CATEGORY ONE
AIRSIDE DRIVING THEORY HANDBOOK
1st edition 2014
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1st edition 2014
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¹Refer to CAT II ILS Manual – 2013
1 INTRODUCTION

1.1 Purpose

The contents of this CAT 1 Driving Handbook sets out the requirements, rules and standard operating procedures for any driver who operates within the manoeuvring area of Changi Airside. The contents also include vehicular requirements for any vehicle operating in the manoeuvring area.

Considering that the manoeuvring area is a highly controlled and critical operating area with heavy movement of aircraft, the rules stated in this handbook, in addition to those published in the Airside Driving Theory Handbook (for apron drivers), shall be strictly adhered to in order to ensure the safety of passengers, working personnel, aircraft and vehicles.

1.2 Review and Revision of Contents

The contents of this handbook will be reviewed on a regular basis. Any supplement or revision to the contents of this handbook shall be published on the website of Changi Airport Group (CAG) Airside Driving Centre (ADC). An “Airside Operations Notice” shall also be published to keep the airside community informed of the supplement or revision.

Driver shall keep an active lookout for such updates and ensure they comply with the rules published in the supplement or revision notice.

Website of CAG ADC:

1.3 Legislation

1.3.1 All personnel operating in the airside of Changi Airport are governed by the following:

(a) The Civil Aviation Authority of Singapore Act 2009 (Act 17 of 2009)
(b) The Civil Aviation Authority of Singapore (Changi Airport) By-Laws 2009
(c) The Civil Aviation Authority of Singapore (Composition of Offences) Regulations 2009
(d) Protected Areas and Protected Places Act (Chapter 256) (Note : In addition, the Penal Code is applicable in certain traffic accidents determined by State Police)
1.4 Jurisdiction

1.4.1 All vehicles and handling operations at the airside, apron, and designated roadways are under the control and jurisdiction of Changi Airport Group (S) Pte Ltd (“CAG”), the airport licensee. CAG has also authorised its contracted enforcement staff from the Auxiliary Police, Airport Police and Airport Emergency Service to act on behalf of CAG in respect of security matters and to check vehicles and persons as may be allowed within the provisions of the law.

1.4.2 The control of aircraft taxiing from runway to aircraft stands and vice versa from the Changi Tower is under the control and jurisdiction of the Civil Aviation Authority of Singapore.

1.5 Related Reference Documents

(a) International Standards and Recommended Practices for Aeronautical Communications in ICAO Annex 10 Vol 2 (Comms/Procedures)
(b) ICAO Annex 14
(c) ICAO Document 9432 (Manual of Radio Telephony)
(d) ICAO Document 9870 (Manual on the Prevention of Runway Incursions)
(e) Changi Aerodrome Manual
(f) CATII ILS Manual – 2013
2. TERMINOLOGY

2.1 Definitions

**Accident** means an occurrence associated with the operation or handling of an aircraft in which a person is fatally or seriously injured, or the aircraft sustains damage (adapted from the definition in ICAO Annex 13).

**Aerodrome** means the Changi Aerodrome, Seletar Aerodrome and any other aerodrome maintained or managed by the Authority and include any road or uncovered area which is within the limits of the aerodrome but does not include any road or uncovered area to which the public has access.

**Aircraft stand** means an area on an apron for parking of aircraft.

**Airfield Driving Permit** means an airfield driving permit issued to the airport licensee under By-Law 67.

**Airfield Vehicle Permit** means an airfield vehicle permit issued by the airport authority under by-law 64.

**Airside** means the movement area of the airport and the adjacent terrain and buildings or parts thereof, access to which is controlled, but does not include the cargo handling area.

**Apron** means that part of the airport, other than the manoeuvring area, to be used for accommodating aircraft for the purposes of embarkation or disembarkation of passengers, loading or unloading of mail or cargo, or fuelling, parking or maintenance of aircraft.

**Authorised person** means –
(a) any other officer or employee of the airport licensee; or
(b) any person duly authorised by the airport licensee to act on its behalf

**CAAS** means Civil Aviation Authority of Singapore.

**CAG** means Changi Airport Group (S) Pte Ltd

**Category 1 Airfield Driving Permit** means driver of this permit is allowed to enter runway and taxiway subject to approval from Changi Tower.
“Follow Me” Vehicle means a vehicle used to guide aircraft or other vehicle.

Incident means an occurrence, other than an accident, associated with the operation or handling of an aircraft, which affects or could affect the safety of operation.

Lightweight transport machine means any mechanically propelled or electrically operated lightweight transportation machine intended for short distance commuting and includes the buggy.

Manoeuvring area means that part of the airport to be used for the taking off, landing and taxiing of the aircraft, but does not include areas set aside to accommodate aircraft, for the embarkation or disembarkation of passengers, for the loading or unloading of mail or cargo, or for fuelling, parking or maintenance of aircraft.

Movement area means that part of the airport to be used for the taking off, landing and taxiing of the aircraft, consisting of the manoeuvring area and the apron.

Notice of Offence means Notice of Composition of Offences is a report of any violations of the Civil Aviation Authority of Singapore (Composition of Offences) Regulations 2009.

Perimeter Roadway means that road within the airside that allows vehicle to move around the airport clear of apron, taxiways and runways.

Primary Roadway means roadways located in front of all aircraft parking stands and baggage handling areas meant for movement of vehicle and equipment.

Runway means a defined rectangular area prepared for the landing and take-off of aircraft.

Runway incursion means 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 aircraft¹.

Runway Strip means a defined area, including the runway and stopway, if provided, that is intended:
   a) to reduce the risk of damage to aircraft running off a runway; and
   b) to protect aircraft flying over the area during take-off and landing operations².

