ENR 1.8 REGIONAL SUPPLEMENTARY PROCEDURES

1 RVSM PROCEDURES IN THE SINGAPORE FIR AND AIRSPACE WHERE ATS IS PROVIDED BY SINGAPORE (SEE ENR 2.1)

1.1 IMPLEMENTATION OF FLOS (FLIGHT LEVEL ORIENTATION SCHEME) AND FLAS (FLIGHT LEVEL ALLOCATION SCHEME) IN THE WESTERN PACIFIC/SOUTH CHINA SEA AREA

1.1.1 In order to minimise flight level transition requirements for flights entering and leaving the Western Pacific / South China Sea area, the following flight level arrangements will be implemented simultaneously and permanently:

a) a single alternate FLOS (i.e. 'east odd flight levels, west even flight levels') in compliance with the Table "RVSM-FEET" of Appendix 3 of ICAO Annex 2 and in accordance with the FLOS in surrounding areas;

b) special high capacity arrangements for six unidirectional parallel routes (L625, L642, M767, M771, N884 and N892) that involve the use of odd and even flight levels in the same direction of flight; and

c) an associated FLAS agreed between affected ACCs to facilitate ATC 'No-PDC' operations.

1.1.2 Non-RVSM approved aircraft shall fly below RVSM airspace unless prior approval has been obtained from the ACC concerned for such aircraft to operate in RVSM airspace. In the assignment of cruising level in RVSM airspace, RVSM-approved aircraft shall be given priority over non-RVSM approved aircraft.

1.1.3 When an RVSM-approved aircraft reports that it is no longer RVSM-compliant before the transfer of control point, the transferring ACC shall immediately notify the receiving ACC of this fact and provide conventional vertical separation of 2,000ft between this aircraft and the other aircraft.

1.2 RVSM OPERATIONAL APPROVAL AND MONITORING

1.2.1 Operators must obtain airworthiness and operational approval from the State of Registry or State of the Operator, as appropriate, to conduct RVSM operations. The requirement for operators to qualify for RVSM operational approval can be found at:

https://www.caas.gov.sg/legislation-regulations/guidelines-advisory/air-operations

Each aircraft operating in RVSM airspace shall hold a valid RVSM approval. RVSM approval issued for one region will always be valid for RVSM operations in another region provided specific restrictions have not been imposed on the operator by the State of the Operator or State of Registry. The Monitoring Agency for Asia Region (MAAR) monitors operator compliance with State approvals requirements by performing periodic scrutiny checks using Traffic Sample Data and the RVSM approvals record (https://www.aerothai.co.th/maar/approvals.php)

1.2.2 Operators are required to participate in the RVSM aircraft monitoring program. This is an essential element of the RVSM implementation program in that it confirms that the aircraft altitude-keeping performance standard is being met. Monitoring accomplished for other regions can be used to fulfil the monitoring requirements for the Asia/Pacific Region. The information on height-keeping performance monitoring options can be found at:

https://www.aerothai.co.th/maar/

1.3 ACAS II AND TRANSPONDER EQUIPAGE

1.3.1 Aircraft operating in RVSM airspace shall be equipped with an airborne collision avoidance system (ACAS II) and to operate the ACAS system in accordance with the relevant provisions of ICAO Annex 10, Volume IV, Chapter 4.

1.4 IN-FLIGHT PROCEDURES WITHIN RVSM AIRSPACE

1.4.1 Before entering RVSM airspace, the pilot should review the status of required equipment. The following equipment should be operating normally:

a. two primary altimetry systems;
b. one automatic altitude-keeping device; and
c. one altitude-alerting device.

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1.4.2 The pilot must notify ATC whenever the aircraft:

a. is no longer RVSM compliant due to equipment failure; or
b. experiences loss of redundancy of altimetry systems; or
c. encounters turbulence that affects the capability to maintain flight level.

See Appendix A for pilot and controller actions in contingency scenarios.

1.4.3 During cleared transition between levels, the aircraft should not overshoot or undershoot the assigned FL by more than 150ft (45m).

1.4.4 Except in an ADS or radar environment, pilots shall report reaching any altitude assigned within RVSM airspace.

1.5 SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES IN OCEANIC AIRSPACE

Introduction

1.5.1 Although all possible contingencies cannot be covered, the procedures in 1.5.4, 1.5.5 and 1.5.6 provide for the more frequent cases such as:

a. the inability to comply with assigned clearance due to meteorological conditions (1.5.6 refers);
b. en-route diversion across the prevailing traffic flow (for example, due to medical emergencies (1.5.4 and 1.5.5 refer)); and
c. the loss of, or significant reduction in, the required navigation capability when operating in an airspace where the navigation performance accuracy is a prerequisite to the safe conduct of flight operations, or pressurization failure (1.5.4 and 1.5.5 refer).

1.5.2 The pilot shall take action as necessary to ensure the safety of the aircraft, and the pilot's judgement shall determine the sequence of actions to be taken, having regard to the prevailing circumstances. Air traffic control shall render all possible assistance.

General Procedures

Note.- Figure 1.5-1 provides an aid for understanding and applying the contingency procedures contained in Section 1.5

1.5.3 If an aircraft is unable to continue the flight in accordance with its ATC clearance, a revised clearance shall be obtained, whenever possible, prior to initiating any action.

1.5.4 If prior clearance cannot be obtained, the following contingency procedures should be employed until a revised clearance is received. In general terms, the aircraft should be flown at an offset level and on an offset track where other aircraft are less likely to be encountered. Specifically, the pilot shall:

a. leave the cleared track or ATS route by initially turning at least 30 degrees to the right or to the left, in order to establish and maintain a parallel, same direction track or ATS route offset 5.0 NM. The direction of the turn should be based on one or more of the following factors:

1) aircraft position relative to any organized track or ATS route system;
2) the direction of flights and flight levels allocated on adjacent tracks;
3) the direction to an alternate airport;
4) any strategic lateral offset being flown; and
5) terrain clearance.

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b. maintain a watch for conflicting traffic both visually and by reference to ACAS (if equipped), leaving ACAS in RA mode at all times, unless aircraft operating limitations dictate otherwise;
c. turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
d. keep the SSR transponder on at all times and, when able, squawk 7700, as appropriate and, if equipped with ADS-B or ADS-C, select the appropriate emergency functionality;
e. as soon as practicable, advise air traffic control of any deviation from their assigned clearance;
f. use means as appropriate (i.e. voice and/or CPDLC) to communicate during a contingency or emergency;
g. if voice communications are used, the radiotelephony distress signal (MAYDAY) or urgency signal (PAN PAN) preferably spoken three times, shall be used, as appropriate;
h. when emergency situations are communicated via CPDLC, the controller may respond via CPDLC. However, the controller may also attempt to make voice contact with the aircraft;

Note.- Guidance on emergency procedures for controllers, radio operators, and flight crew in data link operations can be found in the Global Operational Data Link (GOLD) Manual (Doc 10037).

i. establish communications with and alert nearby aircraft by broadcasting on the frequencies in use and at suitable intervals on 121.5 MHz (or, as a backup, on the inter-pilot air-to-air frequency 123.45 MHz): aircraft identification, the nature of the distress condition, intention of the pilot, position (including the ATS route designator or the track code, as appropriate) and flight level.

Actions to be taken once offset from track

Note.- The pilot's judgement of the situation and the need to ensure the safety of the aircraft will determine the actions outlined to be taken. Factors for the pilot to consider when deviating from the cleared track or ATS route or level without an ATC clearance include, but are not limited to:

a. *operation within a parallel track system;*
b. *the potential for user preferred routes (UPRs) parallel to the aircraft's track or ATS route;*
c. *the nature of the contingency (e.g. aircraft system malfunction); and*
d. *weather factors (e.g. convective weather at lower flight levels).*

1.5.5 If possible, maintain the assigned flight level until established on the 5.0 NM parallel, same direction track or ATS route offset. If unable, initially minimize the rate of descent to the extent that is operationally feasible.

1.5.6 Once established on a parallel, same direction track or ATS route offset by 5.0 NM, either:

a. descend below FL 290, and establish a 500 ft vertical offset from those flight levels normally used, and proceed as required by the operational situation or if an ATC clearance has been obtained, in accordance with the clearance; or

b. establish a 500 ft vertical offset (or 1000 ft vertical offset if above FL 410) from those flight levels normally used, and proceed as required by the operational situation, or if an ATC clearance has been obtained, in accordance with the clearance.

Note.- Altimetry system errors (ASE) may result in less than 500 ft vertical spacing (less than 1000 ft above FL 410) when the above contingency procedure is applied.

