GEN 3.5 METEOROLOGICAL SERVICES

3.5.1 RESPONSIBLE SERVICE

3.5.1.1 The meteorological services for international air navigation are provided by the Meteorological Service Singapore of the National Environment Agency.

Post: THE DIRECTOR-GENERAL
Meteorological Service Singapore
Singapore Changi Airport,
P.O. Box 8
SINGAPORE819643
Tel: (65) 65457190 (HQ)
(65) 62446133 / (65) 65422837 (MET Office)
Fax: (65) 65457192 (HQ)
(65) 65425026 (MET Office)
AFS: WSSSYMYX
URL: www.weather.gov.sg

3.5.1.2 The service is provided in accordance with the provisions contained in the following ICAO documents:

Annex 3 – *Meteorological Service for International Air Navigation*
Doc 10157 – *Procedures for Air Navigation Services - Meteorology (PANS-MET)*
Doc 7030 – *Regional Supplementary Procedures Part 3 - Meteorology*

3.5.1.3 Differences to these provisions, if any, are detailed in subsection GEN 1.7.

3.5.2 AREA OF RESPONSIBILITY

3.5.2.1 Aeronautical meteorological services (MET) is provided for the Singapore FIR. For the following portions of Jakarta FIR, MET is jointly provided by Indonesia and Singapore:

The area bounded by 031727N 1052959E 012450N 1061648E 001030N 1045656E 000000N 1050340E 000000N 1044330E thence around the arc of a circle radius 90 NM centred on 011324N 1035124E to 013430N 1022353E 011300N 1033000E 011408N 1033142E 011200N 1033900E 011046N 1034015E 010800N 1034500E 011500N 1040000E 011800N 1043000E 012921N 1043441E 011947N 1044606E 021838N 1052205E 023641N 1051311E 024348N 1050854E 025010N 1051210E 031453N 1052619E 031727N 1052959E

Vertical limit: SFC to FL370

3.5.3 METEOROLOGICAL OBSERVATIONS AND REPORTS

Meteorological Observations and Reports					
Name of Station/ Location Indicator	*Type & Frequency of Observation/ Automatic Observing Equipment*	*Types of MET Reports & Supplementa-ry Information included*	*Observation System & Sites (s)*	*Hours of Operation*	*Climatological Information*
1	2	3	4	5	6
SINGAPORE/ Singapore Changi WSSS	Half hourly plus special observations	MET REPORT Special Report METAR SPECI TREND WS	a) Ultrasonic wind sensors at ends and middle of RWY 02L/20R (Runway 1), RWY 02C/20C (Runway 2) and RWY 02R/20L (Runway 3). Surface wind report in METAR and SPECI is taken from the wind sensor at the southern end of RWY 02L (with the sensor at the northern end of RWY 02C/20C as backup). b) Windsocks at ends of all runways. c) Transmissometers at both ends and in the middle of all runways. d) Low level wind shear observations made continuously by system of 15 surface wind sensors, located in the airport and its vicinity. e) Integrated and combination of MET Doppler X, C and S band weather radars and two wind lidars for detecting wind shear up to 20km and monitoring storms up to 480km.	H24	Climatological Summaries available at Meteorological Service Singapore of the National Environment Agency.
SINGAPORE/ Seletar WSSL	Hourly plus special observations	MET REPORT Special Report METAR SPECI WS	a) Ultrasonic wind sensors at the ends of runway (surface wind report in METAR and SPECI is taken from measurements of the ultrasonic wind sensor at RWY 03). b) Windsocks at both ends of RWY 03 and 21. c) Transmissometers at both ends of RWY 03 and 21. d) Low level wind shear observations made continuously by system of 6 surface wind sensors, located in its vicinity. e) Integrated and combination of MET Doppler C and S band weather radars for detecting wind shear within 20km and monitoring storms up to 480km.	H24	NIL
SINGAPORE/ Paya Lebar WSAP	Hourly plus special observations	METAR SPECI	a) Cup anemometers and wind vanes located at both ends of the runway, and an ultrasonic wind sensor located at 400m next to mid-runway. Surface wind report in METAR and SPECI is taken from the ultrasonic wind sensor.	H24	NIL