¹ Refer to ICAO Doc 9870
² Refer to ICAO Annex 14
Secondary Roadway means roadways located behind all aircraft parking stands meant for movement of vehicle and equipment that are not allowed or unable to access the primary roadways.

Vehicle means any vehicle whether mechanically propelled or otherwise, and includes bicycle, tricycle, cart, buggy, light weight transport machine, trailer, forklift, tractor, passenger loading bridge and any movable equipment, and vehicular traffic “shall be construed accordingly”.

2.2 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ACC</td>
<td>Apron Control Centre</td>
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<tr>
<td>ADC</td>
<td>Airside Driving Centre</td>
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<tr>
<td>AMC</td>
<td>Airside Management Centre</td>
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<tr>
<td>CAG</td>
<td>Changi Airport Group</td>
</tr>
<tr>
<td>CAT 1 ADP</td>
<td>Category 1 Airfield Driving Permit</td>
</tr>
<tr>
<td>CAT 1 AVP</td>
<td>Category 1 Airfield Vehicle Permit</td>
</tr>
<tr>
<td>FOD</td>
<td>Foreign Object Damage/Debris/Deposit</td>
</tr>
<tr>
<td>ILS</td>
<td>Instrument Landing System</td>
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<tr>
<td>OFZ</td>
<td>Obstacle Free Zone</td>
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<td>REP</td>
<td>Runway Entry/Exit Point</td>
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<tr>
<td>RT</td>
<td>Radio Telephony</td>
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<tr>
<td>SOP</td>
<td>Standard Operating Procedures</td>
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</table>
3 REQUIREMENTS FOR DRIVING ON MANOEUVRING AREAS

3.1 CATEGORY 1 Airfield Driving Permit (CAT 1 ADP)

3.1.1 To enter and drive in the manoeuvring area, driver must have a valid official purpose and possess a CAT 1 ADP. To qualify for the CAT 1 ADP, driver shall first possess an ADP for driving in the apron for at least three (3) months. Driver must not have committed any infringement, ie. involved in accident/incident or issued with any notice of offence during the duration of the driver's airfield driving experience. Driver’s application shall be supported by his/her employer, as well as an airport agency.

To qualify for the CAT 1 ADP, driver shall also undergo additional training and pass a series of tests (theory, oral and practical) to demonstrate his/her competency in driving in the manoeuvring area.

3.1.1 Training
Driver shall attend a briefing conducted by CAG Airside Driving Centre prior to undergoing the tests. The briefing is classroom-based and will cover the rules and standard operating procedures of driving in the manoeuvring area.

In addition, driver shall complete ten (10) familiarisation trips in the manoeuvring area prior to undergoing the tests. Of the ten (10) familiarisation trips, eight (8) are to be conducted in the day* over three (3) different days and the remaining two (2) are to be conducted on two (2) different nights. Driver shall present a copy of the records of the familiarisation trips attended when applying for the tests.

*Note: Day refers to 7am to 7pm

3.1.2 Tests
Driver shall undergo and pass a written theory test, followed by an oral test on radio-telephony (RT) communication skills. Finally, driver has to undergo a practical test where he/she will be assessed on his/her
competency to drive in the manoeuvring area.

Upon passing all of the above tests, the driver will be issued with a Category 1 ADP.

3.1.3 Refresher Training
Driver shall undergo refresher training conducted by CAG ADC every year. The refresher training is conducted twice a year. ADC will notify the driver through the representative of each organisation of the course schedule. If the driver fails to attend the refresher training, the CAT 1 status in his/her ADP will be suspended.

3.2 CATEGORY 1 Airfield Vehicle Permit (CAT 1 AVP)

Vehicle operating in the manoeuvring area shall first possess a valid CAT 1 AVP. To qualify for a CAT 1 AVP, the following vehicular requirements shall be met.

3.2.1 Vehicular Requirements
(a) Possess a valid official purpose for operating in the manoeuvring area.

(b) Possess a valid radio call sign assigned by CAG ADC and the call sign shall be displayed in black, each letter no smaller than 60cm (breadth) and 45cm (length), on the highest point of the vehicle.

(c) Equipped with a set of Radio-telephony (RT) equipment and transponder approved by CAAS. A copy of the installation work order is to be retained and presented to CAG ADC vehicle inspection.

Note: The vehicle inspection will be conducted by CAG ADC prior to issuance of CAT 1 AVP to ensure all the necessary requirements listed in this section have been met.
(d) Entire body of the vehicle shall be painted yellow.

(e) A warning sign that is no less than 15mm (breadth) and 10mm (length) bearing the following words to be displayed on the dashboard or any position conspicuous to the driver.

```
NO ENTRY INTO RUNWAY/TAXIWAY
WITHOUT PERMISSION FROM CHANGI TOWER
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(f) Changi Tower’s contact number shall be displayed in the vehicle.

```
CHANGI TOWER (6541 2416 / 6541 2417)
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(g) A set of flashing yellow lights to be fitted on top of the vehicle. The flashing yellow light shall comply with ICAO standards (Type C lights) listed below.

- 60 - 90 flashes per minute
- Peak intensity at and below 50 - 500 cd/m² shall be 40 minimum 400 max
- Vertical beam spread shall be at 12° (Peak intensity shall be located at approximately 2.5° vertical)

A certificate from the vendor to prove that the flashing yellow lights installed complied with the standards above is to be retained and presented to CAG ADC during vehicle inspection.

(h) A copy of the latest Changi Aerodrome Layout map is to be placed in the vehicle during operations on the manoeuvring area.

