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wp-AMDT-2018-02

1. Significant information and changes

1.1 Singapore FIR

- a. Implementation of Performance-Based Communication and Surveillance (PBCS) to support performance-based reduced horizontal separation minima application using data link.

2. This amendment incorporates information contained in the listed NOTAMs and AIP Supplements which are hereby superseded:

NOTAM:

A0611/18 dated 15/02/18

AIP Supplement:

007/2018 dated 01/02/18

Amended Pages

GEN 0.2-1/2:	: replace.
GEN 0.3-1/2:	: replace.
GEN 0.3-3/4:	: replace.
GEN 0.4-1/2:	: replace.
GEN 0.4-3:	: replace.
GEN 1.3-3:	: replace.
GEN 3.2-3/4:	: replace.
ENR 0.6-1/2:	: replace.
ENR 0.6-3/4:	: replace.
ENR 0.6-5/6:	: replace.
ENR 1.1-15/16:	: replace.
ENR 1.6-5/6:	: replace.
ENR 1.6-7/8:	: replace.
ENR 1.6-9:	: remove.
ENR 1.8-1/2:	: replace.
ENR 1.8-3/4:	: replace.
ENR 1.8-5/6:	: replace.
ENR 1.8-7/8:	: replace.
ENR 1.8-9/10:	: replace.
ENR 1.8-11/12:	: replace.
ENR 1.8-13/14:	: replace.
ENR 1.8-15/16:	: replace.
ENR 1.8-17/18:	: replace.
ENR 1.8-19/20:	: replace.
ENR 1.8-21/22:	: replace.
ENR 1.8-23/24:	: replace.
ENR 1.8-25/26:	: replace.
ENR 1.8-27/28:	: replace.

ENR 1.8-29/30:	: <i>replace.</i>
ENR 1.8-31:	: <i>remove.</i>
ENR 1.10-1/2:	: <i>replace.</i>
ENR 1.10-3:	: <i>replace.</i>
ENR-2.1-9:	: <i>replace.</i>
ENR-2.1-15:	: <i>replace.</i>
ENR-3.1/ATS Chart:	: <i>replace.</i>
ENR 3.3-11/12:	: <i>replace.</i>
ENR-3.5-3:	: <i>replace.</i>
ERC-6-1 En-Route Chart:	: <i>replace.</i>
AD 0.6-1/2:	: <i>replace.</i>
AD 2.WSSS-33/34:	: <i>replace.</i>
AD 2.WSSS-35/36:	: <i>replace.</i>
AD 2.WSSS-37/38:	: <i>replace.</i>
AD 2.WSSS-39/40:	: <i>replace.</i>
AD 2.WSSS-41/42:	: <i>replace.</i>
AD 2.WSSS-43/44:	: <i>replace.</i>
AD 2.WSSS-45/46:	: <i>replace.</i>
AD 2.WSSS-47/48:	: <i>replace.</i>
AD 2.WSSS-49/50:	: <i>replace.</i>
AD 2.WSSS-51/52:	: <i>replace.</i>
AD 2.WSSS-53/54:	: <i>replace.</i>
AD 2.WSSS-55/56:	: <i>replace.</i>
AD 2.WSSS-57/58:	: <i>replace.</i>
AD 2.WSSS-59:	: <i>insert.</i>
AD-2-WSSS-ADC-2:	: <i>replace.</i>
AD-2-WSSS-AOC-2:	: <i>replace.</i>

GEN 0.2 RECORD OF AIP AMENDMENTS**AIP AMENDMENT**

NR/Year	Publication date	Date inserted	Inserted by
5/2014	18 SEP 2014	18 SEP 2014	
6/2014	13 NOV 2014	13 NOV 2014	
1/2015	08 JAN 2015	08 JAN 2015	
2/2015	05 MAR 2015	05 MAR 2015	
3/2015	30 APR 2015	30 APR 2015	
4/2015	25 JUN 2015	25 JUN 2015	
5/2015	20 AUG 2015	20 AUG 2015	
6/2015	15 OCT 2015	15 OCT 2015	
07/2015	10 DEC 2015	10 DEC 2015	
01/2016	04 FEB 2016	04 FEB 2016	
02/2016	31 MAR 2016	31 MAR 2016	
03/2016	26 MAY 2016	26 MAY 2016	
04/2016	21 JUL 2016	21 JUL 2016	
05/2016	15 SEP 2016	15 SEP 2016	
06/2016	10 NOV 2016	10 NOV 2016	
01/2017	05 JAN 2017	05 JAN 2017	
02/2017	02 MAR 2017	02 MAR 2017	
03/2017	27 APR 2017	27 APR 2017	
04/2017	22 JUN 2017	22 JUN 2017	
05/2017	17 AUG 2017	17 AUG 2017	
06/2017	12 OCT 2017	12 OCT 2017	
07/2017	07 DEC 2017	07 DEC 2017	
01/2018	01 FEB 2018	01 FEB 2018	
02/2018	29 MAR 2018	29 MAR 2018	

AIP AMENDMENT

<i>NR/Year</i>	<i>Publication date</i>	<i>Date inserted</i>	<i>Inserted by</i>

GEN 0.3 RECORD OF CURRENT AIP SUPPLEMENTS

NR/Year	Subject	AIP section(s) affected	Period of validity (from/to)	Cancellation record
76/2015	Paya Lebar Airport - Tower Cranes	AD	16 APR 2015 / 31 MAR 2018	
77/2015	Paya Lebar Airport - Saddle Cranes	AD	16 APR 2015 / 01 MAY 2018	
109/2015	Singapore Changi Airport - Shortening of Runway 20C approach lighting to 720m to facilitate the construction of the northern end-around-taxiway	AD	02 OCT 2015 / 31 OCT 2018	
132/2015	Paya Lebar Airport - Cranes	AD	01 JUL 2015 / 12 APR 2018	
133/2015	Paya Lebar Airport - Luffer Crane and Topless Crane	AD	01 JUL 2015 / 30 JUN 2018	
134/2015	Paya Lebar Airport - Luffer Cranes	AD	01 JUL 2015 / 30 JUN 2018	
135/2015	Tengah Aerodrome - Luffer Cranes	AD	01 JUL 2015 / 30 JUN 2018	
142/2015	Paya Lebar Airport - Topless Cranes	AD	03 AUG 2015 / 31 AUG 2018	
160/2015	Paya Lebar Airport - Luffer Cranes	AD	21 SEP 2015 / 15 AUG 2018	
161/2015	Paya Lebar Airport - Luffer Cranes	AD	21 SEP 2015 / 01 SEP 2018	
162/2015	Sembawang Aerodrome - Topless Cranes	AD	31 OCT 2015 / 31 OCT 2018	
004/2016	Singapore Changi Airport - Shortening of Runway 02C Approach Lighting System to 810M to Facilitate southern End-Round-Taxiway Construction	AD	01 JUN 2016 / 30 APR 2020	
029/2016	Paya Lebar Airport - Luffer Cranes	AD	04 MAR 2016 / 01 JUN 2018	
030/2016	Paya Lebar Airport - Saddle Cranes	AD	04 MAR 2016 / 17 JUN 2018	
031/2016	Paya Lebar Airport - Saddle Cranes	AD	04 MAR 2016 / 31 DEC 2018	
032/2016	Paya Lebar Airport - Luffer Crane	AD	04 MAR 2016 / 31 DEC 2018	
033/2016	Paya Lebar Airport - Luffer Crane	AD	04 MAR 2016 / 31 DEC 2018	
034/2016	Paya Lebar Airport - Saddle Cranes	AD	04 MAR 2016 / 31 DEC 2018	
039/2016	Paya Lebar Airport - Topless Cranes	AD	04 MAR 2016 / 31 JAN 2019	
060/2016	Paya Lebar Airport - Luffer Crane	AD	04 AUG 2016 / 31 MAY 2018	
061/2016	Paya Lebar Airport - Luffer Crane and Topless Crane	AD	04 AUG 2016 / 29 JUN 2018	
062/2016	Paya Lebar Airport - Luffer Cranes	AD	04 AUG 2016 / 31 JUL 2018	
063/2016	Paya Lebar Airport - Topless Cranes	AD	04 AUG 2016 / 31 DEC 2018	
064/2016	Paya Lebar Airport - Topless Cranes	AD	04 AUG 2016 / 31 DEC 2018	
065/2016	Paya Lebar Airport - Luffer Crane	AD	04 AUG 2016 / 31 DEC 2018	
066/2016	Paya Lebar Airport - Piling Rig and Crawler Crane	AD	04 AUG 2016 / 01 AUG 2018	
067/2016	Paya Lebar Airport - Topless Cranes and Luffer Crane	AD	04 AUG 2016 / 31 MAR 2019	

NR/Year	Subject	AIP section(s) affected	Period of validity (from/to)	Cancellation record
068/2016	Paya Lebar Airport - Topless Cranes and Luffer Cranes	AD	04 AUG 2016 / 01 JUN 2019	
069/2016	Paya Lebar Airport - Saddle Cranes	AD	04 AUG 2016 / 30 JUN 2019	
070/2016	Paya Lebar Airport - Luffer Cranes and Topless Cranes	AD	04 AUG 2016 / 31 DEC 2019	
089/2016	Seletar Airport - Partial closure of Taxiway EC and Taxiway EC2 due to new aircraft stands and service road construction and associated works	AD	01 NOV 2016 / 31 MAR 2018	
018/2017	Paya Lebar Airport - Piling Machine	AD	10 JAN 2017 / 06 JUN 2018	
019/2017	Paya Lebar Airport - Topless Cranes	AD	10 JAN 2017 / 06 DEC 2018	
022/2017	Paya Lebar Airport - Topless Cranes	AD	10 JAN 2017 / 31 DEC 2018	
023/2017	Paya Lebar Airport - Luffer Crane	AD	10 JAN 2017 / 31 DEC 2018	
024/2017	Paya Lebar Airport - Topless Cranes and Luffer Cranes	AD	10 JAN 2017 / 31 DEC 2018	
025/2017	Paya Lebar Airport - Topless Cranes	AD	10 JAN 2017 / 21 NOV 2019	
026/2017	Paya Lebar Airport - Luffer Crane	AD	10 JAN 2017 / 08 DEC 2019	
047/2017	Paya Lebar Airport - Luffer Cranes and Topless Cranes	AD	13 APR 2017 / 31 AUG 2018	
048/2017	Paya Lebar Airport - Luffer Crane	AD	13 APR 2017 / 31 DEC 2018	
049/2017	Paya Lebar Airport - Mobile Cranes	AD	13 APR 2017 / 31 DEC 2018	
050/2017	Paya Lebar Airport - Luffer Crane	AD	13 APR 2017 / 31 DEC 2018	
051/2017	Paya Lebar Airport - Mobile Cranes	AD	13 APR 2017 / 05 MAR 2019	
052/2017	Paya Lebar Airport - Topless Cranes	AD	13 APR 2017 / 14 MAR 2019	
053/2017	Paya Lebar Airport - Luffer Crane	AD	13 APR 2017 / 14 MAR 2019	
054/2017	Paya Lebar Airport - Luffer Crane	AD	13 APR 2017 / 23 MAR 2019	
055/2017	Paya Lebar Airport - Topless Cranes and Luffer Crane	AD	13 APR 2017 / 31 MAR 2019	
056/2017	Paya Lebar Airport - Topless Cranes	AD	13 APR 2017 / 30 APR 2019	
057/2017	Paya Lebar Airport - Luffer Cranes	AD	13 APR 2017 / 14 JAN 2020	
058/2017	Paya Lebar Airport - Topless Cranes	AD	13 APR 2017 / 26 OCT 2020	
062/2017	Tengah Aerodrome - Topless Crane and Luffer Crane	AD	13 APR 2017 / 31 MAR 2018	
063/2017	Paya Lebar Airport - Topless Cranes and Luffer Crane	AD	13 APR 2017 / 15 APR 2019	
067/2017	Sembawang Aerodrome - Topless Crane	AD	27 APR 2017 / 01 FEB 2020	
068/2017	Paya Lebar Airport - Obstacles	AD	27 APR 2017 / 26 OCT 2020	
075/2017	Sembawang Aerodrome - Crawler Crane	AD	11 JUL 2017 / 17 APR 2018	
076/2017	Paya Lebar Airport - Crawler Crane	AD	11 JUL 2017 / 30 JUN 2018	