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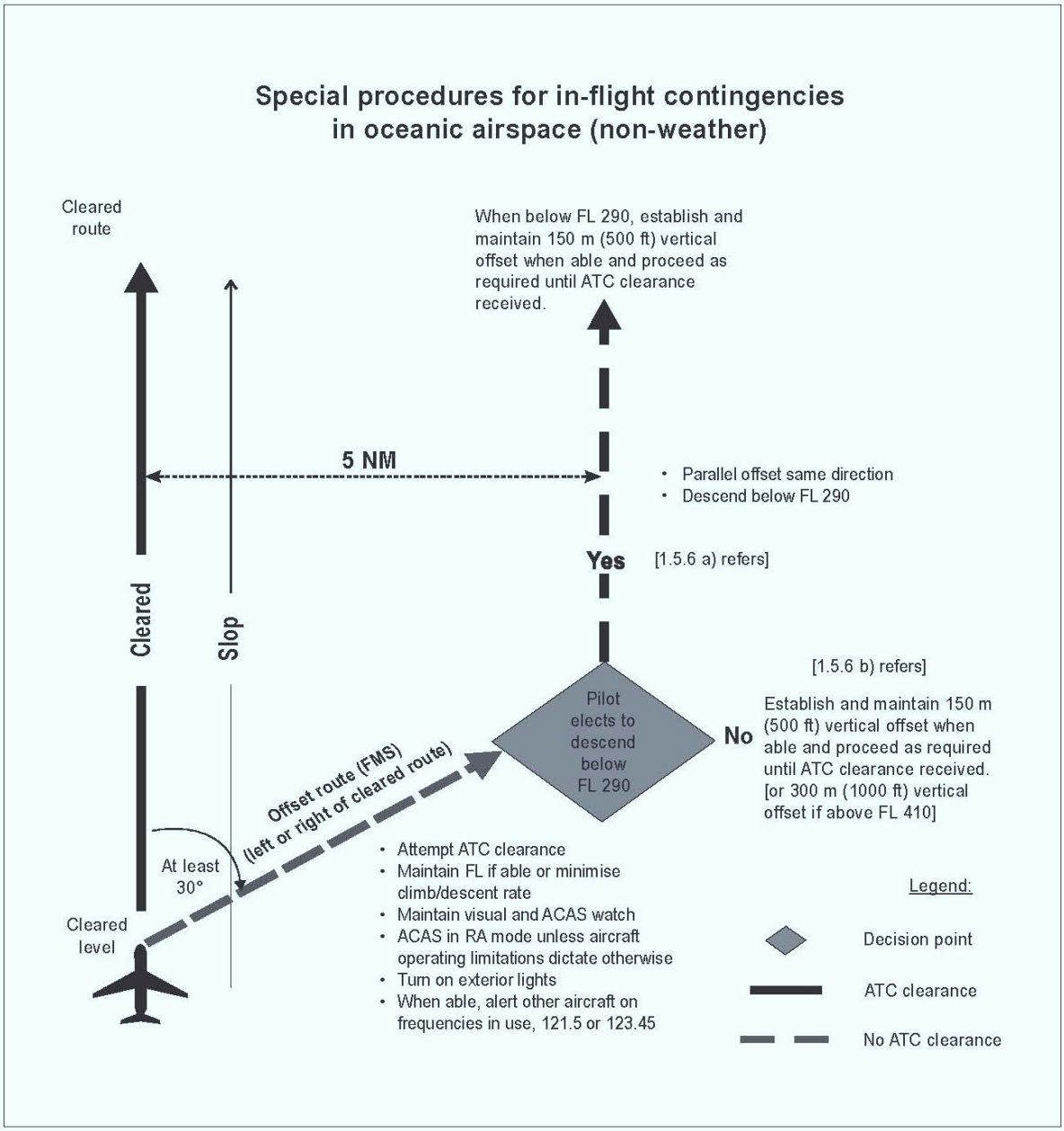

Figure 1.5-1. Visual aid for contingency procedures guidance

1.6 PROCEDURES TO MITIGATE WAKE TURBULENCE ENCOUNTERS AND DISTRACTING AIRCRAFT SYSTEM ALERTS IN THE OCEANIC AIRSPACE OF SINGAPORE FIR

1.6.1 The following special procedures are applicable to mitigate wake turbulence or distracting aircraft system alerts [e.g. ACAS, Ground Proximity Warning System (GPWS)] in Asia and Pacific airspace where RVSM is applied:

Note.- In the contingency circumstances below, ATC will not issue clearances for lateral offsets and will not normally respond to actions taken by the pilots.

1.6.2 An aircraft that encounters wake vortex turbulence or experiences distracting aircraft system alerts shall notify ATC and request a flight level, track or speed change to avoid the condition. However, in situations where such a change is not possible or practicable, the pilot may initiate the following temporary lateral offset procedure with the intention of returning to centreline as soon as practicable:

a) the pilot should establish contact with other aircraft, if possible, on the appropriate VHF inter-pilot air-to-air frequency 123.45MHz; and

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b) one (or both) aircraft may initiate lateral offset(s) not to exceed 2NM from the assigned track, provided that:

i. as soon as practicable to do so, the offsetting aircraft notify ATC that temporary lateral offset action has been taken and specify the reason for doing so (ATC will not normally respond); and

ii. the offsetting aircraft notify ATC when re-established on assigned route(s) or track(s) (ATC will not normally respond).

1.7 FLIGHT PLANNING REQUIREMENTS

1.7.1 Unless special arrangement is made as detailed below, RVSM approval is required for aircraft to operate within designated RVSM airspace. The operator must determine that the appropriate State authority has approved the aircraft and will meet the RVSM requirements for the filed route of flight and any planned alternate routes. The letter “W” shall be inserted in item 10 (Equipment) of the ICAO standard flight plan to indicate that the aircraft is RVSM approved aircraft.

1.8 PROCEDURES FOR OPERATION OF NON-RVSM COMPLIANT AIRCRAFT IN RVSM AIRSPACE

1.8.1 It should be noted that RVSM approved aircraft will be given priority for level allocation over non-RVSM approved aircraft.

1.8.2 The vertical separation minimum between non-RVSM aircraft operating in the RVSM stratum and all other aircraft is 2,000ft.

1.8.3 Non-RVSM compliant aircraft operating in RVSM airspace should use the phraseology as contained in Appendix A.

1.8.4 Non-RVSM compliant aircraft may be cleared to climb to and operate above FL290 or descend to and operate below FL410 provided that they:

a. do not climb or descend at less than the normal rate for the aircraft, and

b. do not level off at an intermediate level while passing through the RVSM stratum.

1.8.5 Non-RVSM compliant aircraft may not flight plan between FL290 and FL410 inclusive within RVSM airspace. After special coordination as detailed in paragraph 1.8.6 below, the following non-RVSM aircraft may flight plan at RVSM flight levels in the RVSM stratum:

a. is being initially delivered to the State of Registry or Operator (see paragraph 1.10 for additional details and information); or

b. was formally RVSM approved but has experienced an equipment failure and is being flown to a maintenance facility for repair in order to meet RVSM requirements and/or obtain approval; or

c. is transporting a spare engine mounted under the wing; or

d. is being utilized for mercy or humanitarian purposes; or

e. State aircraft (those aircraft used in military, custom and police services shall be deemed State aircraft).

1.8.6 The assignment of cruising level to non-RVSM compliant aircraft listed in paragraph 1.10.5 (a) to (e) shall be subject to an ATC clearance. Aircraft operators shall include “STS/CATEGORY (FERRY/ HUMANITARIAN/ MILITARY/ CUSTOMS/POLICE)/ NON-RVSM COMPLIANT” in field 18 of the ICAO flight plan.

1.8.7 Contact details for approval request are as follows:

Watch Manager, Singapore Air Traffic Control Centre:
TEL: (65) 65412668
AFS: WSJCZRZX
FAX: (65) 65457526

1.8.8 This approval process is intended exclusively for the purposes indicated above and not as a means to circumvent the normal RVSM approval process.

1.9 DELIVERY FLIGHTS FOR AIRCRAFT THAT ARE RVSM COMPLIANT ON DELIVERY

1.9.1 An aircraft that is RVSM compliant on delivery may operate in RVSM airspace provided that the crew is trained on RVSM policies and procedures applicable in the airspace and the responsible State issues the operator a letter of authorisation approving the operation. State notification to the APARMO should be in the form of a letter, e-mail or facsimile documenting the one-time flight. The planned date of the flight, flight identification, registration number and aircraft type/series should be included.

1.10 PROCEDURES FOR SUSPENSION OF RVSM

1.10.1 Air traffic services will consider suspending RVSM procedures within affected areas of the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) when there are pilot reports of greater than moderate turbulence. Within areas where RVSM procedures are suspended, the vertical separation minimum between all aircraft will be 2,000ft.

1.11 GUIDANCE FOR PILOTS AND CONTROLLERS FOR ACTIONS IN THE EVENT OF AIRCRAFT SYSTEM MALFUNCTION OR TURBULENCE GREATER THAN MODERATE

1.11.1 See Appendix A for guidance in these circumstances.

1.12 PROCEDURES FOR AIR-GROUND COMMUNICATION FAILURE

1.12.1 The air-ground communication failure procedures specified in ENR 1.6 in conjunction with ICAO PANS-ATM DOC 4444 should be applied.

APPENDIX A

CONTINGENCY SCENARIOS

The following paragraphs summarize pilot actions to mitigate the potential for conflict with other aircraft in certain contingency situations. They should be reviewed in conjunction with the expanded contingency scenarios detailed below which contain additional technical and operational details.

* **Scenario 1**: The pilot is

a. unsure of the vertical position of the aircraft due to the loss or degradation of all primary altimetry systems, or
b. unsure of the capability to maintain cleared flight level (CFL) due to turbulence or loss of all automatic altitude control systems.