*Note:* The latest aerodrome map can be downloaded from CAAS Aeronautical Information Publication (AIP) website. Subscribe to the website to receive alerts on latest updates.

4 AIRFIELD RULES AND REGULATIONS

4.1 Responsibilities of CAT 1 ADP Holder, ie. CAT 1 Driver

4.1.1 For the safe operations on the manoeuvring area, the driver shall first ensure that he/she possesses the necessary qualification to drive in the manoeuvring area, ie. a valid CAT 1 ADP.

4.1.2 Next, driver shall ensure there is a valid official purpose to drive into the manoeuvring area. No one shall enter the manoeuvring area unless absolutely necessary. **Entry into the manoeuvring area is also strictly subjected to approval from Changi Tower.**

4.1.3 **Driver** shall also ensure that he/she is familiar with the airfield layout in order to move safely and orderly in the manoeuvring area. Driver shall check that the latest copy of the aerodrome map is available in the vehicle prior to driving into the manoeuvring area.

4.1.4 All drivers shall use the standard RT phraseology as detailed in paragraph 5.10 (“Standard Phraseology”) and shall also ensure that they listen clearly to Changi Tower’s complete message and read back the complete message to Changi Tower.

4.1.5 It is the responsibility of the driver, who has been trained during the course of obtaining the CAT 1 ADP, to ensure communication over the radio-telephony channel is clear and precise. Thus, only the driver, ie. **CAT 1 ADP holder, is allowed to operate the radio-telephony set** and communicate with Changi Tower for all matters relating to driving on the manoeuvring area. Any exception to this rule shall only be allowed if authorisation has been granted by CAG ADC.

4.1.6 Lastly and very importantly, **driver shall adhere to the Standard Operating Procedures (SOP)** at all times when driving in the manoeuvring area. **Refer to the paragraph 4.2 for the relevant SOP.**

4.2 Standard Operating Procedures (SOP)

(a) Before commencing operations, driver shall:
   - check and ensure that the radio-telephony set is switched on and tuned to the correct frequency for Changi Airport (121.9 MHz);
   - perform radio check with CHANGI APRON to ensure equipment is working well and radio transmission is readable;
check that the transponder\(^1\) is working by checking the indicator light;

![Image of transponder and indicator light]

check that the flashing yellow light on the highest point of vehicle is switched on; and

![Image of flashing yellow light]

check that there is a latest copy of the airfield aerodrome layout map in the vehicle.

(b) Before entering the manoeuvring area, driver shall:

- report current position to CHANGI TOWER, as well as intended destination and purpose;
- request permission from CHANGI TOWER to enter the runway and/or taxiway;
- obtain permission from CHANGI TOWER before entering any part of the runway and/or taxiway;
- perform read-back of the permission received and enter only after acknowledged by CHANGI TOWER;
- stop before stopbar of taxiway junctions and scan the horizon for aircraft and other vehicular movement at all times;
- after receiving permission from Changi Tower to enter, driver is to check that stopbar light is de-illuminated (ie. switched off) before proceeding;

\(^1\) Refer to CAG Airport Operational and Safety Requirements.
the driver shall always **park** the vehicle facing the landing/take-off end of the runway when it is stationary on the runway.

*Note:*

i) When in doubt or unclear, driver shall remain at current location and seek confirmation again from **CHANGI TOWER**. If unable to clarify, driver should turn back; and

ii) Ensure the flashing yellow light on top of the vehicle is switched on and remains illuminated at all times when the vehicle is on the runway and/or taxiway;

iii) Ensure the transponder is working by checking the indicator light in the vehicle.

- perform final visual check just before entering the runway and/or taxiway to ensure that the area is clear of aircraft movement and always give way to taxiing aircraft or aircraft on tow;
- all drivers shall keep a strict lookout for aircraft and other vehicular movement and always maintain constant radio contact with Changi Tower.

(c) On the manoeuvring area, driver shall:
- driver shall report to Changi Tower that driver has vacated;
- maintain listening watch on the radio-telephony channel (121.9 MHz) at all times;
• never leave his/her vehicle unattended on the runway and/or taxiway.

**Note:**

i) In the event of radio-telephony failure while operating on the manoeuvring area, driver shall vacate the area immediately and contact Changi Tower via mobile phone after driver and vehicle are out of the manoeuvring area. CHANGI TOWER can be contacted at Tel: 6541 2416 / 6541 2417.

ii) Alternatively, driver can contact Changi Tower via a working radio-telephony set of another vehicle.

iii) All drivers in the runway shall always listen to their RT sets for any instructions from Changi Tower. If communication with Changi Tower is lost (after 5 tries), driver shall quickly vacate the runway and inform Changi Tower via phone or other means that he has vacated the runway.

(d) After completion of operations on the manoeuvring area, driver shall proceed to vacate the manoeuvring area. But, before exiting the manoeuvring area, driver shall:

• stop before the stop bar marking and look to his left and right for any approaching aircraft. If all is clear, driver shall then exit the manoeuvring area,
• report to CHANGI TOWER. This is to be done only after the vehicle is out of the manoeuvring area.

### 4.3 Scheduled Runway Inspections

All Cateogry 1 ADP holders, ie. drivers operating on the manoeuvring area, are to take note of the following procedures. These procedures are specific to entry into the runway.

(a) During the daily 5-min and 10-min scheduled runway inspections (timing as shown below), only Rovers 34, 35 and 39 are allowed to enter the manoeuvring area. All other drivers are not allowed.