NR/Year	Subject	AIP section(s) affected	Period of validity (from/to)	Cancellation record
077/2017	Paya Lebar Airport - Luffer Cranes and Topless Cranes	AD	11 JUL 2017 / 31 AUG 2018	
078/2017	Paya Lebar Airport - Mobile Cranes and Crawler Cranes	AD	11 JUL 2017 / 30 NOV 2018	
079/2017	Paya Lebar Airport - Topless Crane	AD	11 JUL 2017 / 28 APR 2019	
080/2017	Paya Lebar Airport - Topless Cranes	AD	11 JUL 2017 / 29 APR 2019	
081/2017	Paya Lebar Airport - Luffer Crane	AD	11 JUL 2017 / 01 MAY 2019	
082/2017	Paya Lebar Airport - Topless Cranes	AD	11 JUL 2017 / 31 DEC 2019	
083/2017	Paya Lebar Airport - Topless Cranes	AD	11 JUL 2017 / 31 DEC 2019	
084/2017	Paya Lebar Airport - Luffer Cranes	AD	11 JUL 2017 / 31 DEC 2019	
085/2017	Paya Lebar Airport - Topless Cranes	AD	11 JUL 2017 / 01 JUN 2020	
095/2017	Paya Lebar Airport - Topless Crane and Luffer Cranes	AD	26 SEP 2017 / 31 DEC 2019	
098/2017	Paya Lebar Airport - Topless Cranes	AD	26 SEP 2017 / 31 DEC 2019	
099/2017	Paya Lebar Airport - Crawler Cranes	AD	26 SEP 2017 / 02 MAY 2018	
100/2017	Paya Lebar Airport - Piling Rig and Crawler Crane	AD	26 SEP 2017 / 15 JUL 2018	
101/2017	Paya Lebar Airport - Piling Rig and Crawler Crane	AD	26 SEP 2017 / 15 JUL 2018	
102/2017	Paya Lebar Airport - Crawler Cranes	AD	26 SEP 2017 / 24 JUL 2018	
105/2017	Paya Lebar Airport - Luffer Crane and Saddle Crane	AD	29 SEP 2017 / 31 DEC 2018	
108/2017	Paya Lebar Airport - Topless Crane and Luffer Cranes	AD	30 SEP 2017 / 06 JUL 2020	
110/2017	Paya Lebar Airport - Piling Rig and Crawler Crane	AD	24 OCT 2017 / 16 OCT 2018	
111/2017	Paya Lebar Airport - Crawler Cranes	AD	24 OCT 2017 / 20 OCT 2018	
112/2017	Paya Lebar Airport - Topless Cranes	AD	24 OCT 2017 / 30 OCT 2018	
113/2017	Paya Lebar Airport - Topless Cranes	AD	24 OCT 2017 / 18 OCT 2019	
114/2017	Paya Lebar Airport - Luffer Crane	AD	24 OCT 2017 / 20 OCT 2019	
115/2017	Paya Lebar Airport - Topless Cranes	AD	24 OCT 2017 / 24 OCT 2019	
118/2017	Paya Lebar Airport - Luffer Cranes	AD	20 DEC 2017 / 20 APR 2018	
119/2017	Paya Lebar Airport - Crawler Cranes	AD	10 DEC 2017 / 31 DEC 2018	
120/2017	Paya Lebar Airport - Flat Top Cranes	AD	10 DEC 2017 / 30 JUN 2019	
121/2017	Paya Lebar Airport - Topless Cranes and Luffer Cranes	AD	10 DEC 2017 / 30 SEP 2020	
122/2017	Paya Lebar Airport - Luffer Cranes	AD	10 DEC 2017 / 31 DEC 2020	
123/2017	Paya Lebar Airport - Luffer Cranes	AD	10 DEC 2017 / 31 DEC 2020	
124/2017	Paya Lebar Airport - Luffer Crane	AD	10 DEC 2017 / 31 DEC 2020	

NR/Year	Subject	AIP section(s) affected	Period of validity (from/to)	Cancellation record
125/2017	Paya Lebar Airport - Topless Cranes	AD	10 DEC 2017 / 18 DEC 2019	
126/2017	Paya Lebar Airport - Luffer Cranes	AD	10 DEC 2017 / 19 DEC 2019	
002/2018	Paya Lebar Airport - Luffer Crane	AD	31 JAN 2018 / 30 JUN 2018	
003/2018	Paya Lebar Airport - Luffer Crane	AD	22 JAN 2018 / 31 DEC 2019	
004/2018	Paya Lebar Airport - Crawler Cranes and Boring Rigs	AD	22 JAN 2018 / 31 DEC 2019	
005/2018	Paya Lebar Airport - Topless Cranes	AD	22 JAN 2018 / 29 FEB 2020	
006/2018	Paya Lebar Airport - Topless Crane and Luffer Crane	AD	22 JAN 2018 / 28 FEB 2021	
008/2018	Seletar Airport - Partial closure of Taxiway EC and Taxiway EC2 due to new aircraft stands and service road construction and associated works	AD	31 MAR 2018 / 02 JUL 2018	
009/2018	Singapore Changi Airport - Works schedule and movement area restrictions pertaining to Changi East Development works	AD	24 MAR 2018 / 27 OCT 2018	
010/2018	Airspace closure Kuala Lumpur and Singapore FIRs Exercise BERSAMA SHIELD 18	AD/ENR	06 MAY 2018 / 14 MAY 2018	
011/2018	RSAF aerial flypast prior to and on Singapore's National Day, 09th August 2018	AD/ENR	26 MAY 2018 / 11 AUG 2018	
012/2018	Aerial displays in conjunction with the Republic of Singapore Air Force (RSAF) 50th Anniversary	AD/ENR	02 AUG 2018 / 12 AUG 2018	
013/2018	Singapore Changi Airport - Implementation of Departure Clearance (DCL) via datalink on selected ATS routes	AD	23 APR 2018 PERM	