The pilot should:	ATC can be expected to:
Maintain CFL while evaluating the situation;	
Watch for conflicting traffic both visually and by reference to ACAS, if equipped;	
If considered necessary, alert nearby aircraft by a) Making maximum use of exterior lights; b) Broadcasting position, FL, and intentions on 121.5MHz (as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz may be used).	
Notify ATC of the situation and intended course of action. Possible courses of action include: a) Maintaining the CFL and route provided that ATC can provide lateral, longitudinal or conventional vertical separation. b) Requesting ATC clearance to climb above or descend below RVSM airspace if the aircraft cannot maintain CFL and ATC cannot establish adequate separation from other aircraft. c) Executing the contingency manoeuvre shown in paragraphs 1.5 and 1.6 to offset from the assigned track and FL, if ATC clearance cannot be obtained and the aircraft cannot maintain CFL.	Obtain the pilot's intentions and pass essential traffic information. If the pilot intends to continue in RVSM airspace, assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum. If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible. If adequate separation cannot be established and it is not possible to comply with the pilot's request for clearance to exit RVSM airspace, advise the pilot of essential traffic information, notify other aircraft in the vicinity and continue to monitor the situation. Notify adjoining ATC facilities/sectors of the situation.

Scenario 2: There is a failure or loss of accuracy of one primary altimetry system (e.g. greater than 200ft difference between primary altimeters).

The pilot should:
Cross check standby altimeter, confirm the accuracy of a primary altimeter system and notify ATC of the loss of redundancy. If unable to confirm primary altimeter system accuracy, follow pilot actions listed in the preceding scenario.

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EXPANDED EQUIPMENT FAILURE AND TURBULENCE ENCOUNTER SCENARIOS

Operators may consider this material for use in training programs.

* **Scenario 1**: All automatic altitude control systems failed (e.g. Automatic Altitude Hold).

The pilot should:	ATC can be expected to:
Initially, Maintain CFL Evaluate the aircraft's capability to maintain altitude through manual control Subsequently, Watch for conflicting traffic both visually and by reference to ACAS, if equipped.	
If considered necessary, alert nearby aircraft by: a) Making maximum use of exterior lights; b) Broadcasting position, FL, and intentions on 121.5MHz (as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz may be used).	
Notify ATC of the failure and intended course of action. Possible courses of action include: a) Maintaining the CFL and route, provided that the aircraft can maintain level. b) Requesting ATC clearance to climb above or descend below RVSM airspace if the aircraft cannot maintain CFL and ATC cannot establish lateral, longitudinal or conventional vertical separation. c) Executing the contingency manoeuvre shown in paragraphs 1.5 and 1.6 to offset from the assigned track and FL, if ATC clearance cannot be obtained and the aircraft cannot maintain CFL.	If the pilot intends to continue in RVSM airspace, assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum. If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible. If adequate separation cannot be established and it is not possible to comply with the pilot's request for clearance to exit RVSM airspace, advise the pilot of essential traffic information, notify other aircraft in the vicinity and continue to monitor the situation. Notify adjoining ATC facilities/sectors of the situation

* **Scenario 2:** Loss of redundancy in primary altimetry systems

The pilot should:	ATC can be expected to:
If the remaining altimetry system is functioning normally, couple that system to the automatic altitude control system, notify ATC of the loss of redundancy and maintain vigilance of altitude keeping.	Acknowledge the situation and continue to monitor progress.

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Scenario 3: All primary altimetry systems are considered unreliable or failed.

The pilot should:	ATC can be expected to:
Maintain CFL by reference to the standby altimeter (if the aircraft is so equipped).	Obtain pilot's intention and pass essential traffic information.
Alert nearby aircraft by: a) Making maximum use of exterior lights; b) Broadcasting position, FL, and intentions on 121.5MHz (as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz may be used).	If the pilot intends to continue in RVSM airspace, assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum.
Consider declaring an emergency. Notify ATC of the failure and intended course of action.	If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible.
Possible courses of action include:	If adequate separation cannot be established and it is not possible to comply with the pilot's request for clearance to exit RVSM airspace, advise the pilot of essential traffic information, notify other aircraft in the vicinity and continue to monitor the situation. Notify adjoining ATC facilities/sectors of the situation.
a) Maintaining CFL and route provided that ATC can provide lateral, longitudinal or conventional vertical separation.	
b) Requesting ATC clearance to climb above or descend below RVSM airspace if ATC cannot establish adequate separation from other aircraft.	
c) Executing the contingency manoeuvre shown in paragraphs 1.5 and 1.6 to offset from the assigned track and FL, if ATC clearance cannot be obtained.	

Scenario 4: The primary altimeters diverge by more than 200ft (60m).

The pilot should:
Attempt to determine the defective system through established trouble-shooting procedures and/or comparing the primary altimeter displace to the standby altimeter (as corrected by the correction cards, if required).
If the defective system can be determined, couple the functioning altimeter system to the altitude-keeping device.
If the defective system cannot be determined, follow the guidance in Scenario 3 for failure or unreliable altimeter indications of all primary altimeters.

Scenario 5: Turbulence (greater than moderate) which the pilot believes will impact the aircraft's capability to maintain flight level.

The pilot should:	ATC can be expected to:
Watch for conflicting traffic both visually and by reference to ACAS, if equipped.	
If considered necessary, alert nearby aircraft by: a) Making maximum use of exterior lights; b) Broadcasting position, FL, and intentions on 121.5MHz (as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz may be used).	
Notify ATC of intended course of action as soon as possible. Possible courses of action include: a) Maintaining CFL and route, provided ATC can provide lateral, longitudinal or conventional vertical separation. b) Requesting flight level change, if necessary c) Executingthecontingencymanoeuvreshowninparagraphs 1.5 and 1.6 to offset from the assigned track and FL, if ATC clearance cannot be obtained and the aircraft cannot maintain CFL.	Assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum. If unable to provide adequate separation, advise the pilot of essential traffic information and request pilot's intentions. Notify other aircraft in the vicinity and monitor the situation. Notify adjoining ATC facilities/sectors of the situation.

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CONTROLLER / PILOT PHRASEOLOGY

Phrases	Purpose
(callsign) CONFIRM RVSM APPROVED	Used by the controller to ascertain the RVSM approval status of an aircraft.
NEGATIVE RVSM*	Used by the pilot to report non-RVSM approval status: a) On the initial call on any frequency within the RVSM airspace (controllers shall provide a readback with this same phrase); and b) In all requests for flight level changes pertaining to flight levels within the RVSM airspace; and c) In all readback of flight level clearances pertaining to flight levels within the RVSM airspace. Additionally, except for State aircraft, pilots shall include this RTF phrase to read back flight level clearances involving the vertical transit through FL290 or FL410.
AFFIRM RVSM*	Used by the pilot to report RVSM approval status.
NEGATIVE RVSM STATE AIRCRAFT*	Used by the pilot of a non-RVSM approved State aircraft to report non-RVSM approval status in response to the RTF phrase (callsign) CONFIRM RVSM APPROVED.
(callsign) UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] FLIGHT LEVEL *(number)*	Used to deny ATC clearance into the RVSM airspace.
UNABLE RVSM DUE TURBULENCE*	Used by the pilot to report when severe turbulence affects the aircraft's capability to maintain the height- keeping requirements for RVSM.
UNABLE RVSM DUE EQUIPMENT*	Used by the pilot to report that the aircraft's equipment has degraded below the MASPS (Minimum Aircraft Systems Performance Specification) required for flight within the RVSM airspace.
READY TO RESUME RVSM*	Used by the pilot to report the ability to resume operations within the RVSM airspace after an equipment or weather-related contingency.
REPORT ABLE TO RESUME RVSM	Used by the controller to confirm that an aircraft has regained its RVSM approval status or to confirm that the pilot is ready to resume RVSM operations.

** indicates a pilot transmission*

2 MACH NUMBER TECHNIQUE (MNT) AND AREA NAVIGATION (RNAV)

2.1 INTRODUCTION

2.1.1 RNAV is a method which permits aircraft navigation along any desired flight path within the coverage of the associated navigation aids, or within the limits of the capability of self-contained aids, or a combination of these methods. RNAV equipment is considered to be that equipment which operates by automatically determining aircraft position from one, or a combination of the following sensors with the means to establish and follow a desired path: VOR/DME, DME/DME, INS, LORAN C, GNSS.

2.1.2 Only aircraft equipped with RNAV systems would be able to operate on the RNAV routes in Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1). Aircraft that are not RNAV compliant will only be cleared to operate on non-RNAV routes.

2.1.3 The requirements for conduct of RNAV operations are stated in ICAO Doc 9613 (Manual on Required Navigation Performance) and at https://www.caas.gov.sg/legislation-regulations/guidelines-advisory/air-operations.

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2.1.4 Minimum longitudinal separation of 10 minutes between RNAV equipped aircraft based on Mach Number Technique is applied on ATS routes A464, A576, B338, B469, B470, G334, G579, G580, L625, L642, L644, L649, L762, M630, M635, M646, M751, M753, M758, M761, M767, M768, M771, M772, M774, N502, N875, N884, N891, N892, P501, R469, T21, T22, T23, T24, T25, W22, W24 and W26 in accordance with
DOC 7030/4. MNPS criteria is not required. If item 10 of the flight plan does not include any of the following equipment designators "G", "I" or "R", operators shall insert "NAV/NON-RNAV" in item 18 of the flight plan.