3.5.4 TYPES OF SERVICES

3.5.4.1 The Meteorological Office and Meteorological Watch Office at Singapore Changi Airport operate H24 and provide the following services for international air navigation:

a) Full meteorological documentation and briefing for current operational planning for all flights operating out of Singapore Changi Airport via the Aviation Weather Services Portal at URL https://www.weather.gov.sg/aviation;
b) Area meteorological watch over the Singapore FIR with the supply of meteorological information including SIGMET information to aircraft in flight through the Singapore ATS radio channels (see subsection AD 2.11);
c) For the portions of airspace within the Jakarta FIR where MET is jointly provided by Indonesia and Singapore (see GEN 3.5 para 3.5.2.1), high level SIGWX forecasts are provided jointly with the Centre for Aviation Meteorology of BMKG; SIGMET and special air reports (ARS) are provided jointly with Meteorological Watch Office Jakarta;
d) HF RTF VOLMET broadcasts of meteorological information (see page GEN 3.5-7), Aviation weather report with trend statement, strong low level vertical wind shear report and aerodrome warnings are also included in VHF ATIS broadcasts for Singapore Changi Airport (see page GEN 3.4-3);
e) Meteorological information for ATS.

3.5.4.2 Weather briefing by a forecaster is available H24 to qualified flight operations personnel at the Meteorological Office at Singapore Changi Airport or via telephone at (65)62446133 / (65)65422837. Weather information is available online via the Aviation Weather Services Portal at URL https://www.weather.gov.sg/aviation (see paragraph 9.2 for further details).

3.5.4.3 The Meteorological Office at Seletar Aerodrome operates H24 and provides meteorological documentation without briefing for international and general aviation flights operating out of Seletar Aerodrome.

3.5.4.4 Details of documentation supplied for each flight are determined by arrangement between the operator and the Meteorological Office. In general, the pilot-in-command is provided with documentation comprising one or more fixed-time prognostic streamline/istotach/spot temperature charts of standard isobaric surfaces appropriate to the cruising level (ICAO model IS), one of fixed-time prognostic significant weather chart code form and appropriate aerodrome forecasts in TAF code form.

3.5.4.5 Routine aerodrome forecasts received from other Meteorological Offices are normally included in meteorological documentation without modification. When a required aerodrome forecast is not received, a provisional forecast may be issued by the Meteorological Office providing the documentation.

3.5.4.6 After documentation has been issued and until take-off (i.e. the latest ETD notified to the Meteorological Office), the Meteorological Office at Singapore Changi Airport makes available amendments to the documentation. It is the responsibility of the operator's local representative or the pilot-in-command to obtain any pre-departure amendment(s) from the Meteorological Office at Singapore Changi Airport. The pilot-in-command may request pre-departure amendment(s) through the Singapore Changi Airport Control Tower.

3.5.4.7 Climatological Summaries for Singapore Changi (WSSS-48698) are available from the Meteorological Service Singapore.

3.5.5 OBSERVING SYSTEMS AND OPERATING PROCEDURES AT SINGAPORE CHANGI AIRPORT AND SELETAR AERODROME

3.5.5.1 SINGAPORE CHANGI AIRPORT

3.5.5.2 RWY 02L/20R (Runway 1)

3.5.5.2.1 Surface wind is measured by three ultrasonic wind sensors located as follows:

	DIST FROM END OF RWY	DIST FROM RWY CENTRELINE
(i) One set at	406 metres north of RWY 02L	120 metres
(ii) One set at	Middle of runway	121 metres
(iii) One set at	381 metres south of RWY 20R	121 metres

3.5.5.2.2 RVR observations are made by means of three sets of transmissometers, located as follows:

	DIST FROM END OF RWY	DIST FROM RWY CENTRELINE
(i) 1st set	446 metres north of RWY 02L	120 metres
(ii) 2nd set	Middle of runway	121 metres
(iii) 3rd set	421 metres south of RWY 20R	121 metres

3.5.5.2.3 RVR is reported in steps of 25 metres between 0 and 400 metres, 50 metres between 400 and 800 metres and 100 metres between 800 and 1,500 metres.