GEN 0.4 CHECKLIST OF AIP PAGES

Part 1 – General (GEN)					
GEN 0					
GEN 0.1-1	12 NOV 2015	GEN 3.3-1	12 NOV 2015	ENR 1.7-1	12 NOV 2015
GEN 0.1-2	12 OCT 2017	GEN 3.3-2	21 JUL 2016	ENR 1.7-2	12 NOV 2015
GEN 0.1-3	21 JUL 2016	GEN 3.4-1	12 NOV 2015	ENR 1.7-3	12 NOV 2015
GEN 0.2-1	29 MAR 2018	GEN 3.4-2	02 MAR 2017	ENR 1.7-4	17 AUG 2017
GEN 0.2-2	01 FEB 2018	GEN 3.4-3	02 MAR 2017	ENR 1.7-5	12 NOV 2015
GEN 0.3-1	29 MAR 2018	GEN 3.4-4	02 MAR 2017	ENR 1.7-6	07 DEC 2017
GEN 0.3-2	29 MAR 2018	GEN 3.4-5	12 NOV 2015	ENR 1.7-7	12 NOV 2015
GEN 0.3-3	29 MAR 2018	GEN 3.4-7	21 JUL 2016	ENR 1.7-8	12 NOV 2015
GEN 0.3-4	29 MAR 2018	GEN 3.4-9	21 JUL 2016	ENR 1.7-9	12 NOV 2015
GEN 0.4-1	29 MAR 2018	GEN 3.5-1	12 NOV 2015	ENR 1.8-1	07 DEC 2017
GEN 0.4-2	29 MAR 2018	GEN 3.5-2	12 OCT 2017	ENR 1.8-2	29 MAR 2018
GEN 0.4-3	29 MAR 2018	GEN 3.5-3	12 NOV 2015	ENR 1.8-3	29 MAR 2018
GEN 0.5-1	05 JAN 2017	GEN 3.5-4	12 NOV 2015	ENR 1.8-4	29 MAR 2018
GEN 0.6-1	27 APR 2017	GEN 3.5-5	15 SEP 2016	ENR 1.8-5	29 MAR 2018
GEN 0.6-2	15 SEP 2016	GEN 3.5-6	12 NOV 2015	ENR 1.8-6	29 MAR 2018
GEN 0.6-3	22 JUN 2017	GEN 3.5-7	12 NOV 2015	ENR 1.8-7	29 MAR 2018
		GEN 3.5-8	22 JUN 2017	ENR 1.8-8	29 MAR 2018
		GEN 3.5-9	22 JUN 2017	ENR 1.8-9	29 MAR 2018
		GEN 3.6-1	12 NOV 2015	ENR 1.8-10	29 MAR 2018
		GEN 3.6-2	12 NOV 2015	ENR 1.8-11	29 MAR 2018
		GEN 3.6-3	12 NOV 2015	ENR 1.8-12	29 MAR 2018
		GEN 3.6-4	12 NOV 2015	ENR 1.8-13	29 MAR 2018
		GEN 3.6-5	21 JUL 2016	ENR 1.8-14	29 MAR 2018
GEN 1					
GEN 1.1-1	10 NOV 2016	GEN 4		ENR 1.8-15	29 MAR 2018
GEN 1.1-2	07 DEC 2017	GEN 4.1-1	15 SEP 2016	ENR 1.8-16	29 MAR 2018
GEN 1.2-1	15 SEP 2016	GEN 4.2-1	12 NOV 2015	ENR 1.8-17	29 MAR 2018
GEN 1.2-2	15 SEP 2016	GEN 4.2-2	12 NOV 2015	ENR 1.8-18	29 MAR 2018
GEN 1.2-3	27 APR 2017	GEN 4.2-3	12 NOV 2015	ENR 1.8-19	29 MAR 2018
GEN 1.2-4	27 APR 2017	GEN 4.2-4	12 NOV 2015	ENR 1.8-20	29 MAR 2018
GEN 1.2-5	27 APR 2017	GEN 4.2-5	12 NOV 2015	ENR 1.8-21	29 MAR 2018
GEN 1.2-6	27 APR 2017	GEN 4.2-6	12 NOV 2015	ENR 1.8-22	29 MAR 2018
GEN 1.3-1	21 JUL 2016	Part 2 – EN-ROUTE (ENR)		ENR 1.8-23	29 MAR 2018
GEN 1.3-2	12 NOV 2015	ENR 0		ENR 1.8-24	29 MAR 2018
GEN 1.3-3	29 MAR 2018	ENR 0.6-1	05 JAN 2017	ENR 1.8-25	29 MAR 2018
GEN 1.3-5	21 JUL 2016	ENR 0.6-2	29 MAR 2018	ENR 1.8-26	29 MAR 2018
GEN 1.3-7	21 JUL 2016	ENR 0.6-3	29 MAR 2018	ENR 1.8-27	29 MAR 2018
GEN 1.4-1	12 NOV 2015	ENR 0.6-4	29 MAR 2018	ENR 1.8-28	29 MAR 2018
GEN 1.4-2	12 NOV 2015	ENR 0.6-5	29 MAR 2018	ENR 1.8-29	29 MAR 2018
GEN 1.4-3	12 NOV 2015	ENR 0.6-6	27 APR 2017	ENR 1.8-30	29 MAR 2018
GEN 1.5-1	12 NOV 2015	ENR 1		ENR 1.9-1	07 DEC 2017
GEN 1.6-1	07 DEC 2017	ENR 1.1-1	12 NOV 2015	ENR 1.9-2	01 FEB 2018
GEN 1.6-2	07 DEC 2017	ENR 1.1-2	12 NOV 2015	ENR 1.9-3	27 APR 2017
GEN 1.6-3	07 DEC 2017	ENR 1.1-3	12 NOV 2015	ENR 1.9-4	27 APR 2017
GEN 1.7-1	10 NOV 2016	ENR 1.1-4	12 NOV 2015	ENR 1.9-5	27 APR 2017
GEN 1.7-2	12 NOV 2015	ENR 1.1-5	12 NOV 2015	ENR 1.10-1	01 FEB 2018
GEN 1.7-3	10 NOV 2016	ENR 1.1-6	12 NOV 2015	ENR 1.10-2	29 MAR 2018
GEN 1.7-4	10 NOV 2016	ENR 1.1-7	12 NOV 2015	ENR 1.10-3	29 MAR 2018
GEN 1.7-5	10 NOV 2016	ENR 1.1-8	12 NOV 2015	ENR 1.11-1	12 NOV 2015
GEN 2		ENR 1.1-9	12 NOV 2015	ENR 1.12-1	12 NOV 2015
GEN 2.1-1	12 NOV 2015	ENR 1.1-10	10 NOV 2016	ENR 1.12-2	12 NOV 2015
GEN 2.1-2	12 OCT 2017	ENR 1.1-11	12 NOV 2015	ENR 1.12-3	12 NOV 2015
GEN 2.2-1	02 MAR 2017	ENR 1.1-12	12 NOV 2015	ENR 1.12-4	12 NOV 2015
GEN 2.2-2	02 MAR 2017	ENR 1.1-13	02 MAR 2017	ENR 1.13-1	12 NOV 2015
GEN 2.2-3	02 MAR 2017	ENR 1.1-14	02 MAR 2017	ENR 1.14-1	10 DEC 2015
GEN 2.2-4	05 JAN 2017	ENR 1.1-15	29 MAR 2018	ENR 1.14-2	15 SEP 2016
GEN 2.2-5	10 NOV 2016	ENR 1.1-16	12 NOV 2015	ENR-1.14-3 to ENR-1.14-4	15 SEP 2016
GEN 2.3-1	12 NOV 2015	ENR 1.2-1	21 JUL 2016	ENR-1.14-5 to ENR-1.14-6	15 SEP 2016
GEN 2.3-2	12 NOV 2015	ENR 1.3-1	12 NOV 2015	ENR-1.14-7 to ENR-1.14-8	15 SEP 2016
GEN 2.3-3	12 NOV 2015	ENR 1.4-1	12 NOV 2015	ENR 2	
GEN 2.4-1	12 NOV 2015	ENR 1.5-1	12 NOV 2015	ENR 2.1-1	02 MAR 2017
GEN 2.5-1	21 JUL 2016	ENR 1.5-2	17 AUG 2017	ENR 2.1-2	02 MAR 2017
GEN 2.5-3	21 JUL 2016	ENR 1.5-3	17 AUG 2017	ENR 2.1-3	02 MAR 2017
GEN 2.6-1	12 NOV 2015	ENR 1.5-4	22 JUN 2017	ENR 2.1-4	12 NOV 2015
GEN 2.6-2	12 NOV 2015	ENR 1.6-1	12 NOV 2015	ENR-2.1-7	21 JUL 2016
GEN 2.7-1	12 NOV 2015	ENR 1.6-2	12 NOV 2015	ENR-2.1-9	29 MAR 2018
GEN 3		ENR 1.6-3	12 NOV 2015	ENR-2.1-11A	21 JUL 2016
GEN 3.1-1	21 JUL 2016	ENR 1.6-4	17 AUG 2017	ENR-2.1-11B	21 JUL 2016
GEN 3.1-2	21 JUL 2016	ENR 1.6-5	29 MAR 2018	ENR-2.1-13	21 JUL 2016
GEN 3.1-3	17 AUG 2017	ENR 1.6-6	29 MAR 2018	ENR-2.1-15	29 MAR 2018
GEN 3.1-4	01 FEB 2018	ENR 1.6-7	29 MAR 2018	ENR 3	
GEN 3.2-1	21 JUL 2016	ENR 1.6-8	29 MAR 2018	ENR 3.1-1	02 MAR 2017
GEN 3.2-2	31 MAR 2016	ENR-1.6-9	21 JUL 2016	ENR 3.1-2	02 MAR 2017
GEN 3.2-3	31 MAR 2016	ENR-1.6-11	21 JUL 2016	ENR 3.1-3	10 NOV 2016
GEN 3.2-4	29 MAR 2018			ENR 3.1-4	10 NOV 2016
GEN 3.2-5	31 MAR 2016			ENR 3.1-5	12 NOV 2015
GEN 3.2-6	31 MAR 2016				

ENR 3.1-6	02 MAR 2017	ENR 4.4-2	07 DEC 2017	AD 2.WSSS-29	07 DEC 2017
ENR 3.1-7	02 MAR 2017	ENR 4.4-3	07 DEC 2017	AD 2.WSSS-30	07 DEC 2017
ENR 3.1-8	10 NOV 2016	ENR 4.4-4	07 DEC 2017	AD 2.WSSS-31	07 DEC 2017
ENR 3.1-9	12 NOV 2015	ENR 4.4-5	17 AUG 2017	AD 2.WSSS-32	07 DEC 2017
ENR 3.1-10	02 MAR 2017	ENR 4.4-6	17 AUG 2017	AD 2.WSSS-33	01 FEB 2018
ENR 3.1-11	02 MAR 2017	ENR 4.5-1	12 OCT 2017	AD 2.WSSS-34	29 MAR 2018
ENR 3.1-12	10 NOV 2016	ENR 5			29 MAR 2018
ENR 3.1-13	12 NOV 2015			AD 2.WSSS-35	29 MAR 2018
ENR 3.1-14	02 MAR 2017	ENR 5.1-1	12 NOV 2015	AD 2.WSSS-36	29 MAR 2018
ENR 3.1-15	12 NOV 2015	ENR 5.1-2	12 NOV 2015	AD 2.WSSS-37	29 MAR 2018
ENR 3.1-16	02 MAR 2017	ENR 5.1-3	22 JUN 2017	AD 2.WSSS-38	29 MAR 2018
ENR 3.1-17	12 NOV 2015	ENR 5.1-4	12 NOV 2015	AD 2.WSSS-39	29 MAR 2018
ENR 3.1-18	02 MAR 2017	ENR 5.1-5	12 NOV 2015	AD 2.WSSS-40	29 MAR 2018
ENR 3.1-19	02 MAR 2017	ENR 5.1-6	12 NOV 2015	AD 2.WSSS-41	29 MAR 2018
ENR 3.1-20	12 NOV 2015	ENR 5.1-7	22 JUN 2017	AD 2.WSSS-42	29 MAR 2018
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ENR 3.3-18	07 DEC 2017	AD 0.6-2	29 MAR 2018	AD 2.WSSS-58	29 MAR 2018
ENR 3.3-19	07 DEC 2017	AD 0.6-3	12 OCT 2017	AD 2.WSSS-59	29 MAR 2018
ENR 3.3-20	07 DEC 2017	AD 0.6-4	12 OCT 2017	AD-2-WSSS-ADC-1	15 SEP 2016
ENR 3.3-21	07 DEC 2017	AD 0.6-5	12 OCT 2017	AD-2-WSSS-ADC-2	29 MAR 2018
ENR 3.3-22	07 DEC 2017	AD 0.6-6	12 OCT 2017	AD-2-WSSS-ADC-3	12 OCT 2017
ENR 3.3-23	07 DEC 2017	AD 0.6-7	12 OCT 2017	AD-2-WSSS-AOC-1	07 DEC 2017
ENR 3.3-24	07 DEC 2017			AD-2-WSSS-AOC-2	29 MAR 2018
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AD-2-WSSS-IAC-1	01 FEB 2018	AD-2-WIDD-SID-1	12 NOV 2015
AD-2-WSSS-IAC-2	01 FEB 2018	AD-2-WIDD-SID-2	12 NOV 2015
AD-2-WSSS-IAC-5	01 FEB 2018	AD-2-WIDD-SID-3	12 NOV 2015
AD-2-WSSS-IAC-6	01 FEB 2018	AD-2-WIDD-SID-4	12 NOV 2015
AD-2-WSSS-IAC-7	01 FEB 2018	AD-2-WIDD-STAR-1	12 NOV 2015
AD-2-WSSS-IAC-9	01 FEB 2018	AD-2-WIDD-STAR-2	12 NOV 2015
AD-2-WSSS-IAC-10	01 FEB 2018	AD-2-WIDD-STAR-3	12 NOV 2015
AD-2-WSSS-IAC-11	01 FEB 2018	AD-2-WIDD-STAR-4	12 NOV 2015
AD-2-WSSS-IAC-12	01 FEB 2018	AD 2.WIDN-1	05 JAN 2017
AD-2-WSSS-VAC-1	01 FEB 2018	AD-2-WIDN-SID-1	12 NOV 2015
AD 2.WSSL-1	01 FEB 2018	AD-2-WIDN-SID-2	12 NOV 2015
AD 2.WSSL-2	12 OCT 2017	AD-2-WIDN-SID-3	12 NOV 2015
AD 2.WSSL-3	07 DEC 2017	AD-2-WIDN-SID-4	12 NOV 2015
AD 2.WSSL-4	07 DEC 2017	AD-2-WIDN-STAR-1	12 NOV 2015
AD 2.WSSL-5	12 OCT 2017	AD-2-WIDN-STAR-2	12 NOV 2015
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AD 2.WSSL-8	12 OCT 2017		
AD 2.WSSL-9	12 OCT 2017		
AD 2.WSSL-10	07 DEC 2017		
AD 2.WSSL-11	12 OCT 2017		
AD 2.WSSL-12	07 DEC 2017		
AD 2.WSSL-13	17 AUG 2017		
AD 2.WSSL-14	12 OCT 2017		
AD 2.WSSL-15	02 MAR 2017		
AD 2.WSSL-16	17 AUG 2017		
AD 2.WSSL-17	02 MAR 2017		
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AD 2.WSAT-8	12 NOV 2015		
AD-2-WSAT-ADC-1	12 NOV 2015		

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The granting of social visit passes to all visitors is determined by the Immigration & Checkpoints Authority (ICA) officers at the point of entry.