2.1.5 Operators of aircraft to which the Mach Number Technique and RNAV procedures will be applied must ensure that the equipment carried on their aircraft have been calibrated in accordance with the applicable airworthiness practices.

2.1.6 An 80NM RNAV distance-based longitudinal separation minima, with Mach Number Technique being applied, is permanently implemented on ATS routes within the oceanic portion of the Singapore FIR.

2.2 MACH NUMBER IN A FLIGHT PLAN

2.2.1 Aircraft are required to include their true Mach Number in item 15 of the ICAO flight plan as follows:

a. True airspeed and level preceding the entry point.
b. True Mach Number and level at entry point.

Example: Item 15 of a flight plan for a flight from Kuala Lumpur to Kota Kinabalu:
0460F330 M758 VPK/M072F330 M758

2.2.2 Westbound departure flights from Singapore Changi Airport proceeding beyond Indonesia, Malaysia and Thailand shall include Mach Number in item 18 of the flight plan.

2.3 ATC CLEARANCE

2.3.1 The ATC clearance shall include the filed Mach Number which is to be maintained, whether climbing, descending or on level flight.

Example: An ATC clearance for a flight from Kuala Lumpur to Kuching, issued by Lumpur ATC to aircraft:

MAS 518 CLEARED TO KUCHING VIA AIRWAY MIKE 761, MAINTAIN FL290, AT VPK MAINTAIN SPEED OF MACH POINT SEVEN TWO TILL AGOBA. SSR CODE A2215.

2.4 MAINTENANCE/CHANGE OF MACH NUMBER

2.4.1 Aircraft will be cleared to maintain their Mach numbers from the point of entry to the exit point. Pilots shall adhere strictly to the last assigned Mach number and notify ATC of any variation to the cleared (filed) Mach number. Application of longitudinal separation between aircraft when the Mach Number Technique is used is based on the assumption that the assigned Mach number will be maintained at all times. In the event that for operational reasons it is not feasible to do so, the pilot must inform ATC at the time initial clearance or when subsequent clearances are issued or requested.

2.4.2 The current true Mach number shall be included in routine position reports.

2.4.3 When reporting a change in Mach number, pilots should use the following phraseology:

Example
SINGAPORE RADAR, THIS IS MAS 524, SPEED NOW REDUCED (INCREASED) TO MACH POINT SEVEN ZERO

2.5 LONGITUDINAL SEPARATION ON ATS ROUTES M758 AND M761

2.5.1 Longitudinal Separation Minimum

The minimum longitudinal separation between RNAV equipped aircraft on ATS routes M758 and M761 is 10 minutes based on MNT.

2.5.2 Separation of aircraft when the following aircraft is faster

When the following aircraft is faster, for each 600NM in distance between the entry and exit points of the area where the Mach Number Technique is used, 1 minute is added for each 0.01 difference in Mach number between the two aircraft concerned to compensate for the fact that the second aircraft is overtaking the first aircraft according to the table in Appendix B.

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2.5.3 Separation of aircraft when the preceding aircraft is faster

When the preceding aircraft is maintaining a greater Mach number than the following aircraft, the following separation shall be applied:

a. 9 minutes if the preceding aircraft is Mach 0.02 faster than the following aircraft;
b. 8 minutes if the preceding aircraft is Mach 0.03 faster than the following aircraft;
c. 7 minutes if the preceding aircraft is Mach 0.04 faster than the following aircraft;
d. 6 minutes if the preceding aircraft is Mach 0.05 faster than the following aircraft; and
e. 5 minutes if the preceding aircraft is Mach 0.06 faster than the following aircraft.

2.6 LONGITUDINAL SEPARATION ON ATS ROUTES A464, A576, B338, B469, B470, G579, G580, L625, L642, L644, L649, L762, M630, M635, M646, M751, M753, M758, M761, M767, M768, M771, M772, M774, N502, N875, N884, N891, N892, P501, R469, T21, T22, T23, T24, T25, W22, W24 AND W26

2.6.1 Requirements

The Mach Number Technique is applied on approved ATS routes between RNAV equipped aircraft.

2.6.2 Separation of aircraft with the same Mach number

10 minutes longitudinal separation shall be applied between aircraft with the same Mach number.

2.6.3 Separation of aircraft when the following aircraft is faster

The same buffer as stated in paragraph 2.5.2 shall be applied.

2.6.4 Separation of aircraft when the preceding aircraft is faster

The separation minima specified in paragraph 2.5.3 shall apply.

2.6.5 15 minutes longitudinal separation minimum

15 minutes longitudinal separation minimum shall be applied on these ATS routes between aircraft which cannot comply with RNAV procedures mentioned in paragraph 2.6.1.

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APPENDIX B

Table

APPLICATION OF MACH NUMBER TECHNIQUE WHEN THE FOLLOWING
AIRCRAFT IS THE FASTER
(BASED ON 10 MINUTES LONGITUDINAL SEPARATION)

DIFFERENCE IN MACH	DISTANCE TO FLY AND SEPARATION (IN MINUTES) REQUIRED AT ENTRY POINT				
	001-600 (NM)	601-1200 (NM)	1201-1800 (NM)	1801-2400 (NM)	2401-3000 (NM)
0.01	11	12	13	14	15
0.02	12	14	16	18	20
0.03	13	16	19	22	25
0.04	14	18	22	26	30
0.05	15	20	25	30	35
0.06	16	22	28	34	40
0.07	17	24	31	38	45
0.08	18	26	34	42	50
0.09	19	28	37	46	55
0.10	20	30	40	50	60

3 PERFORMANCE-BASED NAVIGATION ON RNAV ROUTES WITHIN SINGAPORE FIR AND AIRSPACE WHERE ATS IS PROVIDED BY SINGAPORE (SEE ENR 2.1)

3.1 INTRODUCTION

3.1.1 ATC separation minima based on RNP 10 navigation specification will be applied accordingly for aircraft which are approved for RNP 10 operations on the following segments of RNAV routes which fall within the airspace where ATS is provided by Singapore (see ENR 2.1):

L625 - BTN TOMAN and UXEDA and BTN GUTUP and AKMON
L642 - BTN ESPOB and MERSING
L644 - BTN DUDIS and LIGVU
L649 - BTN DAKIX and LAXOR
M635 - BTN VTK and SURGA
M767 - BTN TEGID and UKLIS and BTN NIXEB and TOMAN
M768 - BTN AKMON and ASISU
M771 - BTN MERSING and DUDIS
M772 - BTN ASISU and LAXOR
M774 - BTN OBDOS and JUNHA
N884 - BTN MERSING and OLMUT and BTN RILRI and LAXOR
N892 - BTN MELAS and MERSING

3.1.2 Additionally, to facilitate reduction of separation between suitably equipped aircraft, ATC separation minima based on RNP 4 navigation specification will be applied accordingly for aircraft which are approved for RNP 4 operations on the following segments of RNAV routes which fall within the Singapore FIR:

M767 – BTN TEGID and UKLIS
N884 – BTN RILRI and LAXOR

Note: Conformance monitoring shall be ensured by establishing an ADS-C event contract specifying a lateral deviation change event with a maximum of 5NM threshold and a waypoint change event.

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3.1.3 RCP240 and RSP180 performance specifications shall be required for the application of the Performance- Based Longitudinal Separation Minima and in accordance with ICAO Doc 4444 PANS-ATM paragraph 5.4.2.9.2.

3.1.4 Pilots shall inform ATC of any deterioration or failure of the navigation systems below the navigation requirements for RNP 10 and RNP 4. ATC shall then provide alternative separation and / or alternative routing.

3.2 OPERATIONS BY AIRCRAFT NOT MEETING RNP 10

3.2.1 An aircraft that is unable to meet the minimum navigational requirements for RNP 10 must file flight plan at below FL280. Operations at or above FL290 for these aircraft will be subjected to ATC approval, in accordance with the provisions of paragraph 3.2.2.

3.2.2 ATC units receiving a request for a non-RNP 10 approved aircraft to operate on ATS routes specified in paragraph 3.1, at or above FL290, will co-ordinate with adjacent ATC units affected by the flight. In deciding whether or not to approve the flight, each ATC unit will take into consideration:

a) traffic density;
b) communications, including the non-availability of normal communication facilities;
c) weather conditions en-route; and
d) any other factors pertinent at the time.

3.3 MONITORING OF AIRCRAFT NAVIGATION PERFORMANCE

3.3.1 Monitoring of aircraft navigation performance is a joint responsibility between operators, States of Registry or States of Operators (as applicable), regulatory authorities and the ATS providers. The detection and reporting of non-conformance with the navigation requirements against the following parameters will rely primarily on radar monitoring by ATC units:

<u>Lateral Deviations</u>

a) 10 NM or greater for lateral separation of 50 NM or more; and
b) 5 NM or greater for lateral separation minima less than 50 NM;

<u>Longitudinal Deviations</u>

a) where time separation is applied by ATC:
   i. when the pilot estimate or expected time between two aircraft based on routine position reports varies by 3 minutes or more; or
   ii. when there is an infringement of longitudinal separation minima.

b) where distance-based separation is applied by ATC:
   i. when the distance varies by 10 NM or more from the expected distance; or
   ii. when there is an infringement of longitudinal separation minima.