(b) During the daily 15-min scheduled runway inspections only the following vehicles are allowed.
• Rover 34, 35, 39
• Rovers 10, 11, 13, 14, 18
• Runway sweepers
• Aircraft pavement & Airfield lighting contractors’ vehicles

All others who requires entry into the runway during this period (15 mins inspection) shall seek prior approval from CAG Airside Operations and Engineering. After obtaining approval and on the actual day of entry, driver shall contact driver of Rover 34 to find out the assembly location. Driver must coordinate with driver of Rover 34 prior to entry.

(c) During the daily 90-min scheduled runway inspections, all drivers that require entry into the runway shall assemble at the Runway Entry Point (REP) of the runway.
   • Driver shall report to driver of Rover 39 to obtain a vehicle tag during assembly at the REP.
   • All entry and exit shall be from the REP.

(d) For all drivers entering runway, prior to entry, driver is to seek permission from Changi Tower to enter. After receiving permission from Changi Tower to enter, driver is to check that stopbar light is de-illuminated (ie. switched off) before proceeding.

(e) Refer to paragraph 4.2 on Standard Operating Procedures on operating in the manoeuvring areas.

4.4 Adhoc Entry Into Runway

(a) All Category 1 ADP holders shall enter runway with valid reasons only.

(b) Before entering, driver shall obtain permission from Changi Tower.

(c) All drivers shall refer to paragraph 4.2 on “Standard Operating Procedures” on operating on the manoeuvring areas.

Note: If the instruction is correct, Changi Tower is not required to acknowledge a correct read back. Changi Tower will not provide acknowledgement after permission to enter runway is given, performed and the stopbar lights switched off.

4.5 Escort

i. Driver without a valid CAT 1 ADP who requires to drive into the manoeuvring area shall be escorted by a CAT 1 driver in a separate CAT 1 vehicle.
ii. Escorting is permissible only:
   (a) During scheduled Runway Closure of 90 minutes, planned night closures of more than 90 minutes (e.g. runway repair, clearing of rubber deposits) and ad hoc closures (day or night closures of more than 90 minutes (e.g. flushing of fuel spillage); and
   (b) For point to point movement in the manoeuvring area during short closures to escort vehicles to the closed area of works (e.g. replacement of runway edge lights and urgent patch-up works).

iii. CAT 1 driver shall:
   (a) Inform ATC before the commencement of escort (purpose of escort, number of vehicles being escorted, etc.);
   (b) Maintain close listening watch on radio frequency at all times;
   (c) Be responsible and liable for the safe operations of the driver(s) and vehicle(s) that he/she escorts;
   (d) Escort a maximum of two (2) vehicles at any one time;
   (e) Ensure that he/she stays close to the escorted driver(s) and vehicle(s) and keep a close look-out on their operations;
   (f) Brief the escorted driver(s) prior to the commencement of escort on the route, objective of the mission, escort procedures, means of communication, airside rules and regulations and contingency procedures; and
   (g) Ensure that he/she has the mobile telephone number(s) of the escorted driver(s) prior to the commencement of escort.

iv. Escorted driver shall:
   (a) Be responsible to follow and keep a look out on the CAT 1 driver at all times;
   (b) Never overtake or be ahead of the CAT 1 driver and strictly no breaking away from the convoy;
   (c) Comply with airside rules and regulations as briefed by CAT 1 driver; and
   (d) Ensure that he/she has the mobile telephone number of the CAT 1 driver prior to the commencement of escort.

v. Preferred means of communication between CAT 1 driver and escorted driver is by walkie-talkie followed by mobile telephone.

vi. In case of a break away from escort, the CAT 1 driver and escorted driver shall safely stop their vehicles and contact each other and inform Changi Tower by any means of communication.

Note: The contingency procedure during a full telecommunication failure: the escorted driver may flash the vehicle headlights and/or sound the vehicle horn to alert the CAT 1 driver.
4.6 Vehicle Breakdown

Driver shall immediately inform **Changi Tower and CAG Airside Management Centre** if the vehicle has stalled on the manoeuvring area. Driver shall contact his/her company maintenance section to tow the vehicle away immediately.

4.7 Disruption of Operations at Changi Tower Due to Emergency

When aerodrome control services cannot be provided at Changi Tower due to unforeseen circumstances (e.g. fire, etc), Changi Tower controllers shall evacuate the Control Tower and proceed to the backup cabins and continue the provision of aerodrome control service from there. Prior to evacuation, all parties concerned (including CAG ACC) shall be notified.

Changi Tower shall inform aircraft on the ground (on the respective control frequencies) that Tower operations will be suspended due to (reason) and to maintain a listening watch on frequency 121.9 MHz (i.e. surface utility frequency) and await further instructions.

Aircraft on finals shall go around and contact Singapore Approach on frequency 120.3 MHz for further instructions.

Aircraft committed for a landing shall be cleared to land and once vacated the runway, the aircraft to hold on the taxiway (clear of the runway) and maintain a listening watch on frequency 121.9 MHz to await further instructions.

Aircraft on take-off roll shall be allowed to continue and to contact Singapore Approach after airborne.

Aircraft on the ground (e.g. taxiing for departure or awaiting take-off permission) to hold position until further notice and maintain a listening watch on frequency 121.9 MHz.

Once notified by Changi Tower that evacuation is in progress, CAG ACC shall listen out on frequency 121.9 MHz and inform aircraft on that frequency to hold position and standby for further instructions. When queried, the reason (i.e. Changi Tower operations is suspended until further notice due to evacuation) for delay to be transmitted to pilot.