- ← 2.5 Citizens of Taiwan are required to obtain Visa cards from the Trade Representative of Singapore in Taipei, any Singapore Overseas Mission, or from the various airline operators or shipping companies.

3 PUBLIC HEALTH REQUIREMENTS

- 3.1 Strict compliance with the provisions of the International Health Regulations, 1969, of the World Health Organisation, The Infectious Diseases Act and the Infectious Diseases (Quarantine) Regulations is required.
- 3.2 The pilot-in-command of an aircraft landing at Airports in Singapore shall furnish the Airport Health Officer with one copy of the General Declaration form (see ICAO Annex 9 Appendix 1) and one copy of the Passenger Manifest (see ICAO Annex 9 Appendix 2) signed by the pilot-in-command.
- 3.3 Vaccination Certificate Requirements for entry into Singapore are as follows:
- a. Smallpox and cholera vaccination certificates are not required.
 - b. A yellow fever vaccination certificate is required from travellers above one year of age who, within the preceding six days, have been in or have passed through any country partly or wholly endemic for yellow fever. The certificate is valid for a period of 10 years, beginning ten days after the date of vaccination or in the event of a re-vaccination within such period of ten years, from the date of that re-vaccination.

4 FLYING LICENCES AND RATINGS

4.1 VISITING PILOTS - HOLDERS OF NON-SINGAPORE PILOT LICENCES

- 4.1.1 When a holder of a non-Singapore pilot's licence wishes to fly on a Singapore registered aircraft in a private capacity in Singapore, he will be required to apply for a Certificate of Validation for his foreign licence. The Certificate of Validation, if approved, will be issued for this purpose only and for a limited period. The applicant would also be required to fulfil certain conditions. Pilots who wish to apply for a Certificate of Validation should contact the Personnel Licensing Section of the Civil Aviation Authority of Singapore (see address in paragraph 4.2.2 below)

4.2 CONVERSION OF FOREIGN LICENCE TO SINGAPORE LICENCE

- 4.2.1 Pilots holding valid licences, including an instrument rating and/or flying instructor's rating issued by ICAO Contracting States, may be considered for the conversion of their licences under the following conditions:
- (a) The pilot must demonstrate formal prospective employment by a Singapore air operator, approved training organisation or flying club to operate on Singapore registered aircraft.
(This requirement will not be applicable for the conversion of a foreign licence to a Singapore PPL.)
 - (b) The pilot's foreign licence and its associated ratings must be valid from the time of application to the time of issue of a Singapore licence and its associated ratings.
 - (c) The pilot must fulfil all conversion terms as specified by CAAS within a period of 6 months preceding the issue of a Singapore licence and its associated ratings.
- 4.2.2 Further details on the conversion of a foreign licence can be obtained from:
- Safety Policy and Licensing Division
Personnel Licensing Section
Civil Aviation Authority of Singapore
Singapore Changi Airport Terminal 2
South Finger Pier Level 3
Unit No. 038-039
Singapore 819643
- TEL: (65) 65412482
FAX: (65) 65434941

4.3 PILOTS WHO HAVE ATTAINED THE AGE OF 65

- 4.3.1 Any pilot who has attained his 65th birthday shall not be permitted to act as pilot-in-command or co-pilot of an aircraft engaged in scheduled or non-scheduled international commercial air transport operations within Singapore airspace.

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k. **Visual Approach Chart - ICAO**

This chart is produced for aerodromes used by civil aviation where:

- * only limited navigation facilities are available; or
- * radio communication facilities are not available; or
- * no adequate aeronautical charts of the aerodrome and its surroundings at 1:500 000 or greater scale are available; or
- * visual approach procedures have been established

The aeronautical data shown include information on aerodromes obstacles, designated airspace, visual approach information, radio navigation aids and communication facilities, as appropriate.

5 LIST OF AERONAUTICAL CHARTS AVAILABLE

GEN 3.2.5 LIST OF AERONAUTICAL CHARTS AVAILABLE

<i>Title of Chart Series</i>	<i>Scale</i>	<i>Name and/or number</i>		<i>Price (\$)</i>	<i>Date</i>
World Aeronautical Chart ICAO (WAC)	1:1 000 000	WAC 2860		In AIP	17 AUG 17
Enroute Chart ICAO (ENRC)		ERC 6-1		In AIP	29 MAR 18
Instrument Approach Chart ICAO (IAC)		Singapore Changi			
	1:400 000	RWY 02L - ICW ILS/DME	AD-2-WSSS-IAC-1	In AIP	01 FEB 18
	1:400 000	RWY 02C - ICE ILS/DME	AD-2-WSSS-IAC-2	In AIP	01 FEB 18
	1:400 000	RWY 20R - ICH ILS/DME	AD-2-WSSS-IAC-5	In AIP	01 FEB 18
	1:400 000	RWY 20C - ICC ILS/DME	AD-2-WSSS-IAC-6	In AIP	01 FEB 18
	1:400 000	RWY 20C - VTK DVOR/DME	AD-2-WSSS-IAC-7	In AIP	01 FEB 18
	1:400 000	RWY 02L - RNAV(GNSS)	AD-2-WSSS-IAC-9	In AIP	01 FEB 18
	1:400 000	RWY 02C - RNAV(GNSS)	AD-2-WSSS-IAC-10	In AIP	01 FEB 18
	1:400 000	RWY 20R - RNAV(GNSS)	AD-2-WSSS-IAC-11	In AIP	01 FEB 18
	1:400 000	RWY 20C - RNAV(GNSS)	AD-2-WSSS-IAC-12	In AIP	01 FEB 18
		Paya Lebar			
	1:400 000	RWY 20 - PU DVOR/DME	AD-2-WSAP IAC-1	In AIP	01 FEB 18
	1:400 000	RWY 02 - PU DVOR/DME	AD-2-WSAP IAC-2	In AIP	01 FEB 18
	1:400 000	RWY 20 - IPS ILS/DME	AD-2-WSAP IAC-3	In AIP	01 FEB 18
	1:400 000	RWY 02 - IPN ILS/DME	AD-2-WSAP IAC-4	In AIP	01 FEB 18
	1:400 000	RWY 02 - RNAV(GNSS)	AD-2-WSAP-IAC-5	In AIP	01 FEB 18
	1:400 000	RWY 20 - RNAV(GNSS)	AD-2-WSAP-IAC-6	In AIP	01 FEB 18
Visual Approach Chart ICAO (VAC)	1:400 000	Singapore Changi	AD-2-WSSS-VAC-1	In AIP	01 FEB 18
		Seletar			
	1:100 000	RWY 03	AD-2-WSSL-VAC-1	In AIP	01 FEB 18
	1:100 000	RWY 21	AD-2-WSSL-VAC-2	In AIP	01 FEB 18
	1:100 000	RWY 03	AD-2-WSSL-VAC-3	In AIP	01 FEB 18
	1:100 000	RWY 21	AD-2-WSSL-VAC-4	In AIP	01 FEB 18
Visual Departure Chart		Seletar			
	1:100 000	RWY 03	AD-2-WSSL-VDC-1	In AIP	01 FEB 18
	1:100 000	RWY 21	AD-2-WSSL-VDC-2	In AIP	01 FEB 18
Aerodrome Chart ICAO (AC)		Singapore Changi	AD-2-WSSS-ADC-2	In AIP	29 MAR 18
		Seletar	AD-2-WSSL-ADC-1	In AIP	12 OCT 17
		Paya Lebar	AD-2-WSAP-ADC-1	In AIP	12 NOV 15
Aerodrome Obstacle Chart ICAO TYPE A (AOC)		Singapore Changi			
	1:10 000	RWY 20R/02L	AD-2-WSSS-AOC-1	In AIP	07 DEC 17
	1:10 000	RWY 20C/02C	AD-2-WSSS-AOC-2	In AIP	29 MAR 18
		Seletar			
	1:10 000	RWY 03/21	AD-2-WSSL-AOC-1	In AIP	17 AUG 17
		Paya Lebar			
	1:20 000	RWY 20/02	AD-2-WSAP-AOC-1	In AIP	10 NOV 16
Aerodrome Obstacle Chart ICAO TYPE B (AOC)		Singapore Changi			
	1:25 000	RWY 02L/20R and 02C/20C	AD-2-WSSS-AOC-3	In AIP	01 FEB 18
		Seletar			
	1:12 500	RWY 03/21	AD-2-WSSL-AOC-2	In AIP	12 OCT 17
Precision Approach Terrain Chart ICAO (PATC)		Singapore Changi			
	1:2 500	RWY 02L	AD-2-WSSS-PATC-1	In AIP	01 FEB 18
	1:2 500	RWY 20C	AD-2-WSSS-PATC-2	In AIP	01 FEB 18

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*Note: The following sections in this chapter are intentionally left blank:
ENR 0.1, ENR 0.2, ENR 0.3, ENR 0.4, ENR 0.5.*

8.6 DATA LINK FAILURE

- 8.6.1 Pilots recognising a failure of a CPDLC connection must immediately establish communications on the appropriate voice frequency. When voice communications have been established, voice must continue to be used as the primary medium until a CPDLC connection has been re-established and the controller has authorised the return to data link.
- 8.6.2 In the event of an expected CPDLC shutdown, the controller will immediately advise all data link connected aircraft of the failure by voice. Instructions will continue to be issued by voice until the return of the data link system. The return of the system to an operational state will require a new AFN LOGON from the affected aircraft.

8.7 FLIGHT PLAN NOTIFICATION

- 8.7.1 Aircraft planning to utilise data link communications must annotate their ICAO flight plan as follows:

- a. Data link communication serviceability and capability must be notified by inserting one or more of the following letters in Item 10a (radio communication, navigation and approach aid equipment and capabilities):

J1	CPDLC ATN VDL Mode 2
J2	CPDLC FANS 1/A HF DL
J3	CPDLC FANS 1/A VDL Mode A
J4	CPDLC FANS 1/A VDL Mode 2
J5	CPDLC FANS 1/A SATCOM (INMARSAT)
J6	CPDLC FANS 1/A SATCOM (MTSAT)
J7	CPDLC FANS 1/A SATCOM (Iridium)
P1	CPDLC RCP 400
P2	CPDLC RCP 240
P3	SATVOICE RCP 400
P4-P9	Reserved for RCP

- b. Aircraft registration must be inserted in Item 18 as the ground system uses the information during the AFN LOGON.
- c. Serviceable ADS equipment carried must be annotated on the flight plan by adding one or more of the following descriptors to describe the serviceable surveillance equipment and/or capabilities on board:

B1	ADS-B with dedicated 1090MHz ADS-B “out” capability
B2	ADS-B with dedicated 1090MHz ADS-B “out” and “in” capability
U1	ADS-B “out” capability using UAT
U2	ADS-B “out” and “in” capability using UAT
V1	ADS-B “out” capability using VDL Mode 4
V2	ADS-B “out” and “in” capability using VDL Mode 4
D1	ADS-C with FANS 1/A capabilities
G1	ADS-C with ATN capabilities

- d. Additional surveillance equipment or capabilities are to be listed in Item 18 following the indicator SUR/.