3.3.2 ATC will advise the pilot-in-command when such deviations are observed and implement the required investigation procedures.

3.3.3 The ATC authority will investigate the causes of such deviations in conjunction with the aircraft operator and the State of Registry, or the State of the Operator, as applicable.

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3.4 SEPARATION MINIMA

3.4.1 Lateral Separation Minima

a) 60NM lateral separation minima will be applied between aircraft which are approved for RNP 10, operating at or above FL290, on RNAV routes L644 and M772.
b) 50NM lateral separation minima will be applied between aircraft which are approved for RNP 10 operation on RNAV routes L625, L642, L649, M635, M767, M768, M771, M774, N884 and N892.
c) 30NM lateral separation minima will be applied between aircraft which are approved for RNP 4 operations on RNAV routes M767 and N884.
d) When an aircraft not meeting the RNP 10 navigation requirements is approved to operate at or above FL290, on the ATS routes shown in paragraph 3.1, vertical separation shall be applied with aircraft operating on adjacent routes.

3.4.2 Longitudinal Separation

a) 80NM RNAV or 10 minutes (or less) Mach Number Technique (MNT) separation minima may be applied between aircraft in situations where DCPC could not be maintained or when RCP240 / RSP180 performance requirement could not be complied.

Note: The maximum ADS-C periodic reporting interval of 12 minutes shall be used for RNP 4 approved aircraft.

b) 50NM longitudinal separation may be applied between RNP10 approved aircraft on RNAV routes L642, L762, M635, M767, M768, M771, M774 and N884 which either LOGON to CPDLC or are within VHF radio range.
c) 30NM longitudinal separation may be applied between RNP 4 approved aircraft on RNAV routes M767 and N884 which are LOGON to CPDLC.

3.5 CONTINGENCY PROCEDURES (including WEATHER DEVIATION)

3.5.1 Contingency procedures, including weather deviation, shall be in accordance with the provisions contained in ENR 1.8 paragraphs 1 and 6.

4 NO-PRE-DEPARTURE CO-ORDINATION (NO PDC) PROCEDURES

4.1 INTRODUCTION

4.1.1 No Pre-Departure Co-ordination (No PDC) procedures apply to flights departing from airports within Bangkok, Ha Noi, Ho Chi Minh, Hong Kong, Jakarta, Kota Kinabalu , Kuala Lumpur, Manila, Phnom Penh, Sanya, Singapore, Taipei, Ujung Pandang and Vientiane FIRs operating on RNAV and ATS routes over the South China Sea.

4.1.2 No Pre-Departure Co-ordination (No PDC) levels and FPL route shall be omitted in content of ATC clearance for departures from Singapore Changi Airport on ATS routes A457, B466 and B469/M751 to destinations in Peninsular Malaysia and Thailand, as well as to Medan Polonia.

4.2 NO PDC FLIGHT LEVEL ALLOCATION

4.2.1 Flight Level Allocation Scheme (FLAS) for Western Pacific / South China Sea Area:

ATS Route	No-PDC Flight Levels (Other levels available with prior approval)	Remarks
G334	Eastbound - FL250, FL270 Westbound - FL260, FL280	
G580	Eastbound - FL270, FL290, FL330 Westbound - FL280, FL300, FL340	
L517	FL280, FL300, FL340	
L625	FL310, FL320, FL350, FL360, FL390, FL400	
L642	FL310, FL320, FL350, FL360, FL390, FL400	
L644	Southbound - FL330, FL410	
B469 / M751	FL280, FL300, FL320, FL340, FL360, FL380, FL400	For flights to/from airports within Bangkok FIR
M753	Northbound - FL260, FL300, FL380 Southbound - FL270, FL330	
M754	Northbound - FL300, FL340, FL380 Southbound - FL290, FL330, FL370, FL410	

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ATS Route	No-PDC Flight Levels (Other levels available with prior approval)	Remarks
M758	Eastbound - FL270, FL290, FL330 Westbound - FL280, FL300, FL340	
M761	Eastbound - FL270, FL290, FL330 Westbound - FL280, FL300, FL340	
M767	FL310, FL320, FL350, FL360, FL390, FL400	
M768	Eastbound - FL270, FL330, FL410 Westbound - FL300, FL380	
M771	FL310, FL320, FL350, FL360, FL390, FL400	
M772	Northbound - FL300, FL380	
N875	Eastbound - FL290, FL330, FL370 Westbound - FL300, FL340, FL380	
N884	FL310, FL320, FL350, FL360, FL390, FL400	
N891	Northbound - FL260, FL300, FL380 Southbound - FL330	
N892	FL310, FL320, FL350, FL360, FL390, FL400	

4.2.2 FLAS for Large Scale Weather Deviations (LSWD) in Western Pacific / South China Sea Area as applicable by Singapore ACC:

Flight Level Allocation (LSWD)	ATS Route and Direction of Flight					
	L642	**M771**	**N892**	**L625**	**N884**	**M767**
	SW	NE	SW	NE	NE	SW
410						
400	400		400			400
390		390		390	390	
380						
370						
360	360		360			360
350		350		350	350	
340						
330						
320	320		320			320
310		310		310	310	
300						
290						

4.2.3 Aircraft requesting FL280, FL300 and FL320 on ATS routes L510, L759, L515/M770, N571, N571/N877, P628 and P574 will be assigned No-PDC FL280. Succeeding aircraft on the same route will be assigned FL280 with10 minutes longitudinal separation provided there is no closing speed with the preceding aircraft. Additional longitudinal separation as appropriate shall be provided by ATC for the faster aircraft following a slower aircraft on the same route.

4.2.4 For aircraft operating on ATS routes L510, N571, P574 and P628, which are equipped with Automatic Dependent Surveillance – Contract (ADS-C) and Controller-Pilot Data Link Communication (CPDLC), 7 minutes longitudinal separation will be applied between pair(s) of suitably equipped aircraft on the same route provided there is no closing speed with the preceding aircraft.

4.2.5 For aircraft on N571 or N571/ N877, the first aircraft from Singapore or Kuala Lumpur to be over GUNIP can expect its requested flight level.

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4.2.6 For aircraft on M770, the first aircraft from Singapore or Kuala Lumpur to be over the Kuala Lumpur / Bangkok FIR boundary can expect its requested flight level.

4.2.7 For aircraft on L759, the first aircraft from Singapore or Kuala Lumpur to be over the Kuala Lumpur / Bangkok FIR boundary can expect its requested flight level.

4.2.8 For aircraft on P628, the first aircraft from Singapore or Kuala Lumpur to be over VPL can expect its requested flight level.

4.2.9 For aircraft going beyond Medan on ATS route L762, FL280 and FL300 may be assigned. Succeeding aircraft on the same route will be cleared to FL280 or FL300 with 10 minutes longitudinal separation provided there is no closing speed with the preceding aircraft. Additional longitudinal separation as appropriate shall be provided by ATC for the faster aircraft following a slower aircraft on the same route.

5 STRATEGIC LATERAL OFFSET PROCEDURES

5.1 INTRODUCTION

5.1.1 Studies and safety analyses conducted by the ICAO Separation and Airspace Safety Panel (SASP) have shown that the application of a strategic lateral offset by aircraft from route centre line would result in an overall increase in safety of operations in remote and oceanic airspace.

5.2 STRATEGIC LATERAL OFFSETS IN EN-ROUTE AIRSPACE

5.2.1 Offsets may only be applied outside surveillance cover in en-route airspace within the Singapore FIR.

5.2.2 Offsets may only be applied by aircraft with automatic offset tracking capability.

5.2.3 The following requirements may apply to the use of the offset:

a. The decision to apply a strategic lateral offset is the responsibility of the flight crew;
b. The offset shall be established at a distance of one or two nautical miles to the right of the centre line relative to the direction of flight. Offsets are not to exceed two nautical miles right of centre line;
c. The strategic lateral offset procedure has been designed to include offsets to mitigate the effects of wake turbulence of preceding aircraft. If wake turbulence needs to be avoided, offsets to the right of the centreline relative to the direction of flight in tenths of a nautical mile up to a maximum of 3.7km (2nm) shall be used.

Pilots may contact other aircraft on the air to air frequency, 123.45MHz, as necessary, to coordinate the best wake turbulence offset option. As noted below, it is not necessary to notify air traffic control of approved offsets;

d. In airspace where the use of lateral offsets has been authorized, ATC clearance is not required for this procedure and pilots are not required to inform ATC that an offset is being applied;
e. Position reports are based on the current ATC clearance and not the exact coordinates of the offset position.

An example of a position report made by a pilot when passing reporting point TODAM while being offset from track is:
“Singapore Radio, Singapore 871, position TODAM 0930 Flight Level 380, estimate.....etc”.