3.5.5.2.4 Surface wind report in METAR and SPECI is taken from the wind sensor at the southern end of RWY 02L (with the sensor at the northern end of RWY 02C/20C as backup).

3.5.5.3 RWY 02C/20C (Runway 2)

3.5.5.3.1 Surface wind is measured by three ultrasonic wind sensors, located as follows:

	DIST FROM THRESHOLD	DIST FROM RWY CENTRELINE
(i) One set at	414 metres north of RWY 02C	130 metres
(ii) One set at	Middle of runway	130 metres
(iii) One set at	413 metres south of RWY 20C	128 metres

3.5.5.3.2 RVR observations are made by means of three sets of transmissometers, located as follows:

	DIST FROM THRESHOLD	DIST FROM RWY CENTRELINE
(i) 1st set	449 metres north of RWY 02C	120 metres
(ii) 2nd set	Middle of runway	120 metres
(iii) 3rd set	427 metres south of RWY 20C	120 metres

3.5.5.3.3 RVR is reported in steps of 25 metres between 0 and 400 metres, 50 metres between 400 and 800 metres and 100 metres between 800 and 1,500 metres.

3.5.5.4 RWY 02R/20L (Runway 3)

3.5.5.4.1 Surface wind is measured by three ultrasonic wind sensors located as follows:

	DIST FROM THRESHOLD	DIST FROM RWY CENTRELINE
(i) One set at	428 metres north of RWY 02R	132 metres
(ii) One set at	Middle of runway	121 metres
(iii) One set at	435 metres south of RWY 20L	132 metres

3.5.5.4.2 RVR observations are made by means of three sets of transmissometers, located as follows:

	DIST FROM THRESHOLD	DIST FROM RWY CENTRELINE
1st set	421 metres north of RWY 02R	120 metres
2nd set	Middle of runway	121 metres
3rd set	425 metres south of RWY 20L	120 metres

3.5.5.4.3 RVR is reported in steps of 25 metres between 0 and 400 metres, 50 metres between 400 and 800 metres and 100 metres between 800 and 1500 metres.

3.5.5.5 Wind Shear Observations (Singapore Changi Airport)

3.5.5.5.1 Horizontal low level wind shear observations are measured continuously by a system consisting of 15 surface wind sensors, MET Doppler X, S and C band weather radars and two wind lidars located in Singapore Changi airport and its vicinity.

3.5.5.5.2 ATC will pass to all aircraft taking off or landing for the next 1/2 hour from the time of report whenever microburst or wind shear of intensity 15 knots or greater is observed/reported.

3.5.5.5.3 The phraseology used by ATC to warn pilots of the presence of wind shear of intensity between 15 and 30 knots is:

> "..... (callsign) WIND SHEAR WARNING
> STRONG LOW LEVEL WIND SHEAR OBSERVED IN THE
> VICINITY OF
> CHANGI AIRPORT AT ..... (time)"

3.5.5.5.4 The phraseology used by ATC to warn pilots of the presence of wind shear of intensity greater than 30 knots is:

> ".....(callsign) WIND SHEAR WARNING
> SEVERE LOW LEVEL WIND SHEAR OBSERVED IN THE
> VICINITY OF
> CHANGI AIRPORT AT .....(time)"

3.5.5.5.5 The presence of wind shear will also be broadcast in the ATIS for the next half an hour.

3.5.6 SELETAR AERODROME

3.5.6.1 Surface wind is measured by ultrasonic wind sensors at ends of runway. Surface wind report in METAR and SPECI is taken from measurements of the ultrasonic wind sensor at RWY 03.

3.5.6.2 Wind Shear Observations (Seletar Aerodrome)

3.5.6.2.1 ATC will pass to all aircraft taking off or landing for the next 1/2 hour from the time of report whenever microburst or windshear of intensity 15 knots or greater is observed/reported.