9 WEATHER DEVIATION PROCEDURES FOR USE IN THE SINGAPORE FIR**9.1 GENERAL**

- 9.1.1 Deviations applicable in the South China Sea airspace, particularly outside the coverage of direct controller-pilot VHF communication.
- 9.1.2 These 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.
- 9.1.3 If an aircraft is required to deviate from track to avoid weather and prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. In the meantime, the aircraft shall broadcast its position (including the ATS route designator or the track code, as appropriate) and intentions on frequency 121.5MHz at suitable intervals until ATC clearance is received.
- 9.1.4 The pilot shall advise ATC when weather deviation is no longer required or when a weather deviation has been completed and the aircraft has returned to its cleared track.

9.2 OBTAINING ATC PRIORITY WHEN WEATHER DEVIATION IS REQUIRED

- 9.2.1 When the pilot initiates communications with ATC, rapid response may be obtained by stating that “WEATHER DEVIATION IS REQUIRED” to indicate that priority is desired on the frequency and for ATC response.
- 9.2.2 The pilot also retains the option of initiating the communication using the urgency call “PAN-PAN” 3 times to alert all listening parties of a special handling condition which will receive ATC priority for issuance of a clearance or assistance.

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

- 9.3.1 When two-way pilot-controller communications are in effect, and a pilot identifies the need to deviate from track to avoid weather, the pilot shall notify ATC and request clearance to deviate from track, advising where possible the extent of the deviation expected.
- 9.3.2 ATC will then take one of the following actions:
- i. if there is no conflicting traffic in the lateral dimension, ATC shall issue clearance to deviate from track;
 - ii. 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;
 - iii. 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.
- 9.3.3 The pilot shall comply with the ATC clearance issued for the deviation or, if ATC is unable to issue a revised clearance, and after evaluating the circumstances of the situation, the pilot shall execute the procedures detailed in paragraph 9.4 below. The pilot shall immediately inform ATC of intentions and ATC will issue essential traffic information to all affected aircraft.
- 9.3.4 The pilot shall, at regular intervals, update ATC of the extent and progress of the deviation to ensure that separation applied is not infringed or to enable ATC to update essential traffic information.

9.4 ACTIONS TO BE TAKEN WHEN PILOT-CONTROLLER COMMUNICATIONS ARE NOT ESTABLISHED OR REVISED ATC CLEARANCE IS NOT AVAILABLE

- 9.4.1 If contact cannot be established, or a revised ATC clearance is not available and deviation from track is required to avoid weather, the pilot shall take the following actions:
- a. deviate away from an organised track or route system, if possible;
 - b. broadcast aircraft position and intentions on frequency 121.5MHz at suitable intervals stating:
 - i. flight identification;
 - ii. flight level;
 - iii. track code or ATS route designator; and
 - iv. extent of deviation expected.
 - c. watch for conflicting traffic both visually and by reference to TCAS (if equipped);
 - d. turn on aircraft exterior lights;
 - e. when the aircraft is approximately 10NM from track, initiate a level change based on the following criteria:

<u>Route Centreline Track</u>	<u>Deviation Greater than 10NM</u>	<u>Above FL290 Level Change</u>	<u>At FL290 & Below Level Change</u>
East	Left	Descend 500ft	Descend 300ft
000-179 Mag	Right	Climb 500ft	Climb 300ft
West	Left	Climb 500ft	Climb 300ft
180-359 Mag	Right	Descend 500ft	Descend 300ft

- f. when returning to track, be established at the assigned flight level or altitude when the aircraft is within approximately 10NM of track;
- g. if contact cannot be established prior to deviation, continue to attempt to contact ATC to obtain a clearance. If contact is subsequently established, continue to keep ATC advised of intentions and obtain essential traffic information.

3. After fuel jettison, proceed to SAMKO Holding Area (SHA) via Awy G580 and SINJON DVOR. Maintain 7,000ft. At SHA descend for an instrument approach on RWY 02L/02C. Identify the runway-in-use in accordance with para 1.11 above.
- 1.12.3 When radio communication failure occurs immediately after the aircraft has departed on RWY 20R/ 20C, the pilot shall proceed according to the following procedures:
- a. Proceed straight ahead to SAMKO Holding Area (SHA) climbing to the last assigned altitude. At SHA climb/descend to maintain 7,000ft;
 - b. Hold at SHA for 4 minutes. Leave SHA for HOSBA Holding Area (HHA) via SJ DVOR and Airway G580 to jettison fuel, maintaining 7,000ft;
 - c. After fuel jettison, proceed to NHA via Airway W401. Maintain 7,000ft. On crossing VTK 042R turn right to intercept VTK 023R. At NHA descend to carry out an instrument approach on RWY 20R/20C.
- 1.12.4 ATC action is based on the assumption that the aircraft will take a minimum of 10 min to jettison fuel. An aircraft therefore should not leave earlier than 10 min after arrival at HOSBA Holding Area even if fuel jettison is completed at a shorter time or if jettisoning is not necessary or possible unless circumstances require an immediate return.
- 1.12.5 Alternatively, aircraft may jettison fuel between HOSBA and point 80NM from VTK DVOR/DME on Airway G580.
- 1.13 TOTAL RADIO FAILURE - SPECIAL PROCEDURES - SELETAR AP - ARRIVALS**
- 1.13.1 If total radio communication failure occurs in VMC during daylight hours to an aircraft bound for Seletar AD, the pilot shall continue to fly in VMC and land at the most suitable aerodrome.
- 1.13.2 If in IMC or when weather conditions are such that the total radio communication failure aircraft cannot complete its flight in accordance with 1.13.1, the pilot will EITHER:
- a. proceed in accordance with the last acknowledged clearance from ATC; OR
 - b. if no specific instructions or clearances have been received and acknowledged:
 - i. maintain the last assigned level and proceed via flight planned route to KK NDB;
 - ii. commence descent from KK NDB at or as close as possible to the ETA Seletar AD as indicated on the flight plan or last EAT passed by ATC and acknowledged by aircraft;
 - iii. leave KK NDB at 2,500ft and proceed to overhead Seletar;
 - iv. if Seletar Aerodrome is visual, initiate the standard arrival procedures for RWY 21;
 - v. if unable to effect a landing on RWY 21, carry out a missed approach at or below 1,500ft and land on RWY 03.
- 1.13.3 ATC will assist the pilot in identifying RWY-in-use by switching on the RWY lights and appropriate PAPI.
- 1.13.4 The pilot shall keep a look-out for light signals from Seletar Tower. On receipt of a green light from Seletar Tower, a landing may be made.
- 1.13.5 If unable to land within 30 minutes of ETA Seletar as indicated in the flight plan or last acknowledged EAT, aircraft will proceed to its flight planned alternate.
- 1.13.6 It is the pilot's responsibility to ensure that he is clear of other traffic while carrying out the standard arrival procedure.

1.14 TOTAL RADIO FAILURE - SPECIAL PROCEDURES - SELETAR AP - DEPARTURES

- 1.14.1 If total radio communication failure occurs to a departing aircraft within the Seletar Control Zone, the pilot shall maintain 2,500ft and if Seletar Ad is visual, initiate the standard arrival procedures for RWY 21. If unable to effect a landing on RWY 21, carry out a missed approach at or below 1,500ft and land on RWY 03. When in the circuit, the pilot shall keep a look-out for light signals from Seletar Tower.
- 1.14.2 If departing aircraft experiences total radio communication failure outside the Seletar Control Zone, the pilot shall follow procedures as set out in paragraph 1.13.
- 1.14.3 At night, aircraft experiencing total radio communication failure will proceed to its flight planned alternate.

1.15 RADIO FAILURE - SPECIAL PROCEDURES - SELETAR AP - HELICOPTERS

- 1.15.1 Helicopters experiencing RTF failure should approach low level (not above 300ft) and fly past the Control Tower on the eastern side of the runway rocking laterally.
- 1.15.2 Unless the pilot unmistakably sees a green light from the Tower, he is not to assume that he is cleared to land but is to carry out the same procedure again.
- 1.15.3 In each circumstance, it is the pilot's responsibility to ensure that he is cleared of other circuit traffic and does not encroach on the approach of the runway.

1.16 RADIO FAILURE - SPECIAL PROCEDURES - SELETAR AP - FIXED WING AIRCRAFT

- 1.16.1 Aircraft experiencing radio failure are to descend on the western side of the runway to 600ft and rock the aircraft when passing abeam the Control Tower.
- 1.16.2 Unless the pilot unmistakably sees a green light from the Tower, he is not to assume that he is cleared to land but is to carry out the same procedure again.
- 1.16.3 When carrying out radio failure procedure, the pilot-in-command shall not infringe the helicopter circuit whenever it is active and shall keep a sharp look-out for helicopters and other aircraft operating in the aerodrome circuit.

1.17 ACTION TAKEN BY ATC DURING RADIO FAILURE

- 1.17.1 In addition to the action specified in paragraph 1.8.2, if unable to establish normal communication with an aircraft, ATC will:
- Maintain separation between the aircraft and other aircraft known to be operating in its vicinity;
 - Transmit essential information to the aircraft, including the flight levels reserved for its use, route to be flown, and any significant weather information, such as terminal weather, areas in which VMC may be expected, etc.;
 - Advise other acft in the vicinity of the presumed psn of the acft experiencing radio failure;
 - Use ground radar to check whether or not the aircraft is receiving and complying with ATC instructions, and to ensure separation from other aircraft;
 - Inform the operator concerned or his representative;
 - Inform the alternate aerodrome of the circumstances of the failure and request attempts to establish communication with the aircraft;
 - Inform all concerned and end all radio failure actions if communication with aircraft is established and when aircraft lands.

2 SECONDARY SURVEILLANCE RADAR (SSR)

2.1 OPERATING PROCEDURES

- 2.1.1 All aircraft flying in controlled airspace in the Singapore FIR are required to operate SSR transponders selecting Mode 3/A (4096 codes) and Mode C simultaneously.
- 2.1.2 Aircraft dep Singapore shall operate transponders in accordance with instructions given by ATC.
- 2.1.3 Pilots who have received specific instructions from ATC concerning the setting of the transponder shall maintain that setting except in circumstances detailed in paragraphs 2.2, 2.3 and 2.4.
- 2.1.4 Aircraft bound for Singapore shall transpond on the SSR code last assigned to them by the adjacent FIR, or if no code has been previously assigned, advise the ATC unit concerned who will provide the required code.

2.2 EMERGENCY PROCEDURES

- 2.2.1 The pilot of an aircraft encountering a state of emergency shall set his transponder to Code 7700.

2.3 RADIO COMMUNICATION FAILURE

- 2.3.1 The pilot of an aircraft experiencing 2-way radio communication failure shall set his transponder to Code 7600.

2.4 SYSTEM OF SSR CODE ASSIGNMENT

- 2.4.1 Aircraft operating in the Singapore FIR will be assigned the following codes except for those aircraft already assigned codes by adjacent FIRs:

INTERNATIONAL	DOMESTIC
0100 - 0177	0001 - 0077
2200 - 2277	4200 - 4277
	4300 - 4377
	4600 - 4677

Table A

AIR TRAFFIC CONTROL RADAR UNITS			
LOCATION	PARENT ATC UNIT	RADAR UNIT CALLSIGN	SERVICE/FACILITIES PROVIDED
SINGAPORE CHANGI AIRPORT	SINGAPORE CONTROL	SINGAPORE RADAR (in general)	Radar surveillance and control of aircraft in controlled airspace and, in certain circumstances, outside controlled airspace within the Singapore FIR. Maximum operating range is 220NM on PSR and 250NM on SSR. Radar services will be provided at the discretion of ATC.
		SINGAPORE RADAR	Flow Control. Radar surveillance and control of aircraft in controlled airspace within 40NM radius of Singapore Changi Airport.
		SINGAPORE ARRIVAL	Radar surveillance and control of all arrivals in controlled airspace within 20NM radius of Singapore Changi Airport.