6 WEATHER DEVIATION PROCEDURES IN THE SINGAPORE FIR AND AIRSPACE WHERE ATS IS PROVIDED BY SINGAPORE (SEE ENR 2.1)

6.1 GENERAL

Note.- The following procedures are intended for deviations around adverse meteorological conditions.

6.1.1 Modern ATC radar equipment are normally designed to suppress weather clutter and ATC may not always be aware of its presence.

6.1.2 ATC may pass observed weather information that appears likely to affect the pilot’s flight and advise if a detour will result in the aircraft leaving controlled airspace. The pilot will be responsible for deciding whether to accept a detour into uncontrolled airspace.

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6.1.3 If the pilot intends to detour a storm centre observed on his radar display, the pilot shall, obtain clearance from ATC for his proposed action. This is to ensure that separation which ATC may be providing to other aircraft is not prejudiced.

6.1.4 The following procedures are intended to enhance ICAO Regional Supplementary Procedures (DOC 7030). However, it must be recognised that all possible circumstances cannot be covered. The pilot's judgement shall ultimately determine the sequence of actions taken and ATC shall render all possible assistance.

6.2 OBTAINING ATC PRIORITY WHEN WEATHER DEVIATION IS REQUIRED

6.2.1 When weather deviation is required, the pilot should initiate communications with ATC via voice or CPDLC. A rapid response may be obtained by either:

a. stating "WEATHER DEVIATION REQUIRED" to indicate that priority is desired on the frequency and for ATC response; or
b. requesting a weather deviation using a CPDLC lateral downlink message.

6.2.2 When necessary, the pilot should initiate the communications using the urgency call "PAN PAN" (preferably spoken three times) or by using a CPDLC urgency downlink message to alert all listening parties of a special handling condition which requires ATC priority for issuance of a clearance or assistance.

6.3 ACTIONS TO BE TAKEN WHEN CONTROLLER-PILOT COMMUNICATIONS ARE ESTABLISHED

6.3.1 When two-way pilot-controller communications are in effect, the pilot should notify ATC and request clearance to deviate from track or ATS route, advising, when possible, the extent of the deviation requested. The flight crew will use whatever means are appropriate (i.e. voice and/or CPDLC) to communicate during a weather deviation.

Note.- Pilots are advised to contact ATC as soon as possible with requests for clearance in order to provide adequate time for the request to be assessed and acted upon.

6.3.2 After communicating with ATC, ATC will take one of the following actions:

a. if there is no conflicting traffic in the lateral dimension, ATC shall issue clearance to deviate from track;
b. if there is conflicting traffic in the lateral dimension, ATC shall separate aircraft by establishing vertical separation and issue a clearance to deviate from track;
c. if there is conflicting traffic in the lateral dimension, and ATC is unable to establish vertical separation, ATC shall advise the pilot and provide information on all other aircraft with which the aircraft could potentially conflict.

6.3.3 The pilot shall either:

a. comply with the ATC clearance issued; or
b. if ATC is unable to issue a revised clearance, the pilot shall evaluate the circumstances of the situation and advise ATC of intentions before executing the procedures detailed in paragraph 6.4. ATC will issue essential traffic information to all affected aircraft.

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6.4 ACTIONS TO BE TAKEN IF A REVISED ATC CLEARANCE CANNOT BE OBTAINED

6.4.1 If the aircraft is required to deviate from track or ATS route to avoid adverse meteorological conditions and a revised ATC clearance cannot be obtained, the pilot shall take the following actions:

a. if possible, deviate away from an organized track or ATS route system;
b. establish communications with and alert nearby aircraft by broadcasting on 121.5MHz, at suitable intervals:. (or, on 123.45MHz as a backup inter-pilot air-to-air frequency);
   i. aircraft identification;
   ii. flight level;
   iii. position (including ATS route designator or the track code); and
   iv. intentions.
c. watch for conflicting traffic both visually and by reference to ACAS (such as TCAS, if equipped);
d. turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
e. for deviations of less than 5.0 NM from the originally cleared track or ATS route, remain at a level assigned by ATC;
f. for deviations greater than, or equal to 5.0 NM from the originally cleared track or ATS route, when the aircraft is approximately 5.0 NM from track, initiate a level change in accordance with the following table:

Originally cleared track or ATS route centreline	Deviations greater than 5NM	Level change
EAST (000-179 magnetic)	LEFT RIGHT	DESCEND 300ft CLIMB 300ft
WEST (180-359 magnetic)	LEFT RIGHT	CLIMB 300ft DESCEND 300ft

g. if the pilot receives clearance to deviate from cleared track or ATS route for a specified distance and, subsequently, requests, but cannot obtain a clearance to deviate beyond that distance, the pilot should apply an altitude offset in accordance with the table above before deviating beyond the cleared distance; and

h. when returning to track or ATS route, be at its assigned flight level when the aircraft is within approximately 5.0 NM of the centreline.

Note.- If, as a result of actions taken under the provisions of 6.4.1, the pilot determines that there is another aircraft at or near the same flight level with which a conflict may occur, then the pilot is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

6.4.2 If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

6.4.3 The pilot shall inform ATC when weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to its cleared route.

7 AIR TRAFFIC MANAGEMENT CONTINGENCY PLAN

7.1 INTRODUCTION

7.1.1 The Air Traffic Management (ATM) Contingency Plan for Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) has been developed to fulfil the requirements of the ICAO Standards and Recommended Practices contained in Annex 11 and the Regional Supplementary Procedures (Doc 7030). In the event of partial or total disruption to the provision of Air Traffic Services (ATS) and / or the related support services in Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1), the ATM Contingency Plan referred to in this section shall be activated to ensure the continued safety of air navigation of aircraft operating through the affected airspace.

7.1.2 However, this contingency plan does not address arrangements for aircraft arriving and departing at Singapore airports. Aircraft departing or landing at Changi operating within 60NM from Singapore will be subjected to contingency procedures stated in ENR 1.8 paragraphs 1.5, 1.6, 1.7 and 1.8.

7.1.3 This ATM Contingency Plan provides:

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a) the contingency routes structure using existing published airways to enable transit through the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) and

b) the associated Air Traffic Control (ATC) procedures to support the contingency plan.

7.1.4 As and where dictated by circumstances, aircraft planning to operate through Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) that have not yet departed may be temporarily suspended until a full assessment of the prevailing conditions has been determined and sufficient air traffic services restored.

7.1.5 Long-haul international aircraft and special operations (e.g. Search and Rescue (SAR), State aircraft, humanitarian flights, etc.) shall be afforded priority for levels at FL290 and above. Aircraft operators that operate domestic and regional flights should plan on the basis that FL290 and above may not be available.

7.1.6 Aircraft operators may elect to avoid the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) by using ATS routes outside of Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1).

7.2 REDUCED ATS AND PROVISION OF FLIGHT INFORMATION SERVICES (FIS)

7.2.1 During the period where the contingency arrangements are in place, ATS including ATC services may not be available, a NOTAM will be issued providing the relevant information. The contingency plan provides for limited flight information and alerting services to be provided by Singapore ACC.

7.2.2 FIS and flight monitoring will be provided by the designated ATS authorities for the adjacent FIRs on the contingency routes that enter their respective FIRs.

7.2.3 During the early stages of a contingency event, ATC may be overloaded and tactical action may be taken to re-clear aircraft on alternative routes not included in this Plan.

7.2.4 In the event that ATS cannot be provided in the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) a NOTAM shall be issued indicating the following:

a. time and date on the commencement of the contingency measures;
b. airspace available for aircraft operations and airspace to be avoided;
c. details of the facilities and services available or not available and any limits on ATS provision, including an expected date of restoration of services if available;
d. information on the provisions made for alternative services;
e. applicable ATS routes, AIP-published contingency routes, or tactically defined contingency routes;
f. any special procedures to be complied by neighbouring ATS units not covered by this Plan;
g. any special procedures to be complied by pilots; and
h. any other details that aircraft operators may find useful with respect to the disruption and actions taken.

7.2.5 In the event that the Singapore International NOTAM Office is unable to issue the NOTAM, the alternate International NOTAM Office will take action to issue the contingency NOTAM upon notification by CAAS.

7.3 AIRCRAFT SEPARATION AND SPACING

7.3.1 Aircraft separation criteria, where applicable, will be in accordance with the ICAO Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM, Doc 4444) and the Regional Supplementary Procedures
(Doc 7030).

7.3.2 The longitudinal separation / spacing will be 15 minutes. However, this may be reduced to 10 minutes in conjunction with application of the Mach number technique where authorized by CAAS and the agreed ATS coordination with the adjacent ATS authority.

7.3.3 The contingency route structure provides for lateral separation / spacing of 100NM. In cases where the lateral spacing of contingency routes is less than 100NM, a minimum vertical separation of 1000 feet will be applicable.

7.4 PRIORITY FOR FLIGHT LEVELS

7.4.1 Where possible, aircraft on long-haul international flights shall be afforded priority for cruising levels assigned in accordance with the flight level allocation scheme as specified in paragraph 7.10.

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7.5 AIRSPACE CLASSIFICATIONS

7.5.1 Depending on the degree of disruption, airspace classifications may be changed to reflect the reduced level of services. Changes to airspace classification will be notified via NOTAM.