Essentially, driver shall expect a higher volume of transmission on frequency 121.9 MHz. Therefore, driver shall be more attentive and alert to ensure messages are properly conveyed and received.
4.8 Tower Light Signals During Failure of Radio Communications at Changi Tower

During failure of radio communications at Changi Tower, light signals shall be used to communicate with driver on the manoeuvring area. Driver shall be well-versed with the Changi Tower light signals and keep on a lookout for light signals at all times.

<table>
<thead>
<tr>
<th>Colour and Type of Signal</th>
<th>Movement of Vehicles, Equipment and Personnel</th>
<th>Aircraft on the Ground</th>
<th>Aircraft in Flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Green</td>
<td>Cleared to cross, proceed, or go</td>
<td>Cleared for takeoff</td>
<td>Cleared to land</td>
</tr>
<tr>
<td>Flashing Green</td>
<td>Not applicable</td>
<td>Cleared for taxi</td>
<td>Return for landing (to be followed by steady green at the proper time)</td>
</tr>
<tr>
<td>Steady Red</td>
<td>STOP</td>
<td>STOP</td>
<td>Give way to other aircraft and continue circling</td>
</tr>
<tr>
<td>Flashing Red</td>
<td>Clear the taxiway/ runway</td>
<td>Taxi clear of the runway in use</td>
<td>Airport unsafe, do not land</td>
</tr>
<tr>
<td>Flashing White</td>
<td>Return to starting point on airport</td>
<td>Return to starting point on airport</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Alternating Red and Green</td>
<td>Exercise Extreme Caution</td>
<td>Exercise Extreme Caution</td>
<td>Exercise Extreme Caution</td>
</tr>
</tbody>
</table>
5 COMPETENCY IN RADIO-TELEPHONY COMMUNICATIONS

5.1 The Need to be Competent

Competency in radio-telephony communications is mandatory for driver as he/she is to maintain clear and concise communication with Changi Tower and Changi Apron. It is also very important in preventing miscommunication or misunderstanding of instructions or information in relation to driving on the manoeuvring area.

5.2 Language

English is used internationally for all ground radio telephony (RT) communications.

5.3 Time System

Start of a day is denoted by 0001H.
End of a day is denoted by 2400H.

5.4 Communication Techniques

The effective use of radio-telephony equipment depends on:

(a) articulation
(b) microphone techniques
(c) choice of words

Poor delivery of RT communication techniques can cause confusion and may potentially lead to accidents.
5.5 Basic Guidelines

5.5.1 Before transmission, users shall:
   (a) ensure they are tuned to the right frequency;
   (b) ensure radio transmission is readable by performing a radio check;
   (c) decide on the message to be transmitted.

5.5.2 During transmission, users shall:
   (a) ensure transmit switch is on;
   (b) speak into the microphone;
   (c) speak normally and clearly;
   (d) refrain from shouting or whispering and from varying pitch and tone;
   (e) use standard words and phrases;
   (f) be concise; and
   (g) refrain from interrupting if another party is making a transmission and is expecting a reply; give priority to a distress call.

5.5.3 After transmission, users shall ensure transmit switch is completely released to prevent jamming of the frequency.
5.6 Pronunciation of Letters

It is important to transmit each word slowly and with clarity, avoid mispronunciation and omission of consonants.

<table>
<thead>
<tr>
<th>LETTER</th>
<th>WORD</th>
<th>PRONUNCIATION IN ENGLISH</th>
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<tr>
<td>A</td>
<td>ALFA</td>
<td>AL FAH</td>
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<tr>
<td>B</td>
<td>BRAVO</td>
<td>BRAH VOH</td>
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<td>F</td>
<td>FOXTROT</td>
<td>FOKS TROT</td>
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<tr>
<td>G</td>
<td>GOLF</td>
<td>GOLF</td>
</tr>
<tr>
<td>H</td>
<td>HOTEL</td>
<td>HOH TELL</td>
</tr>
<tr>
<td>I</td>
<td>INDIA</td>
<td>IN DEE AH</td>
</tr>
<tr>
<td>J</td>
<td>JULIET</td>
<td>JEW LEE ETT</td>
</tr>
<tr>
<td>K</td>
<td>KILO</td>
<td>KEY LOH</td>
</tr>
<tr>
<td>L</td>
<td>LIMA</td>
<td>LEE MAH</td>
</tr>
<tr>
<td>M</td>
<td>MIKE</td>
<td>MIKE</td>
</tr>
<tr>
<td>N</td>
<td>NOVEMBER</td>
<td>NO VEM BER</td>
</tr>
<tr>
<td>O</td>
<td>OSCAR</td>
<td>OSS CAR</td>
</tr>
<tr>
<td>P</td>
<td>PAPA</td>
<td>PAH PAH</td>
</tr>
<tr>
<td>Q</td>
<td>QUEBEC</td>
<td>KEY BECK</td>
</tr>
<tr>
<td>R</td>
<td>ROMEO</td>
<td>ROW ME OH</td>
</tr>
<tr>
<td>S</td>
<td>SIERRA</td>
<td>SEE AIR RAH</td>
</tr>
<tr>
<td>T</td>
<td>TANGO</td>
<td>TANG GO</td>
</tr>
<tr>
<td>U</td>
<td>UNIFORM</td>
<td>YOU NEE FORM</td>
</tr>
<tr>
<td>V</td>
<td>VICTOR</td>
<td>VIK TAH</td>
</tr>
<tr>
<td>W</td>
<td>WHISKEY</td>
<td>WISS KEY</td>
</tr>
<tr>
<td>X</td>
<td>XRAY</td>
<td>ECKS RAY</td>
</tr>
<tr>
<td>Y</td>
<td>YANKEE</td>
<td>YANG KEY</td>
</tr>
<tr>
<td>Z</td>
<td>ZULU</td>
<td>ZOO LOO</td>
</tr>
</tbody>
</table>

5.7 Pronunciation of Digits

The following words are used when transmitting single digits.

