore

- Aerodrome operator shall also report any aircraft incidents, including accidents and serious incidents, to CAAS

- Safety lessons will be shared with the stakeholders via forums, meetings, airside notices and circulars, etc

- In addition, there are various forums (e.g. dialogue sessions with the aerodrome operator) to raise and resolve runway safety issues

Runway Safety Culture and Promotion

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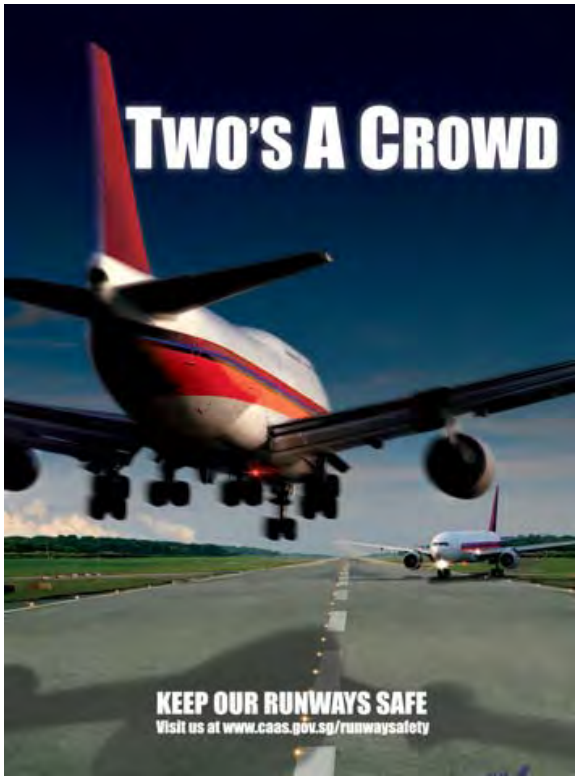
Runway Safety Culture and Promotion

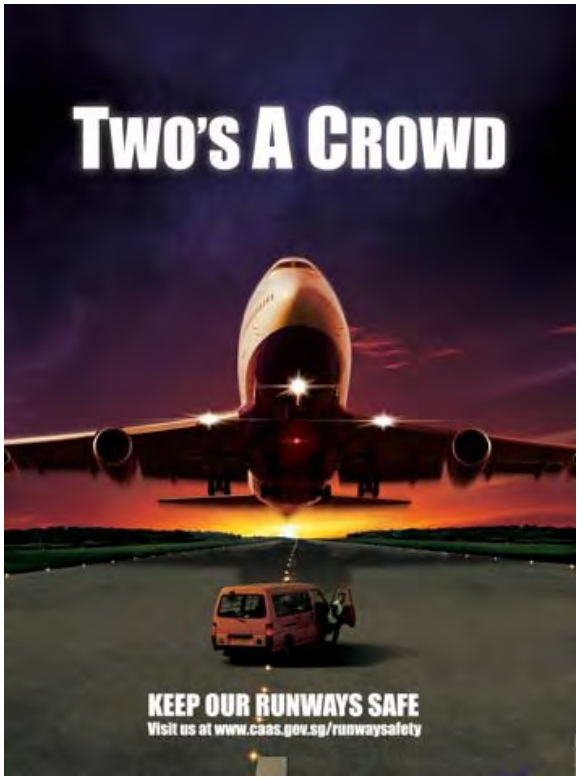
- Runway safety enhancement is a continuous process that requires the efforts and cooperation of all stakeholders of the civil aviation community

- Runway safety information is shared to stakeholders via regular forums, meetings, airside notices and circulars, etc

- Runway safety posters/handbooks have been printed and given to the stakeholders to educate and create awareness on runway safety e.g. runway incursions, foreign objects and debris

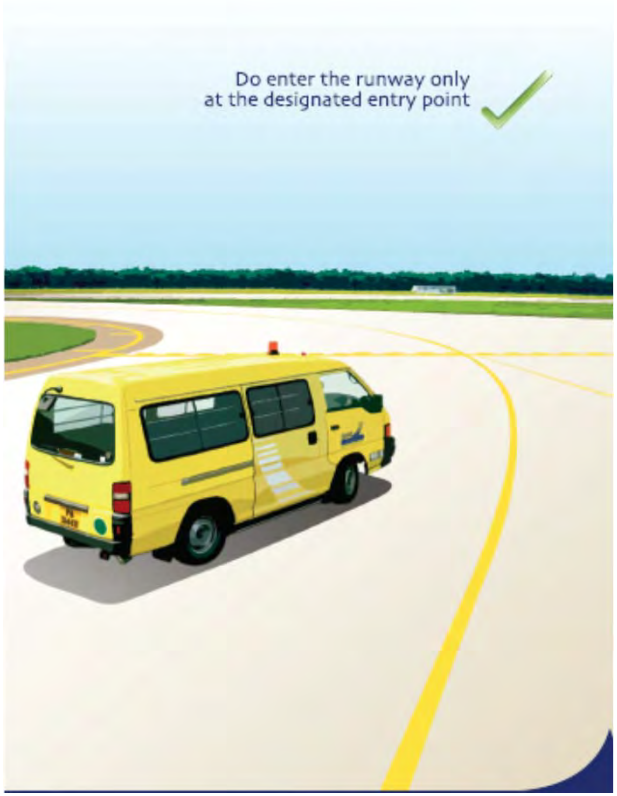
CAAS Runway Safety Posters





CAAS Runway Safety Posters

CAAS Safety Handbook



CAAS Safety Handbook

Thank You

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