7.6 AIRCRAFT POSITION REPORTING

7.6.1 Beyond VHF coverage, Automatic Dependent Surveillance - Contract (ADS-C) shall replace any requirement for voice position reporting to ATC for suitably equipped aircraft and in this case Controller-Pilot Data Link Communications (CPDLC) or HF will be the secondary means of communication. When CPDLC has been authorised for use by the relevant ATC authority, this will become the primary means of communication while HF will act as the secondary means of communication. If means of communication (i.e. ADS-C, CPDLC, HF, VHF) are not available, aircraft operators shall comply with the communications procedures as stated in paragraph 7.9.

7.6.2 In the event that communication with the appropriate ATS authority could not be established, aircraft operators may apply Traffic Information Broadcast by Aircraft (TIBA) procedures in the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) as outline in paragraph 7.11 on 121.5MHz.

7.7 EXCLUSIONS

7.7.1 VFR flights shall not operate in the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) during contingency operations, except for State aircraft, Medevac flights, and any other aircraft as authorised by CAAS.

7.8 PILOT AND OPERATOR PROCEDURES

7.8.1 Filing of flight plans

7.8.1.1 Flight planning requirements detailed in AIP Singapore continue to apply during contingency operations, except where modified by the contingency ATS routes and flight level allocation scheme specified by ATC and / or in NOTAM.

7.8.1.2 Airspace users are expected to familiarize themselves with the Contingency Plan of the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) and the activation times. For aircraft intending to operate in areas during periods when the Contingency Plan is activated, the operators shall plan the flight to conform to the requirements of Contingency Plan.

7.8.1.3 The flight planning requirements during contingency periods will be in accordance to ICAO Annex 2 Chapter 3 and DOC 4444 Chapter 4 and Appendix 2. Additional information, will, however, be required, to indicate that the aircraft will operate in airspace where the Contingency Plan is active.

7.8.2 Overflight approval

7.8.2.1 Airspace users must obtain overflight approval from CAAS prior to operating aircraft through the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2 . 1). During the period of activation of this Contingency Plan, the adjacent ATS authority will provide normal ATC clearances for aircraft to enter Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1). The adjacent ATS authority is not responsible for coordination or provision of overflight clearances for Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1). The airspace users must ensure any required overflight approval has been obtained.

7.8.3 Pilot operating procedures

7.8.3.1 Pilots will continue to make or broadcast routine position reports in line with normal ATC procedures.

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7.8.3.2 Pilots of aircraft operating in the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) during contingency operations shall comply with the following procedures:

a. all aircraft proceeding along the ATS routes established in this Contingency Plan will comply with the instrument flight rules (IFR) and will be assigned a flight level in accordance with the flight level allocation scheme applicable to the route(s) being flown as specified in paragraph 7.10;
b. aircraft are to flight plan using the Contingency Routes specified in paragraph 7.10, according to their airport of origin and destination;
c. aircraft are to operate as close as possible to the centre line of the assigned contingency route;
d. a continuous communications watch shall be maintained on the specified contingency frequency as specified in paragraph 7.10;
e. aircraft position reports and other information as necessary shall be broadcast in accordance with TIBA procedures defined in paragraph 7.11;
f. aircraft navigation and anti-collision lights shall be displayed;
g. except in cases of emergency or for reasons of flight safety, pilots are to maintain the last assigned flight level, MACH number and SSR transponder code during their entire flight within Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2 . 1). If no transponder code has been assigned, aircraft shall squawk Code 2000.
h. aircraft are to reach the flight level last assigned by the responsible ACC at least 10 minutes before entering the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) or as otherwise instructed by the ATC unit acting in accordance with the Operational Contingency Arrangement;
i. pilots are to contact the next adjacent ACC as soon as possible, and in any event not less than ten (10) minutes before the estimated time of arrival over the relevant exit point from the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1);
j. pilots are to strictly adhere to the ICAO Traffic Information Broadcasts by Aircraft (TIBA) procedures, reproduced in paragraph 7.11, on the specified VHF and HF frequencies listed in paragraph 7.10. When necessitated by emergency conditions or flight safety requirements, pilots are to transmit blind on these frequencies, their current circumstances and the commencement and completion of any climb and descent or deviation from the cleared contingency route;
k. whenever emergencies and / or flight safety reasons make it impossible to maintain the flight level assigned for transit of Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1), pilots are to comply with the special procedures for in-flight contingencies set out in ENR 1.8 paragraph 1.5. If the deviation brings the aircraft out of Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1), pilots are to immediately inform the ACC unit responsible for that airspace. Pilots are to broadcast details of any level change including aircraft identification, aircraft position and route, vacated flight level, intended flight level; flight level passed and cruising flight level on 121.5MHz;
l. pilots are to maintain own longitudinal separation of 15 minutes from preceding aircraft at the same cruising level. However, this may be reduced to 10 minutes in conjunction with application of the Mach number technique where authorized by CAAS and the agreed ATS coordination with the adjacent ATS authority; and
m. not all operational circumstances can be addressed by this Contingency Plan and pilots are to maintain a high level of alertness when operating in the contingency airspace and take appropriate action to ensure safety of aircraft.

7.8.4 **Interception of civil aircraft**

7.8.4.1 Aircraft operators must be familiar with international intercept procedures contained in ICAO Annex 2 - Rules of the Air, paragraph 3.8 and Appendix 2, Sections 2 and 3.

7.8.4.2 Pilots are to comply with instructions given by the pilot of the intercepting aircraft. In such circumstances, the pilot of the aircraft being intercepted shall broadcast information on the situation.

7.8.4.3 If circumstances leading to the closure of the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) where no contingency routes are available, aircraft will be required to keep clear of Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2 . 1). As much warning as possible will be provided by the appropriate ATS authorities in the event of the complete closure of airspace.

7.8.4.4 Pilots shall continuously guard the VHF emergency frequency 121.5MHz and shall operate their transponder at all times during flight, regardless of whether the aircraft is within or outside airspace where secondary surveillance radar (SSR) is used for ATS purposes. Transponder should be set on the last discrete code assigned by ATC or select Code 2000 if no code was assigned.

7.9 COMMUNICATION PROCEDURES

7.9.1 **Degradation of Communication - Pilot Radio Procedures**

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7.9.1.1 When operating within the contingency airspace, pilots should use normal radio communication procedures where ATS services are available. Where limited or no ATS is available, communications shall be conducted in accordance with the procedures in this Plan or as otherwise notified by NOTAM.

7.9.1.2 If communications are lost unexpectedly on the normal ATS frequencies, pilots shall try the next applicable frequency, e.g. if en-route contact is lost, pilots shall try the next appropriate frequency (the next normal handover frequency). Pilots should also consider attempting to contact ATC on the last frequency where two-way communication had been established. In the absence of communication with ATC, the pilot shall continue to make routine position reports on the assigned frequency, and also broadcast positions in accordance with the TIBA procedures in paragraph 7.11.

7.9.2 **Communication frequencies**

7.9.2.1 A list of frequencies to be used for the contingency routes and the ATS units providing FIS and air-ground communication monitoring for the Singapore FIR and airspace where ATS is provided by Singapore (see ENR 2.1) is detailed in paragraph 7.10.

7.10 CONTINGENCY ROUTES

7.10.1 **Between Singapore and Manila FIR**

7.10.1.1 The following table shows the Contingency Routes (CR) Structure, Flight Level Allocation Scheme (FLAS) and Transfer of Control and Communication (TOC) between Singapore and Manila FIR.

CR	ATS Route	Direction	FLAS	ACC	Transfer of Communication (TOC)	Remarks
CRS-3	N884 (075400N 1122000E - LAXOR)	East	FL310 FL350	Manila ACC	At 075400N 1122000E, contact Manila ACC: - ADS/CPDLC: Logon RPHI - HF: 5655 / 8942 - VHF : 118.9 (LAXOR)	International operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
CRM-3	N884 (LAXOR - LULBU)	East	FL310 FL350 FL390	Singapore ACC	Applicable between 2100-1300 UTC At LULBU, contact Puerto Princesa Approach 122.0	International operators may choose to avoid the Manila FIR by using alternate ATS routes in other FIRs. Puerto Princesa Approach Facility Hours of Operations 2100-1300UTC
	N884 (LAXOR - LEGED)				Applicable between 1300-2100UTC At LUBAN, contact Clark Tower 118.7	International operators may choose to avoid the Manila FIR by using alternate ATS routes in other FIRs. Clark Control Tower Hours of Operations: H24

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CR	ATS Route	Direction	FLAS	ACC	Transfer of Communication (TOC)	Remarks
CRM-4	M767 (TOSOV - TEGID)	West	FL320 FL360 FL400	Singapore ACC	Applicable between 2100-1300UTC At TOSOV to contact Singapore ATC: - ADS/CPDLC: Logon WSJC - HF: 6556 / 8942	International operators may choose to avoid the Manila FIR by using alternate ATS routes in other FIRs.
	M767 (TELEN - TEGID)				Applicable between 1300-2100UTC At TELEN to contact Singapore ATC: - ADS/CPDLC: Logon WSJC - HF: 6556 / 8942	
N/A	M772	N/A	N/A	N/A	Not applicable. M772 will be suspended. No flight planning is allowed.	N/A

7.10.2 **Between Singapore and Ho Chi Minh FIR**

7.10.2.1 The following table shows the Contingency Routes (CR) Structure, Flight Level Allocation Scheme (FLAS) and Transfer of Control and Communication (TOC) between Singapore and Ho Chi Minh FIR.