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>WORDS</th>
<th>NUMBER</th>
<th>WORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ZERO</td>
<td>5*</td>
<td>FIFE</td>
</tr>
<tr>
<td>1</td>
<td>WUN</td>
<td>6</td>
<td>SIX</td>
</tr>
<tr>
<td>2</td>
<td>TOO</td>
<td>7</td>
<td>SEVEN</td>
</tr>
<tr>
<td>3</td>
<td>TREE</td>
<td>8</td>
<td>AIT</td>
</tr>
<tr>
<td>4</td>
<td>FOWER</td>
<td>*9</td>
<td>NINER</td>
</tr>
</tbody>
</table>

*Note: Digit 5 and 9 are spoken as “FIFE” and “NINER” respectively as they are easily confused when spoken normally.
5.8 Call Signs

<table>
<thead>
<tr>
<th>Callsign Suffix</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGI TOWER</td>
<td>CAAS CHANGI TOWER</td>
</tr>
<tr>
<td>CHANGI APRON</td>
<td>CAG APRON CONTROL CENTRE</td>
</tr>
</tbody>
</table>

5.9 Standards Words

The following are the standard words used in the radiotelephony communications.

<table>
<thead>
<tr>
<th>Word / Phrases</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledge</td>
<td>Let me know you have received and understood the message</td>
</tr>
<tr>
<td>Affirm</td>
<td>Yes</td>
</tr>
<tr>
<td>Approved</td>
<td>Permission for requested action is granted</td>
</tr>
<tr>
<td>Cancel</td>
<td>Withdraw the previously transmitted clearance</td>
</tr>
<tr>
<td>Contact</td>
<td>Establish radio contact with .....</td>
</tr>
<tr>
<td>Correction</td>
<td>An error has been made in this transmission (or message indicated.</td>
</tr>
<tr>
<td></td>
<td>The correct version is .....</td>
</tr>
<tr>
<td>Enter</td>
<td>Permission granted to go to runway .....</td>
</tr>
<tr>
<td>Give Way</td>
<td>To allow the mentioned traffic (aircraft) to pass by.</td>
</tr>
<tr>
<td>Hold Short</td>
<td>To stop at the point and do not enter the specific area ahead.</td>
</tr>
<tr>
<td>How do you read</td>
<td>What is the readability of my transmission?</td>
</tr>
<tr>
<td>Negative</td>
<td>No / Permission not granted / That is not correct.</td>
</tr>
<tr>
<td>Proceed</td>
<td>Clear to go to ..... (usually taxiway or holding point)</td>
</tr>
<tr>
<td>Read Back</td>
<td>Repeat all, or the specified part, of this message back to me exactly as</td>
</tr>
<tr>
<td></td>
<td>received</td>
</tr>
<tr>
<td>Request</td>
<td>I wish to know ... or obtain.</td>
</tr>
<tr>
<td>Report</td>
<td>Pass me the following information</td>
</tr>
<tr>
<td>Say Again</td>
<td>Repeat all, or part, of your last transmission</td>
</tr>
<tr>
<td>Standby</td>
<td>Wait and I will call you</td>
</tr>
<tr>
<td>Vacate</td>
<td>To leave the manoeuvring area</td>
</tr>
</tbody>
</table>

Note:
More can be found in the International Standards and Recommended Practices for Aeronautical Communications in ICAO Annex 10 Vol 2 (Comms/Procedures)
5.10 Standard Phraseology

The following are standard phraseologies to be used during various operating scenarios on the manoeuvring area. Driver shall apply these standard phraseologies as closely as practicable.

5.10.1 Performing Radio Check

<table>
<thead>
<tr>
<th>Changi Apron</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rover One, Changi Apron.</td>
<td>Changi Apron, Rover One. Radio check, 121.9.</td>
</tr>
<tr>
<td>Rover One, Read you strength five¹</td>
<td>Changi Apron. Read you strength five.</td>
</tr>
</tbody>
</table>

¹ Note: Readability of transmissions to be reported on the following scale:

- **Strength 1 (One)** - Unreadable
- **Strength 2 (Two)** -Readable now and then
- **Strength 3 (Three)** - Readable but with difficulty
- **Strength 4 (Four)** - Readable
- **Strength 5 (Five)** - Perfectly readable

Minimum strength of 4 (Four) is required. If read level is 3 or below, perform another radio check with CHANGI APRON. If read level remains at 3 or below, do not use vehicle. Send RT for servicing.

5.10.2 Request to Enter Taxiway

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rover requests clearance from Changi Tower to enter taxiway for maintenance ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Changi Tower</strong></td>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One.</td>
</tr>
<tr>
<td><strong>Standby.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>When movement instructions can be given,</strong> Changi Tower will contact Rover ...</td>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One.</td>
</tr>
<tr>
<td></td>
<td>Rover One, <strong>Proceed</strong> to Taxiway Echo One via Alpha One.</td>
<td></td>
</tr>
<tr>
<td>Scenario</td>
<td>Changi Tower</td>
<td>Rover One</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Scenario 1:</strong></td>
<td>If Rover is unsure of instructions, request for confirmation from Changi</td>
<td>Changi Tower, Rover One. Please <strong>confirm proceed</strong> to Taxiway Echo One via</td>
</tr>
<tr>
<td></td>
<td>Tower.</td>
<td>Alpha One.</td>
</tr>
<tr>
<td></td>
<td>Affirm, Rover One.</td>
<td></td>
</tr>
<tr>
<td><strong>Scenario 2:</strong></td>
<td>If Rover is unsure of instructions, request for a repeat of instructions from</td>
<td>Changi Tower, Rover One. <strong>Say Again.</strong></td>
</tr>
<tr>
<td></td>
<td>Changi Tower.</td>
<td></td>
</tr>
<tr>
<td><strong>Prior to movement,</strong></td>
<td>Rover shall read back the instructions to Changi Tower ...</td>
<td>Rover One <strong>proceeding</strong> to Taxiway Echo One via Alpha One*.</td>
</tr>
</tbody>
</table>