Note:

The transfer of responsibility from one radar unit to another will be effected at any mutually agreed time, level or place.

ENR 1.8 REGIONAL SUPPLEMENTARY PROCEDURES

1 RVSM PROCEDURES IN THE SINGAPORE FIR

1.1 **IMPLEMENTATION OF REVISED 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 (L642, M771, N892, L625, N884 and M767) that involve managed 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 To harmonise with RVSM operations within Jakarta FIR, RVSM operations within the Singapore FIR shall be conducted between FL290 and FL410 (inclusive) in the following areas:

ATS Routes	Flight Level Assignment
A464 (S) Southbound	FL290, FL310, FL330, FL350, FL370, FL390, FL410
A576 (S) Southbound	FL290, FL310, FL330, FL350, FL370, FL390, FL410
B470	FL290, FL300, FL310, FL320, FL330, FL340, FL350, FL360, FL370, FL380, FL390, FL400 and FL410 except for flights beyond Jakarta where only odd levels shall be assigned.
B469 (S) Southbound	FL290, FL310, FL330, FL350, FL370, FL390 and FL410
N875/G464 (S) Southbound	FL290, FL330, FL370 and FL410
W36 (S) Southbound	FL290, FL330, FL370 and FL410
L644 (S) Southbound	FL290, FL330, FL370 and FL410
L762(W) Westbound	FL300, FL320, FL340, FL360, FL380 and FL400
R469 (W) Westbound	FL300, FL320, FL340, FL360, FL380 and FL400
W22 (W) Westbound	FL300, FL320, FL340, FL360, FL380 and FL400

1.1.3 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.

1.1.4 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:

http://www.caas.gov.sg/caasWeb2010/export/sites/caas/en/Regulations/Safety/Advisory_Circulars/AC-AOC_series-AIR_Operators/AC_AOC-15_0.pdf

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 (<http://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:

<http://www.aerothai.co.th/maar/monitoringsystems.php>

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.

- 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 pages ENR 1.8-8 to ENR 1.8-11 or Appendix 5 of FAA IG 91-RVSM 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.

- 1.4.5 Paragraphs 1.5, 1.6, 1.7 and 1.8 below contain procedures for in-flight contingencies that have been updated for RVSM operations. The contingency procedures in paragraphs 1.5 and 1.6 and the off-set procedures in paragraph 1.8 should be applied in Oceanic operations. The weather deviation procedures in paragraph 1.7 may be applied in all airspace in the region.

1.5 SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES IN OCEANIC AIRSPACE IN THE SINGAPORE FIR

- 1.5.1 The following general procedures apply to both subsonic and supersonic aircraft and are intended as guidance only. Although all possible contingencies cannot be covered, they provide for cases of inability to maintain assigned level due to:

- a. weather;
- b. aircraft performance;
- c. pressurisation failure; and
- d. problems associated with high-level supersonic flight.

- 1.5.2 The procedures are applicable primarily when rapid descent and/or turn-back or diversion to an alternate airport is required. The pilot's judgement shall determine the sequence of actions to be taken, taking into account specific circumstances.

- 1.5.3 If an aircraft is unable to continue flight in accordance with its air traffic control clearance, a revised clearance shall, whenever possible, be obtained prior to initiating any action, using a distress or urgency signal as appropriate.
- 1.5.4 If prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time and, until a revised clearance is received, the pilot shall:
- if possible, deviate away from an organised track or route system;
 - establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: flight identification, flight level, aircraft position (including the ATS route designator or the track code) and intentions on the frequency in use, as well as on frequency 121.5MHz (or, as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz);
 - watch for conflicting traffic both visually and by reference to ACAS (if equipped); and
 - turn on all aircraft exterior lights (commensurate with appropriate operating limitations).

1.6 IN-FLIGHT CONTINGENCY PROCEDURES FOR SUBSONIC AIRCRAFT REQUIRING RAPID DESCENT, TURN-BACK OR DIVERSION IN OCEANIC AIRSPACE IN THE SINGAPORE FIR

Initial action

- 1.6.1 If unable to comply with the provisions of 1.5.3 to obtain a revised ATC clearance, the aircraft should leave its assigned route or track by turning 45 degrees right or left whenever this is possible. The direction of the turn should be determined by the position of the aircraft relative to any organised route or track system (for example, whether the aircraft is outside, at the edge of, or within the system). Other factors to consider are terrain clearance and the levels allocated to adjacent routes or tracks.

Subsequent action

- 1.6.2 An aircraft able to maintain its assigned level should acquire and maintain in either direction a track laterally separated by 15NM from its assigned route or track and once established on the offset track, climb or descend 500ft (150m).
- 1.6.3 An aircraft NOT able to maintain its assigned level should, whenever possible, minimise its rate of descent while turning to acquire and maintain in either direction a track laterally separated by 15NM from its assigned route or track. For subsequent level flight, a level should be selected which differs by 500ft (150m) from those normally used.
- 1.6.4 Before commencing a diversion across the flow of adjacent traffic, the aircraft should, while maintaining the 15NM offset, expedite climb above or descend below levels where the majority of aircraft operate (e.g. to a level above FL400 or below FL290) and then maintain a level which differs by 500ft (150m) from those normally used. However, if the pilot is unable or unwilling to carry out a major climb or descent, the aircraft should be flown at a level 500ft above or below levels normally used until a new ATC clearance is obtained.
- 1.6.5 If these contingency procedures are employed by a twin-engine aircraft as a result of an engine shutdown or a failure of an ETOPS critical system, the pilot should advise ATC as soon as practicable of the situation, reminding ATC of the type of aircraft involved and requesting expeditious handling.

1.7 WEATHER DEVIATION PROCEDURES IN THE SINGAPORE FIR

General procedures

- 1.7.1 The following procedures are intended to provide guidance. 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.
- 1.7.2 If the aircraft is required to deviate from track to avoid weather and prior clearance cannot be obtained, an air traffic control clearance shall be obtained at the earliest possible time. In the meantime, the aircraft shall follow the procedures detailed in paragraph 1.7.9.
- 1.7.3 The pilot shall advise ATC when weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to the centreline of its cleared route.
- 1.7.4 When the pilot initiates communications with ATC, rapid response may be obtained by stating "WEATHER DEVIATION REQUIRED" to indicate that priority is desired on the frequency and for ATC response.
- 1.7.5 The pilot still retains the option of initiating the communications using the urgency call "PAN PAN" to alert all listening parties to a special handling condition, which may receive ATC priority for issuance of a clearance or assistance.

- 1.7.6 When controller-pilot communications are established, the pilot shall notify ATC and request clearance to deviate from track, advising, when possible, the extent of the deviation expected. ATC will take one of the following actions:
- if there is no conflicting traffic in the horizontal dimension, ATC will issue clearance to deviate from track; or
 - if there is conflicting traffic in the horizontal dimension, ATC will separate aircraft by establishing vertical separation or, if unable to establish vertical separation, ATC shall:
 - advise the pilot unable to issue clearance for requested deviation
 - advise pilot of conflicting traffic
 - request pilot's intentions

SAMPLE PHRASEOLOGY:

"Unable (requested deviation), traffic is (callsign, position, altitude, direction), advise intentions."

- 1.7.7 The pilot will take the following actions:
- advise ATC of intentions by the most expeditious means available,
 - comply with air traffic control clearance issued, or
 - execute the procedures detailed in 1.7.9 below, (ATC will issue essential traffic information to all affected aircraft.)
 - if necessary, establish voice communications with ATC to expedite dialogue on the situation.

Actions to be taken if a revised air traffic control clearance cannot be obtained

- 1.7.8 The pilot shall take the actions listed below under the provision that the pilot may deviate from rules of the air (e.g. the requirement to operate on route or track centreline unless otherwise directed by ATC), when it is absolutely necessary in the interests of safety to do so.

- 1.7.9 If a revised air traffic control clearance cannot be obtained and deviation from track is required to avoid weather, the pilot shall take the following actions:

- if possible, deviate away from an organised track or route system;
- establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: flight identification, flight level, aircraft position (including the ATS route designator or the track code) and intentions (including the magnitude of the deviation expected) on the frequency in use, as well as on frequency 121.5MHz (or, as a back-up, the VHF inter-pilot air-to-air frequency 123.45MHz).
- watch for conflicting traffic both visually and by reference to ACAS (if equipped);
- turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
- for deviations of less than 10NM, aircraft should remain at the level assigned by ATC;
- for deviations of greater than 10NM, when the aircraft is approximately 10NM from track, initiate a level change based on the following criteria:

Route centreline track	Deviations greater than 10NM	Level change
EAST 000-179 magnetic	LEFT RIGHT	DESCEND 300ft CLIMB 300ft
WEST 180-359 magnetic	LEFT RIGHT	CLIMB 300ft DESCEND 300ft

Note: Items b) and c) call for the pilot to broadcast aircraft position and pilot's intentions, identify conflicting traffic and communicate air-to-air with nearby aircraft.

If the pilot determines that there is another aircraft at or near the same FL with which his aircraft might conflict, then the pilot is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

- 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.
- when returning to track, be at its assigned flight level when the aircraft is within approximately 10NM of centreline.

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

1.8.1 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.

1.8.2 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
- 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).

1.9 FLIGHT PLANNING REQUIREMENTS

1.9.1 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.

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

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

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

1.10.3 Non-RVSM compliant aircraft operating in RVSM airspace should use the phraseology as contained in page ENR 1.8-12.

1.10.4 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.

1.10.5 Non-RVSM compliant aircraft may not flight plan between FL290 and FL410 inclusive within RVSM airspace. After special coordination as detailed in paragraph 1.10.6 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 1.11 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).

1.10.6 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.

1.10.7 Contact details for approval request are as follows:

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

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

1.11 DELIVERY FLIGHTS FOR AIRCRAFT THAT ARE RVSM COMPLIANT ON DELIVERY

1.11.1 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.

1.12 PROCEDURES FOR SUSPENSION OF RVSM

1.12.1 Air traffic services will consider suspending RVSM procedures within affected areas of the Singapore FIR 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.

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

← 1.13.1 See pages ENR 1.8-7 to ENR 1.8-10 for guidance in these circumstances.

1.14 PROCEDURES FOR AIR-GROUND COMMUNICATION FAILURE

1.14.1 The air-ground communication failure procedures specified in page ENR 1.6-3 in conjunction with ICAO PANS-ATM DOC 4444 should be applied.

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 <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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.

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.