3.5.6.2.2 The phraseology used by ATC to warn pilots of the presence of wind shear of intensity between 15 and 30 knots is:

"..........(callsign) WIND SHEAR WARNING
STRONG LOW LEVEL WIND SHEAR
OBSERVED IN THE VICINITY OF
SELETAR AIRPORT AT .....(time)"

3.5.6.2.3 The phraseology used by ATC to warn pilots of the presence of wind shear of intensity greater than 30 knots is:

"..........(callsign) WIND SHEAR WARNING
SEVERE LOW LEVEL WIND SHEAR
OBSERVED IN THE VICINITY OF
SELETAR AIRPORT AT .....(time)"

3.5.7 NOTIFICATION REQUIRED FROM OPERATORS

3.5.7.1 It is the responsibility of the operator or the pilot-in-command to notify the meteorological office of any flight for which meteorological documentation is required (ref. ICAO Annex 3, paragraph 2.3). As much prior notice as possible should be given, and at least one hour notice at Singapore Changi Airport and two hours at Seletar Aerodrome would be required for nonscheduled flights.

3.5.8 AIRCRAFT REPORTS

3.5.8.1 AIREP

3.5.8.1.1 Special aircraft observations shall be made and the reports transmitted as necessary to ATC.

3.5.8.1.2 Special aircraft observations of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud shall be recorded on the special Air-Report of Volcanic Activity form which can be downloaded from URL https://aim-sg.caas.gov.sg. A copy of the completed Volcanic Activity Report shall be delivered by the operator or a flight crew member, without delay, either personally or by telephone facsimile (TEL: 62446133 / 65422837 or FAX: 65429978 / 65425026) to the Meteorological Office, Singapore Changi Airport.

3.5.8.2 REPORTING OF LOW LEVEL WIND SHEAR

3.5.8.2.1 Pilots encountering wind shear shall report to ATC as soon as possible.

3.5.8.2.2 When reporting wind shear on radiotelephony, the information should be transmitted in this order:

a) Aircraft callsign;
b) WIND SHEAR report;
c) Time (of wind shear occurrence);
d) Position (of wind shear);
e) Intensity (moderate, strong or severe);
f) Average height of wind shear layer.

3.5.8.2.3 On receipt of a wind shear report from a pilot, ATC will pass it to other aircraft in the vicinity. The following phraseology will be used:

"WIND SHEAR WARNING
ARRIVING (or DEPARTING) ..... (type of aircraft)
REPORTED ..... (moderate, strong, severe)
WIND SHEAR IN APPROACH (or DEPARTURE)
RUNWAY ..... (number) AT ..... (time)
HEIGHT OF WIND SHEAR LAYER ..... (feet)"

3.5.8.2.4 The presence of wind shear as reported by a pilot will also be broadcast in the ATIS for the next half an hour unless subsequent reports indicate that wind shear no longer exists.