*Note: *If the instruction is correct, Changi Tower is not required to acknowledge a correct read back.
### 5.10.3 Request to Enter Runway

If the prevailing direction of aircraft landing/take-off is 02 at Runway 02L (for Runway 1), ...

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Changi Tower, Rover One.</td>
</tr>
<tr>
<td></td>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One holding at Bay 509. Request to enter Runway 02L for maintenance. Duration One Zero minutes.</td>
</tr>
<tr>
<td><strong>Standby.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>When movement instructions can be given, Changi Tower will contact Rover ...</strong></td>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One.</td>
</tr>
<tr>
<td></td>
<td>Rover One, proceed to holding point Whiskey One via Victor Three, Whiskey Papa. Hold Short of Runway 02L.</td>
<td>Changi Tower, Rover One.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Rover is unsure of instructions, request for confirmation from Changi Tower.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Affirm, Rover One.</td>
<td>Changi Tower, Rover One, Please confirm proceed to holding point Whiskey One via Victor Three, Whiskey Papa. Hold short of Runway 02L.</td>
</tr>
<tr>
<td><strong>Scenario 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Rover is unsure of instructions, request for a repeat of instructions from Changi Tower.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proceed to holding point Whiskey One via Victor Three, Whiskey Papa. Hold short of Runway 02L.</td>
<td>Changi Tower, Rover One. Say Again.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After instructions to proceed are clarified with Changi Tower ...</td>
<td></td>
<td>Changi Tower, Rover One, Proceeding to holding point Whiskey One via Victor Three, Whiskey Papa. Hold Short of Runway 02L.</td>
</tr>
<tr>
<td>When Rover is at designated holding point ...</td>
<td></td>
<td>Changi Tower, Rover One. At holding point Whiskey One.</td>
</tr>
<tr>
<td></td>
<td>Rover One, standby.</td>
<td></td>
</tr>
<tr>
<td>Changi Tower gives Rover instructions to enter runway...</td>
<td>Rover One, Changi Tower. Enter Runway 02L via Whiskey one.</td>
<td></td>
</tr>
<tr>
<td>Prior to movement, Rover shall read back instructions to Changi Tower ...</td>
<td></td>
<td>Rover One entering Runway 02L via Whiskey One.</td>
</tr>
</tbody>
</table>
Note: If the instruction is correct, Changi Tower is not required to acknowledge a correct read back. Changi Tower will not provide acknowledgement after permission to enter runway is given performed and the stopbar lights switched off.

5.10.4 Vacate Runway

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One.</td>
<td></td>
</tr>
<tr>
<td>Rover One, Vacate Runway 02L via Whiskey Niner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changi Tower, Rover One. Vacating Runway 02L via Whiskey Niner*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changi Tower, Rover One. Runway 02L vacated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rover One.**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: If the instruction is correct, Changi Tower is not required to acknowledge a correct read back.

**Note: Changi Tower will need to acknowledge receipt of the report that vehicle has vacated.

5.10.5 Request to Escort Convoy on Taxiway

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Changi Tower</th>
<th>Rover One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rover One, Changi Tower.</td>
<td>Changi Tower, Rover One.</td>
<td></td>
</tr>
<tr>
<td>Rover seeks movement request from Changi Tower...</td>
<td>Changi Tower, Rover One at bay Delta Four Niner. Escorting convoy of three vehicles. Request to proceed to North Cross Three to dump soil at work site.</td>
<td></td>
</tr>
<tr>
<td>Rover One, proceed to North Cross Three via Alpha Six.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior to movement, Rover shall read back instructions to Changi Tower ...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changi Tower, Rover One proceeding to North Cross Three via Alpha Six.*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: If the instruction is correct, Changi Tower is not required to acknowledge a correct read back.
6 AIRFIELD LAYOUT

6.1 Latest Aerodrome Map

The latest aerodrome map can be downloaded from CAAS Aeronautical Information Publication (AIP) website. Subscribe to the website to receive alerts on latest updates.

7 AIRFIELD MARKINGS, LIGHTS AND SIGNS

7.1 Taxiway

The following are the markings, lights and signs found on a taxiway, as well as the holding point leading to a taxiway. Driver shall not proceed beyond the holding point unless permission has been granted by Changi Tower. Failure to do so is a serious infringement of airfield rules.

7.1.1 Signs

7.1.2 Markings

7.1.3 Light

7.2 Runway

The following are the markings, lights and signs found on a runway, as well as the holding point leading to a runway. Driver shall hold at these points, seek permission and obtain confirmation from Changi Tower before entering the runway. Otherwise, it will constitute a runway incursion which is a serious infringement.

7.2.1 Holding Point Markings

There are holding point markings and runway mandatory signs at all taxiways. Vehicles approaching holding points shall STOP before the holding point and get permission from Changi Tower before entering the runway.
Holding point leading to runway, seek permission and obtain confirmation from Changi Tower before entering the runway.