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).	
<p>Alert nearby aircraft by:</p> <p>a) Making maximum use of exterior lights;</p> <p>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).</p> <p>Consider declaring an emergency. Notify ATC of the failure and intended course of action.</p> <p>Possible courses of action include:</p> <p>a) Maintaining CFL and route provided that ATC can provide lateral, longitudinal or conventional vertical separation.</p> <p>b) Requesting ATC clearance to climb above or descend below RVSM airspace if ATC cannot establish adequate separation from other aircraft.</p> <p>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.</p>	<p>Obtain pilot's intentions and pass essential traffic information.</p> <p>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.</p> <p>If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible.</p> <p>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.</p> <p>Notify adjoining ATC facilities/sectors of the situation.</p>

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 display 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.	
<p>If considered necessary, alert nearby aircraft by:</p> <p>a) Making maximum use of exterior lights;</p> <p>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).</p>	
<p>Notify ATC of intended course of action as soon as possible.</p> <p><u>Possible courses of action include:</u></p> <p>a) Maintaining CFL and route, provided ATC can provide lateral, longitudinal or conventional vertical separation.</p> <p>b) Requesting flight level change, if necessary</p> <p>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.</p>	<p>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.</p> <p>If unable to provide adequate separation, advise the pilot of essential traffic information and request pilot's intentions.</p> <p>Notify other aircraft in the vicinity and monitor the situation.</p> <p>Notify adjoining ATC facilities/sectors of the situation.</p>

CONTROLLER / PILOT PHRASEOLOGY

Phrases	Purpose
<i>(callsign)</i> 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 <i>(callsign)</i> CONFIRM RVSM APPROVED.
<i>(callsign)</i> UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] FLIGHT LEVEL <i>(number)</i>	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 the revised South China Sea ATS route structure which forms part of the Singapore FIR. 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 FAA AC 90-45 (Approval of Area Navigation Systems for use in the US National Airspace System).
- 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, B470, G334, L625, L642, L644, L649, L762, M646, M751, M753, M758, M761, M767, M768, M771, M772, M774, N875, N884, N891 and N892 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 600m 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 A (see page ENR 1.8-16).

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, B470, G579, L625, L642, L644, L649, L762, M646, M751, M753, M767, M768, M771, M772, N875, N884, N891 AND N892**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 para 2.5.2 shall be applied.

2.6.4 Separation of aircraft when the preceding aircraft is faster

The separation minima specified in para 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 para 2.6.1.

Note: The longitudinal separation minimum for aircraft operating between Singapore and Jakarta airports on airways B470 and G579 is 10 minutes irrespective of whether they are RNAV-equipped.

APPENDIX ATable

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 RNP 10 NAVIGATION REQUIREMENTS

3.1 INTRODUCTION

3.1.1 ATC will apply 50NM lateral separation minima to aircraft which are approved for RNP 10 operations on the following segments of RNAV routes which fall within the Singapore FIR:

L625 - BTN TOMAN and AKMON
L642 - BTN ESPOB and MERSING
L649 - BTN DAKIX and LAXOR
M635 - BTN VTK and SURGA
M767 - BTN TEGID and TOMAN
M771 - BTN MERSING and DUDIS
M774 - BTN OBDOS and KADAR
N884 - BTN MERSING and LAXOR
N892 - BTN MELAS and MERSING

3.1.2 A Performance-Based Longitudinal Separation Minima of 50NM may be applied between RNP 10 approved aircraft on RNAV routes L642, M635, M767, M771, M774 and N884 which either LOGON to CPDLC or are within VHF radio range as the primary means of communication. Such direct controller-pilot communication (DCPC) shall be maintained at all times when applying these separation minima

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

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

3.1.5 ATC will apply 60NM lateral separation minima to aircraft which are approved for RNP 10 operations on RNAV routes:

L644 - BTN DUDIS and KIKOR
M772 - BTN ASISU and LAXOR

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

3.1.7 Pilots of aircraft meeting RNP 10 navigation requirements must indicate /R at Item 10 of the ICAO Flight Plan.

3.2 OPERATIONS BY AIRCRAFT NOT MEETING RNP 10 REQUIREMENTS

3.2.1 An aircraft that is unable to meet the minimum navigational requirements for RNP 10 must file flight plan at FL280 or below. Operations above FL280 for these aircraft will be subject to ATC approval, in accordance with the provisions of paragraph 3.2.3.

3.2.2 Pilots of such aircraft wishing to operate on ATS routes specified in paragraph 3.1.1, at or above FL290, must indicate their level requirements at Item 18 of the ICAO Flight Plan as RMK/REQ FL (insert level). Approval to operate at the preferred level will be subject to ATC co-ordination and clearance. Flights that are not approved will be required to operate at FL280 or below or via alternative routes.

3.2.3 ATC units receiving a request for a non-RNP 10 approved aircraft to operate on ATS routes specified in paragraph 3.1.1, 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 communications facilities;
- c. weather conditions en-route; and
- d. any other factors pertinent at the time.

3.3 SAFETY ASSESSMENT CRITERIA

3.3.1 The safety criteria associated with the introduction of the reduced lateral separation minima of 60NM will be in accordance with the requirements for RNP 10 navigation performance, i.e. aircraft navigation performance shall be such that the standard deviation of lateral track errors shall be less than 8.7km (4.7NM).

3.4 MONITORING OF AIRCRAFT NAVIGATION PERFORMANCE

- 3.4.1 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:

Lateral Deviations

- i. a deviation of 15NM or more from track centreline based on radar observations;

Longitudinal Deviations

- i. where time separation is applied by ATC - when the reported separation based on ATC verified pilot estimates varies by 3 minutes or more from the expected separation at the reporting point; or
ii. where a distance based standard is applied by ATC based on ADS, radar observation or RNAV distance reports - when the distance varies by 10NM or more from the expected distance.

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

- 3.4.3 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.

3.5 SEPARATION MINIMA

3.5.1 Lateral Separation Minima

- a. A lateral separation minima of 60NM will be applied between aircraft equipped in accordance with RNP 10 navigation requirements, operating at FL290 or above, on ATS routes L644 and M772 (see paragraph 3.1.2). 50NM lateral separation minima will be applied between aircraft which are approved for RNP10 operations on ATS routes L625, L642, L649, M635, M767, M771, M774, N884 and N892 (see paragraph 3.1.1).
- b. When an aircraft not meeting the RNP 10 navigation requirements is approved to operate at or above FL290, on the ATS routes shown in paragraphs 3.1.1 and 3.1.2, vertical separation shall be applied with aircraft operating on adjacent routes.

3.5.2 Longitudinal Separation

- 3.5.2.1 80NM RNAV or 10 minutes (or less) Mach Number Technique (MNT) separation minima may be applied between aircraft.

- 3.5.2.2 50NM longitudinal separation may be applied between RNP10 approved aircraft on ATS routes L642, L762, M635, M767, M771, M774 and N884 which either LOGON to CPDLC or are within VHF radio range.

3.6 OPERATORS' PROCEDURES

- 3.6.1 The operator shall ensure in-flight procedures, crew manuals and training programmes are established in accordance with RNP 10 navigation requirements.

3.7 CONTINGENCY PROCEDURES (including WEATHER DEVIATION)

- ← 3.7.1 Contingency procedures, including weather deviation, shall be in accordance with the provisions contained in AIP Singapore pages ENR 1.8-2 to ENR 1.8-5.

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 the Bali, Bangkok, Hanoi, Ho Chi Minh, Hong Kong, Jakarta, Kota Kinabalu (including Brunei), Kuala Lumpur, Manila, Phnom Penh, Sanya, Singapore, Taipei 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	Uni-directional
L625	FL310, FL320, FL350, FL360, FL390, FL400	Uni-directional
L642	FL310, FL320, FL350, FL360, FL390, FL400	Uni-directional
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	
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	Uni-directional
M768	Eastbound - FL270, FL330, FL410 Westbound - FL300, FL380	
M771	FL310, FL320, FL350, FL360, FL390, FL400	Uni-directional
M772	Northbound - FL300, FL380	
N875	Eastbound - FL290, FL330, FL370 Westbound - FL300, FL340, FL380	
N884	FL310, FL320, FL350, FL360, FL390, FL400	Uni-directional
N891	Northbound - FL260, FL300, FL380 Southbound - FL330	
N892	FL310, FL320, FL350, FL360, FL390, FL400	Uni-directional

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						

Flight Level Allocation (LSWD)	ATS Route and Direction of Flight					
	L642	M771	N892	L625	N884	M767
	SW	NE	SW	NE	NE	SW
330						
320	320		320			320
310		310		310	310	
300						
290						

- 4.2.3 Aircraft requesting FL280, FL300 and FL320 on ATS route L759, L515/M770, N571, N571/N877, P628 and P574 will be cleared to FL280. Succeeding aircraft on the same route will be cleared to FL280 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.
- 4.2.4 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.
- 4.2.5 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.
- 4.2.6 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.
- 4.2.7 For aircraft on P628, the first aircraft from Singapore or Kuala Lumpur to be over VPL can expect its requested flight level.
- 4.2.8 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 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 CHANGI FLOW MANAGEMENT PROCEDURES

6.1 INTRODUCTION

- 6.1.1 The objectives of the procedures are to improve the efficiency of Singapore's air traffic service by minimising radar vectoring as well as improving airspace capacity.
- 6.1.2 The procedures require the holding of Changi arrivals over established holding areas.

6.2 ENTRY AND EXIT GATES

- 6.2.1 'Entry gates' and 'Exit gates' are established to ensure segregation between arriving and departing aircraft operating at Singapore Changi Airport. These gates (waypoints) are incorporated in the RNAV SIDs/STARs which have been implemented to support the flow management procedures. The 'entry' and 'exit' gates are shown below:

<u>Entry Gate</u>	<u>Coordinates</u>
BOBAG	010230N 1032954E
PASPU	015915N 1040618E
REMES	004342N 1035735E
LAVAX	010950N 1042714E

6.3 ARRIVING AIRCRAFT TO SINGAPORE CHANGI AIRPORT

- 6.3.1 **STANDARD INSTRUMENT ARRIVAL (STAR)**
IFR flight should expect a Standard Instrument Arrival (STAR). Changi arrivals via ATS route A464 shall flight plan ARAMA STAR route. LELIB STAR would be issued to pilots when traffic permits. ATC may also clear arrivals to join the LEBAR STAR when air traffic permits to facilitate arrivals joining downwind to the west of Singapore Changi Airport.
- 6.3.2 **ENTRY GATE TIME**
To regulate the flow of traffic into the Approach airspace, ATC will issue, when necessary, a time restriction at an entry gate associated with the inbound route of the flight into Singapore Changi Airport.
- 6.3.3 **DESCENT PROFILE**
Pilots shall plan their descent profile in accordance to the published STAR procedures.
- 6.3.4 **SPEED CONTROL**
Speed control restrictions are incorporated into the STARs to enhance predictability and planning of air traffic in the Approach airspace. Pilots shall adhere to the speed control restrictions published in the STAR procedures unless otherwise advised. ATC may issue further speed adjustment during the different phases of the flight if traffic situation warrants.

6.4 APPROACH AIRSPACE HOLDING PROCEDURES

- 6.4.1 **ENTRY PROCEDURE**
The entry into the holding patterns shall be in accordance with the three-sector entry procedure as prescribed in ICAO Doc 8168 - OPS/611 Edition 1993.
- 6.4.2 **RATE OF TURN**
All turns are to be made at a bank angle of 25° or at a rate of 3° per second, whichever requires the lesser bank.
- 6.4.3 **DESCENT PROCEDURE**
When instructed to join a holding pattern, pilots shall reach their assigned altitudes prior to arriving at the holding point. This will allow appropriate traffic sequencing and the reduction of step-descents in the holding pattern.