3.5.9 VOLMET SERVICE

VOLMET SERVICE						
Name of station	*CALLSIGN IDENT (EM)*	*Frequency*	*Broadcast period*	*HR of SER*	*Aerodromes included*	*Contents and format of REP and FCST*
1	2	3	4	5	6	7
SINGAPORE	SINGAPORE RADIO (A3J)	6676KHz (1230-2230) 11387KHz (2230-1230)	H + 20 to H + 25 and	H24	SINGAPORE (1) SINGAPORE (2)(4) KUALA LUMPUR (3)(4) SUBANG AIRPORT (4) SOEKARNO-HATTA (3)(4) KUCHING (3)(4) BRUNEI (3)(4) KOTA KINABALU (3)(4) DEN PASAR (3) (4) PENANG (3)(4) SINGAPORE (5) KUALA LUMPUR (4)(8)	SIGMET METAR METAR METAR METAR METAR METAR METAR METAR METAR TAF TAF
			H + 50 to H + 55		SINGAPORE (1) SINGAPORE (4)(6) KUALA LUMPUR (4)(7) SUBANG AIRPORT (4) SOEKARNO-HATTA (4)(7) KUCHING (4)(7) BRUNEI (4)(7) KOTA KINABALU (4)(7) DEN PASAR (4)(7) PENANG (4)(7) SINGAPORE (5) SOEKARNO HATTA (4)(8)	SIGMET METAR METAR METAR METAR METAR METAR METAR METAR METAR TAF TAF
	Plain Language EN. (1) SIGMET message or 'NIL' is transmitted. (2) Latest routine report H+00 including trend statement; repeated at end of broadcast, time permitting. (3) H+00 (or the previous H+30 report when the H+00 report is not available) including trend statement when appended. (4) As available. (5) Valid for 12 hours. (6) Latest routine report H+30 including trend statement; repeated at end of broadcast, time permitting. (7) H+30 (or the H+00 report when the H+30 report is not available) including trend statement when appended. (8) Valid for 30 hours.					
SINGAPORE	SINGAPORE VOLMET	D-VOLMET	as required	H24	SINGAPORE KUALA LUMPUR SOEKARNO-HATTA SINGAPORE KUALA LUMPUR SUBANG AIRPORT SOEKARNO-HATTA KUCHING BRUNEI KOTA KINABALU DEN PASAR PENANG SINGAPORE KUALA IUMPUR SOEKARNO-HATTA	SIGMET SIGMET SIGMET METAR METAR METAR METAR METAR METAR METAR METAR METAR TAF TAF TAF
	Data Link VOLMET (D-VOLMET) service available H24. AP Ident WSSS. Messages comply with ARINC 623 standards.					

3.5.10 SIGMET SERVICE

3.5.10.1 General

3.5.10.1.1 For the safety of air traffic, the Meteorological Watch Office of Singapore maintains an area meteorological watch and warning service. This service consists partly of a continuous weather watch within the Singapore FIR and the portions of airspace within the Jakarta FIR where MET is jointly provided by Indonesia and Singapore (see GEN 3.5 para 3.5.2.1), and issuance of appropriate information (SIGMET) by Meteorological Watch Office of Singapore and partly of the issuing of warnings for Changi Airport.

SIGMET SERVICE						
Name of MWO/ location indicators	*Hours of Operation*	*FIR or CTA served*	*Type of SIGMET / validity*	*Specific procedures*	*ATS unit served*	*Additional Information*
1	2	3	4	5	6	7
SINGAPORE /WSSS	H24	Singapore FIR Jakarta FIR*	SIGMET / 4-6HR	Nil	Singapore ACC	Nil

* For the portions of airspace within the Jakarta FIR where MET is jointly provided by Indonesia and Singapore (see GEN 3.5 para 3.5.2.1), SIGMET is jointly provided by the Meteorological Watch Offices of Jakarta and Singapore. The Meteorological Watch Offices of Jakarta and Singapore have implemented agreed coordination procedures in accordance with the procedures in the ICAO Asia/Pacific Regional SIGMET Guide and Operational SIGMET Coordination to ensure that there is no conflict in the SIGMETs published by both Meteorological Watch Offices.

3.5.11 Area Meteorological Watch Service

3.5.11.1 The area meteorological watch service is performed by the Meteorological Service Singapore.

3.5.11.2 The Meteorological Service Singapore issues information in the form of SIGMET messages about the occurrence or expected occurrence of one or several of the following significant meteorological phenomena:

- thunderstorms *
- severe turbulence
- severe icing
- severe mountain waves
- heavy sand storm/dust storm
- volcanic ash cloud
- tropical cyclone

* Area of widespread cumulonimbus clouds or cumulonimbus along a line (squall line) with little or no space between individual clouds, or cumulonimbus embedded in cloud layers or obscured by haze.

3.5.11.3 The SIGMETs are issued in abbreviated plain language using ICAO abbreviations and are respectively numbered consecutively for each day commencing at 0001. Their period of validity is generally not more than 4 hours and less than 6 hours from the time of transmission.