CR	ATS Route	Direction	FLAS	ACC	Transfer of Communication (TOC)	Remarks
CRS-1	L642 (ESPOB – 060000N 1045600E)	West	FL360 FL400	Ho Chi Minh ACC	At 060000N 1045600E, contact Kuala Lumpur ATC: - VHF: 132.6 - HF: 5655 / 8942	International operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
CRS-2	M771 (060000N 1060900E – DUDIS)	East	FL350 FL390	Ho Chi Minh ACC	At 060000N 1060900E, contact Ho Chi Minh ATC: - ADS / CPDLC: Logon VVHM - VHF: 133.05 / 119.35 - HF: 5655 / 8942	International operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
CRS-3	N884 (060000N 1095600E – 075400N 1122000E)	**East**	FL310 FL350	Ho Chi Minh ACC	At 060000N 1095600E, contact Ho Chi Minh ATC: - ADS / CPDLC: Logon VVHM - VHF: 133.05 / 120.7 - HF: 5655 / 8942 At 075400N 1122000E, contact Manila ATC: - ADS / CPDLC: Logon RPHI - VHF: 118.9 (LAXOR) - HF: 5655 / 8942	International operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
CRS-4	M768 (064600N 1121500E - AKMON)	East	FL330	Ho Chi Minh ACC	At 064600N 1121500E, contact Kota Kinabalu ATC: - ADS / CPDLC: Logon WBFC - VHF: 126.1	International operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
		West	FL380	Ho Chi Minh ACC	At 064600N 1121500E, contact Ho Chi Minh ATC: - ADS / CPDLC: Logon VVHM - VHF: 133.05 / 119.35	

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CR	ATS Route	Direction	FLAS	ACC	Transfer of Communication (TOC)	Remarks
CRH-1	N891 (XONAN - IGARI)	North	FL300	Ha Noi ACC	At IGARI, contact Ha Noi ACC: - VHF: 120.9 / 133.85	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
		South	FL330	Ha Noi ACC	At IGARI, contact Singapore ATC: - ADS / CPDLC: Logon WSJC - VHF: 134.9 / 134.35 - HF: 6556 / 8942	
CRH-2	M753 (OSOTA – IPRIX)	North	FL270	Ha Noi ACC	At IPRIX, contact Ha Noi ACC: - VHF: 120.9	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
		South	FL260	Ha Noi ACC	At IPRIX, contact Singapore ATC: - ADS / CPDLC: Logon WSJC - VHF: 134.9 / 134.35 - HF: 6556 / 8942	
CRH-3	R468 / M768 (SAPEN – TSH – AKMON)	East	FL270	Ha Noi ACC	At AKMON, contact Singapore ATC: - ADS / CPDLC: Logon WSJC - HF: 6556 / 8942	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
		West	FL380	Ha Noi ACC	At AKMON, contact Ha Noi ACC: - VHF: 133.05 / 119.35 - HF: 5655 / 8942	
CRH-4	L642 (EXOTO – ESPOB)	West	FL310 FL320 FL390 FL400	Ha Noi ACC	At ESPOB, contact Singapore ATC: - ADS / CPDLC: Logon WSJC - VHF: 134.9 / 134.35 - HF: 6556 / 8942	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
CRH-5	M771 (DUDIS - DONDA)	East	FL310 FL320 FL390 FL400	Ha Noi ACC	At DUDIS, contact Ha Noi ACC: - VHF: 133.05 / 119.35 - HF: 5655 / 8942	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
CRH-6	N892 (MIGUG – MELAS)	West	FL310 FL320 FL390 FL400	Ha Noi ACC	At MELAS, contact Singapore ATC: - ADS / CPDLC: Logon WSJC - VHF: 134.9 / 134.35 - HF: 6556 / 8942	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.
CRH-7	L625 (AKMON – ARESI)	East	FL310 FL320 FL390 FL400	Ha Noi ACC	At AKMON, contact Ha Noi ACC: - VHF: 133.05 / 119.35 - HF: 5655 / 8942	International operators may choose to avoid the Ho Chi Minh FIR by using alternate ATS routes in other FIRs.

7.10.3 **Between Singapore and Kota Kinabalu FIR**

7.10.3.1 To be developed

7.10.4 **Between Singapore and Kuala Lumpur FIR**

7.10.4.1 To be developed

7.11 TRAFFIC INFORMATION BROADCASTS BY AIRCRAFT (TIBA)

7.11.1 **Introduction and applicability of broadcasts**

7.11.1.1 Traffic information broadcasts by aircraft are intended to permit reports and relevant supplementary information of an advisory nature to be transmitted by pilots on a designated VHF radiotelephone (RTF) frequency for the information of pilots of other aircraft in the vicinity.

7.11.1.2 TIBAs shall be introduced only when necessary and as a temporary measure.

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7.11.1.3 The broadcast procedures shall be applied in designated airspace where:

a. there is a need to supplement collision hazard information provided by air traffic services outside controlled airspace; or

b. there is a temporary disruption of normal air traffic services.

7.11.1.4 Such airspaces shall be identified by the States responsible for provision of air traffic services within these airspaces, if necessary with the assistance of the appropriate ICAO Regional Office(s), and duly promulgated in aeronautical information publications or NOTAM, together with the VHF RTF frequency, the message formats and the procedures to be used. Where, in the case of paragraph 7.11.1.3 a., more than one State is involved, the airspace should be designated on the basis of regional air navigation agreements and promulgated in Doc 7030.

7.11.1.5 When establishing a designated airspace, dates for the review of its applicability at intervals not exceeding 12 months should be agreed by the appropriate ATS authority(ies).

7.11.2 **Details of broadcasts**

VHF RTF frequency to be used

7.11.2.1 The VHF RTF frequency to be used shall be determined and promulgated on a regional basis. However, in the case of temporary disruption occurring in controlled airspace, the States responsible may promulgate, as the VHF RTF frequency to be used within the limits of that airspace, a frequency used normally for the provision of air traffic control service within that airspace.

7.11.2.2 Where VHF is used for air-ground communications with ATS and an aircraft has only two serviceable VHF sets, one should be tuned to the appropriate ATS frequency and the other to the TIBA frequency.

Listening watch

7.11.2.3 A listening watch shall be maintained on the TIBA frequency 10 minutes before entering the designated airspace until leaving this airspace. For an aircraft taking off from an aerodrome located within the lateral limits of the designated airspace, listening watch should start as soon as appropriate after take-off and be maintained until leaving the airspace.

Time of broadcasts

7.11.2.4 A broadcast shall be made:

a. 10 minutes before entering the designated airspace or, for a pilot taking off from an aerodrome located within the lateral limits of the designated airspace, as soon as appropriate after take-off;

b. 10 minutes prior to crossing a reporting point;

c. 10 minutes prior to crossing or joining an ATS route;

d. at 20-minute intervals between distant reporting points;

e. 2 to 5 minutes, where possible, before a change in flight level;

f. at the time of a change in flight level; and

g. at any other time considered necessary by the pilot.

Forms of broadcast

7.11.2.5 The broadcasts other than those indicating changes in flight level, i.e. the broadcasts referred to in paragraph 7.11.2.4 a., b., c., d. and g., should be in the following form:

ALL STATIONS (necessary to identify a traffic information broadcast)
(call sign)

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FLIGHT LEVEL (number) (or CLIMBING* TO FLIGHT LEVEL (number))
(direction)
(ATS route) (or DIRECT FROM (position) TO (position))
POSITION (position**) AT (time)
ESTIMATING (next reporting point, or the point of crossing or joining a designated ATS route) AT (time)
(call sign)
FLIGHT LEVEL (number) (direction)

Fictitious example:

"ALL STATIONS WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND DIRECT FROM PUNTA SAGA TO PAMPA POSITION 5040 SOUTH 2010 EAST AT 2358 ESTIMATING CROSSING ROUTE LIMA THREE ONE AT 4930 SOUTH 1920 EAST AT 0012 WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND OUT"

7.11.2.6 Before a change in flight level, the broadcast (referred to in paragraph 7.11.2.4 e.) should be in the following form:

ALL STATIONS
(call sign)
(direction)
(ATS route) (or DIRECT FROM (position) TO (position))
LEAVING FLIGHT LEVEL (number) FOR FLIGHT LEVEL (number) AT (position and time)

7.11.2.7 Except as provided in paragraph 7.11.2.8, the broadcast at the time of a change in flight level (referred to in paragraph 7.11.2.4 f.) should be in the following form:

ALL STATIONS
(call sign)
(direction)
(ATS route) (or DIRECT FROM (position) TO (position))
LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)
followed by:
ALL STATIONS
(call sign)
MAINTAINING FLIGHT LEVEL (number)

7.11.2.8 Broadcasts reporting a temporary flight level change to avoid an imminent collision risk should be in the following form:

ALL STATIONS
(call sign)
LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)
followed as soon as practicable by:
ALL STATIONS
(call sign)
RETURNING TO FLIGHT LEVEL (number) NOW

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