7.2.2 Stopbar Lights
The red stopbar lights on the roadway indicates the holding point and driver must stop and seek permission from Changi Tower before entering runway. Driver shall never cross the illuminated stopbar lights.

7.2.3 Threshold Markings on Runway

7.3 Taxiway Crossings
The “Give Way to Aircraft” sign painted on the roadway warns driver of taxiway crossing ahead and potential aircraft movement. Driver shall stop at the “STOP” marking and visually check that the area is clear of aircraft movement before moving onto the crossing.

If there are light signals at the roadway crossing, driver shall check the signals that indicate it is clear to proceed before moving. Notwithstanding
this, the light signals provide supplementary warning. Driver is still required to visually check that the area is clear of aircraft movement before moving.

To prevent obstruction to aircraft movement, driver is not allowed to stop on any part of the crossing.

7.3.1 **Hotspot** : Junction of North Cross Taxiways and Roadways R3S, R3N, R5S and R5N

7.3.2 **Hotspot** : Junction of South Cross Taxiways and Roadway R7S Link

7.4 **Runway Strip**

7.4.1 Runway Strip means a defined area, including the runway and stopway, if provided, that is intended:
   (a) to reduce the risk of damage to aircraft running off a runway; and
   (b) to protect aircraft flying over the area during take-off and landing operations.

7.4.2 The runway strip represents the area which is 150m from to the left and right of the centre line of the runway. All personnel and vehicles must keep clear of the runway strip at all times unless permission to enter is obtained from Changi Tower. The runway strips are demarcated by black dashes in the diagram below. Please refer to Annex A for the entire layout of the runway strip.
7.4.3 There are signs and markings to indicate an entry to a runway. Drivers and personnel must watch out for these and ensure they do not move beyond these points.

Unauthorized entry is considered as a “RUNWAY INCURSION” and could result in serious safety issues. Thus, all drivers and personnel must pay extra attention and ensure they keep out of the area unless permission to enter is obtained from Changi Tower.

7.5 Perimeter Roadway near Runway

There are several entry points to the runway located on the perimeter roadway. Driver shall ensure that permission to enter is obtained from Changi Tower before entry.

The signs are installed along perimeter roadway to act as boundary. All personnel shall not move beyond the edge of perimeter roadway. All personnel shall stay clear of the runway strip, including road access to runway and turf area.

7.5.1 Hotspot: Junction of Perimeter West Roadway and Taxiway SA Leading to SASCO Hangar (The taxiway in front of SASCO Hangar has been designated “Taxiway SA”. This taxiway leads to Runway 02L/20R.)
Signs and physical barriers have been put up to inform drivers that they are approaching taxiway. Unauthorised entry into the taxiway is prohibited.

7.5.2 **Hotspot:** Perimeter West Roadway In front of Gate W2A (facing aircraft stand at Terminal 3)

Chains, flashing RED lights and “NO ENTRY” sign to indicate “NO ENTRY RUNWAY AHEAD”

7.5.3 **Hotspot:** Junction of Perimeter West Roadway In front of Fire Station 1 Leading to Runway 02L/20R

Centre Position, entrance to Runway 02L/20R via Fire Station 1 location with flashing RED lights. There is no mandatory holding point markings on the roadway. This point of entry is not a taxiway.
7.5.4 **Hotspot**: Along Perimeter East Roadway PE6 facing Taxiway E9

7.5.5 **Hotspot**: Perimeter East Roadway in front of Fire Station 2

7.6 **Secondary Roadways**

The roadway is painted in broken white lines and located behind aircraft parking stands. The speed limit is 30km/h as the secondary roadway is within 15m from aircraft stand.

Driver shall look out and give way to aircraft taxiing or being towed in or out of aircraft stands. If there is an aircraft approaching, driver shall vacate the secondary roadway and wait at the edge of an available aircraft stand until the aircraft moves off. Driver shall visually check that the area is clear of aircraft movement before proceeding.

Driver shall not use the secondary roadway as a short cut or to overtake. Only vehicles exceeding the height limit along the primary roadway shall be allowed to use the secondary roadway.
8. CATEGORY II INSTRUMENT LANDING SYSTEM (ILS) OPERATIONS

8.1 Changi Tower may deploy CATEGORY II ILS Operations during prolonged period of low visibility (like haze) to help aircraft landings. All airside personnel and equipment must withdraw from the CATEGORY II ILS Out of Bound Area within one hour of the declaration.

8.2 Unauthorised entry of vehicles into roadways leading to runways may affect the ILS readings which are crucial during the landing of an aircraft.

8.3 Vehicles that need to move into or in the vicinity of the CATEGORY II ILS Out of Bound Area must seek permission from the Changi Tower.

Note: CAT II ILS Out of Bound Area is demarcated in yellow/pink in the attached airport layout in Annex B.
### 9. USEFUL CONTACT NUMBERS

<table>
<thead>
<tr>
<th>Civil Aviation Authority of Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changi Tower</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Changi Airport Group (S) Pte Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airside Control Centre (ACC)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Airside Management Centre (AMC)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Airport Emergency Service Hotline</td>
</tr>
<tr>
<td>Airside Driving Centre</td>
</tr>
</tbody>
</table>

### Key Agencies

<table>
<thead>
<tr>
<th>Medical Emergency Hotline</th>
<th>65432223</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Police Division (APD)</td>
<td>65450000</td>
</tr>
<tr>
<td>Airport Police (Operations Room)</td>
<td></td>
</tr>
<tr>
<td>Changi Airport Fuel Hydrant Installation (CAFHI)</td>
<td>65464316</td>
</tr>
</tbody>
</table>