3.5.11.4 SIGMETs issued by the Meteorological Service Singapore are transmitted to adjacent MWOs in accordance with regional air navigation agreements and used by ATS units in Singapore.

3.5.12 Warning Service

3.5.12.1 Aerodrome warnings for Changi Airport are issued by Meteorological Service Singapore if one or several of the following phenomena are expected to occur at the airport:

- squall
- thunderstorm
- hail
- tornado
- horizontal visibility and/or RVR of 800 metres or less
- mean surface wind speed of 25 knots or more
- wind gusts of 35 knots or more
- cloud of BKN or OVC amount with base 500 ft or less

3.5.12.2 The warnings are:

- for the protection of parked and moored aircraft,
- for the protection of equipment at the airport, and
- for the safety of arriving and departing aircraft.

3.5.12.3 The warnings are issued in English and are distributed in accordance with a distribution list which has to be agreed upon locally. In order to guarantee rapid dissemination of the warnings, the distribution list to be used shall, as far as possible, contain only one recipient for an interested group; this recipient will be responsible for the further dissemination of the warning within the group.

3.5.12.4 SIGMET is disseminated by directed transmissions to aircraft through general calls by the Singapore Area Control Centre for Singapore FIR , and the portions of airspace within the Jakarta FIR where MET is jointly provided by Indonesia and Singapore (see GEN 3.5 para 3.5.2.1).

3.5.13 OTHER AUTOMATED METEOROLOGICAL SERVICES

3.5.13.1 Besides VOLMET and ATIS broadcasts, airline operators can obtain access to various operational meteorological information through the Aviation Weather Services Portal and automated faxing service.

3.5.13.2 The Aviation Weather Services Portal is free to airlines and flight operators for flights departing from Singapore Changi or Seletar Airports. It is accessible via the "Login" link at URL https://www.weather.gov.sg/. A registered user account is required for the access. For registration, please email to MSS_Aviation_Enquiries@nea.gov.sg.

AVIATION WEATHER SERVICES PORTAL

Service Name	*Information Available*	*Area, Route and Aerodrome Coverage*	*Telephone and Telefax numbers Remarks*
1	2	3	4
Aviation Weather Services Portal	METAR, SPECI, TAF, AD Warning, Wind Shear Warning, SIGMET, Tropical Cyclone Warnings/Advisories, Volcanic Ash, Radioactive Fallout and Haze Information Advisories	All METAR, SPECI, TAF, SIGMET, Tropical Cyclone Warnings/Advisories, Volcanic Ash, Radioactive Fallout Advisories received from designated major centres around the world. AD Warning and Wind Shear Warning for WSSS and WSSL. Haze Information/Advisories for Southeast Asia Region	
	Latest Himawari-8 composite and true colour satellite images every 20 minutes	Southeast Asia and full globe	
	Latest Himawari-8 IR and hourly cloud top height satellite images every 10-minutes	Asia Pacific	
	Latest images from other satellites such as EUMETSAT, NOAA and Feng-Yun weather satellites	Europe, US Polar, America and Asia Pacific	
	Low-to-Mid-Level Significant Weather Charts	Low-Medium level (Surface-FL250) covering southern ASEAN region	
	WAFS(World Area Forecast System) SIGWX charts	Medium-High level covering Asia, Middle East, Africa, America and Europe	
	Prognostic Wind-Temperature charts	Standard levels covering Europe, America, Asia-Pacific regions and the southern ASEAN region.	
	Weather Radar images	Latest Singapore Changi Airport 70km, 240km and480km range rain intensity radar plots.	
	WAFC Washington model gridded data	Full globe forecast of winds, temperature, turbulence potential, icing potential and horizontal extent of cumulonimbus clouds	
	Take-off conditions	Singapore Changi Airport	
	Climb and Descent winds forecast	Selected airports over Asia Pacific, Europe, Africa and North America	

Note: Details of meteorological briefing at aerodromes are given in the individual aerodrome sections, i.e. AD 2