6.4.4 DETAILS OF APPROACH AIRSPACE HOLDING AREAS

Holding Fix / ID / Co-ordinates	Inbound Track °M	Direction of Turn	MAX HLDG Speed (IAS)	Time (MIN)	MNM-MAX HLDG Level	Controlling Unit and Frequency
1	2	3	4	5	6	7
NYLON 013657N 1040624E	203°	Left	220 knots	1	FL140 3,000ft	Singapore Approach 124.05MHz (PRI) 132.15MHz (SRY)
LAVAX 010950N 1042714E	269°	Left	220 knots	1	FL140 7,000ft	Singapore Approac 124.05MHz (PRI) 132.15MHz (SRY)
REMES 004342N 1035735E	348°	Right	220 knots	1	FL140 6,000ft	Singapore Approach 124.6MHz (PRI) 132.15MHz (SRY)
BOBAG 010230N 1032954E	083°	Right	220 knots	1	FL140 6,000ft	Singapore Approac 124.6MHz (PRI) 132.15MHz (SRY)

6.4.5 ALTERNATE HOLDING AREAS

In the event of inclement weather or capacity constraints rendering a specific holding area unusable, arrivals may be cleared to an alternate holding area for re-sequencing. To ensure smooth transition to alternate holding area, all arrivals bound for Singapore Changi Airport shall have their FMS programmed with all the four promulgated holding areas (paragraph 6.4.4)

6.5 EXPECTED TIME TO LEAVE HOLDING AREA

6.5.1 If arrival delay is processed by means of holding, pilots will be informed of the expected time to leave the respective holding area.

6.5.2 The expected time to leave is issued to serve as an early notification of the probable holding duration as well as for unforeseen circumstance such as radio failure (see page ENR 1.6-4). Subsequently, a specified time to leave the holding area will be issued to pilots to resume the flight according to the assigned RNAV STARs.

6.6 DEPARTING AIRCRAFT FROM SINGAPORE CHANGI AIRPORT

6.6.1 DEPARTURE SPEED CONTROL

Departing aircraft shall not exceed IAS 230 knots below 4,000 feet AMSL or at the waypoints specified in the SID and not exceed IAS 250 knots below 10,000 feet AMSL. Pilots shall also comply with speed control restrictions according to published SIDs.

7 AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B) OUT EXCLUSIVE AIRSPACE WITHIN PARTS OF THE SINGAPORE FIR

7.1 ADS-B BASED SURVEILLANCE AIRSPACE AND AIRCRAFT OPERATOR APPROVAL

- 7.1.1 Aircraft that operates on ATS routes L642, L644, M753, M771, M904, N891, N892, Q801, Q802, Q803 and T611 within airspace bounded by 073605N 1090045E, 040713N 1063543E, 041717N 1061247E (MABLI), 044841N 1052247E (DOLOX), 045223N 1041442E (ENREP), 045000N 1034400E, thence north along the Singapore FIR boundary to 070000N 1080000E at or above FL290 must carry serviceable ADS-B transmitting equipment that has been certified as meeting EASA AMC 20-24, or FAA AC No. 20-165A - Airworthiness Approval of ADS-B, or meets the equipment configuration standards in Appendix XI of Civil Aviation Order 20.18 of the Civil Aviation Safety Authority of Australia.
- 7.1.2 Aircraft that does not comply with the requirements stipulated in paragraph 7.1.1 will not be accorded priority in the delineated airspace and flight level assignments would be subjected to air traffic conditions.
- 7.1.3 If an aircraft carries ADS-B transmitting equipment but does not comply with the requirements stipulated in paragraph 7.1.1, the aircraft must not fly in the delineated airspace unless the equipment is deactivated or set to transmit only a value of zero for the Navigation Uncertainty Category (NUCp) or Navigation Integrity Category (NIC).
- 7.1.4 Flights operating in the delineated airspace are to contact Singapore Radar on 134.35MHz (primary frequency) and 133.6MHz (secondary frequency).

7.2 FLIGHT PLANNING REQUIREMENTS

- 7.2.1 Aircraft operators complying with the requirements stipulated in paragraph 7.1.1 are to indicate the appropriate ADS-B designator in Item 10 of the ICAO flight plan:

- B1 ADS-B with dedicated 1090 MHz ADS-B “out” capability
- B2 ADS-B with dedicated 1090 MHz ADS-B “out” and “in” capability

- 7.2.2 Aircraft operators are to include the aircraft address (24 Bit Code) in hexadecimal format in Item 18 of the ICAO flight plan as per the following example:

CODE/7C432B

- 7.2.3 Aircraft Identification (ACID) not exceeding 7 characters must be accurately indicated in Item 7 of the ICAO flight plan and replicated exactly when set in the aircraft avionics (for transmission as Flight ID) as follows:

either

- a) The three-letter ICAO designator of the aircraft operator followed by the flight number (e.g. SIA123, MAS123, GIA123), when radiotelephony callsign consists of the associated ICAO telephony designator for the aircraft operator followed by the flight number (e.g. SINGAPORE 123, MALAYSIAN 123, INDONESIA 123).

or

- b) The aircraft registration (e.g. N555AB, 9VABC) when the radiotelephony callsign consists of the aircraft registration.

Important: ACID entered should not have any leading zeros unless it is part of the flight number as indicated in Item 7 of the ICAO flight plan. Hyphens, dashes or spaces are NOT to be used.

7.3 STATE AIRCRAFT

7.3.1 The conditions stipulated apply to STATE aircraft intending to operate within the delineated airspace.

7.4 INFLIGHT CONTINGENCIES

7.4.1 The pilot-in-command, upon awareness of an onboard ADS-B equipment failure, must inform ATC as soon as possible. ATC would then provide the necessary clearance to ensure separation with other flights operating in the delineated airspace.

7.5 ATC-PILOT PHRASEOLOGIES

7.5.1 Aircraft operators and pilots are to note the following phraseologies when operating in the delineated airspace:

	Circumstances	Phraseologies
1	To request the capability of the ADS-B equipment	a) ADVISE ADS-B CAPABILITY *b) ADS-B TRANSMITTER (data link) *c) ADS-B RECEIVER (data link) *d) NEGATIVE ADS-B * Denotes pilot transmission
2	To request reselection of aircraft identification	RE-ENTER ADS-B AIRCRAFT IDENTIFICATION
3	To request the operation of the IDENT feature	TRANSMIT ADS-B IDENT
4	To request transmission of pressure-altitude	TRANSMIT ADS-B ALTITUDE
5	To request termination of transponder and / or ADS-B transmitter operation	a) STOP SQUAWK [TRANSMIT ADS-B ONLY] b) STOP ADS-B TRANSMISSION [SQUAWK (code) ONLY]
6	To request termination of pressure-altitude transmission because of faulty operation	STOP ADS-B ALTITUDE TRANSMISSION [WRONG INDICATION, or reason]
7	Confirmation of ADS-B operations	ADS-B TRANSMISSION NOT RECEIVED, CONFIRM ADS-B OPERATIONAL
8	To inform an aircraft that its ADS-B transmitter appears to be inoperative or malfunctioning	ADS-B TRANSMITTER APPEARS TO BE INOPERATIVE / MALFUNCTION
9	ATS ADS-B surveillance system ground equipment un-serviceability	ADS-B OUT OF SERVICE (appropriate information as necessary)

8 AIR TRAFFIC MANAGEMENT CONTINGENCY PLAN**8.1 INTRODUCTION**

8.1.1 The Air Traffic Management (ATM) Contingency Plan for Singapore FIR 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 the Singapore Flight Information Region (FIR), 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 Singapore FIR.

8.1.2 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.

8.1.3 This ATM Contingency Plan provides:

- a. the contingency routes structure using existing published airways to enable transit through the Singapore FIR; and
- b. the associated Air Traffic Control (ATC) procedures to support the contingency plan.

8.1.4 As and where dictated by circumstances, aircraft planning to operate through Singapore FIR 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.

8.1.5 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.

8.1.6 Aircraft operators may elect to avoid the Singapore FIR by using ATS routes outside of Singapore FIR.

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

8.2.1 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.

8.2.2 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.

8.2.3 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.

8.2.4 In the event that ATS cannot be provided in the Singapore FIR, 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.

8.2.5 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.

8.3 AIRCRAFT SEPARATION AND SPACING

8.3.1 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).

8.3.2 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.

8.3.3 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.

8.4 PRIORITY FOR FLIGHT LEVELS

8.4.1 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 8.10.

8.5 AIRSPACE CLASSIFICATIONS

8.5.1 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.

8.6 AIRCRAFT POSITION REPORTING

8.6.1 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 8.9.

8.6.2 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 as outline in paragraph 8.11 on 121.5MHz.

8.7 EXCLUSIONS

8.7.1 VFR flights shall not operate in the Singapore FIR during contingency operations, except for State aircraft, Medevac flights, and any other aircraft as authorised by CAAS.

8.8 PILOT AND OPERATOR PROCEDURES

8.8.1 Filing of flight plans

8.8.1.1 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.

8.8.1.2 Airspace users are expected to familiarize themselves with the Contingency Plan of the Singapore FIR 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.

8.8.1.3 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.

8.8.2 Overflight approval

8.8.2.1 Airspace users must obtain overflight approval from CAAS prior to operating aircraft through the Singapore FIR. During the period of activation of this Contingency Plan, the adjacent ATS authority will provide normal ATC clearances for aircraft to enter Singapore FIR. The adjacent ATS authority is not responsible for coordination or provision of overflight clearances for Singapore FIR. The airspace users must ensure any required overflight approval has been obtained.

8.8.3 Pilot operating procedures

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

8.8.3.2 Pilots of aircraft operating in the Singapore FIR 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 8.10;
- b. aircraft are to flight plan using the Contingency Routes specified in paragraph 8.10, 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 8.10;
- e. aircraft position reports and other information as necessary shall be broadcast in accordance with TIBA procedures defined in paragraph 8.11;
- 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. 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 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;
- j. pilots are to strictly adhere to the ICAO Traffic Information Broadcasts by Aircraft (TIBA) procedures, reproduced in paragraph 8.11, on the specified VHF and HF frequencies listed in paragraph 8.10. 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, 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, 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.

8.8.4 Interception of civil aircraft

- 8.8.4.1 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.
- 8.8.4.2 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.
- 8.8.4.3 If circumstances leading to the closure of the Singapore FIR where no contingency routes are available, aircraft will be required to keep clear of Singapore FIR. As much warning as possible will be provided by the appropriate ATS authorities in the event of the complete closure of airspace.
- 8.8.4.4 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.

8.9 COMMUNICATION PROCEDURES**8.9.1 Degradation of Communication - Pilot Radio Procedures**

- 8.9.1.1 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.
- 8.9.1.2 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 8.11.

8.9.2 Communication frequencies

- 8.9.2.1 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 is detailed in paragraph 8.10.

8.10 CONTINGENCY ROUTES**8.10.1 Between Singapore and Manila FIR**

- 8.10.1.1 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 (N075400 E1122000 - LAXOR)	East	FL310 FL350	Manila ACC	At N075400 E1122000, contact Manila ACC: - ADS/CPDLC: Logon RPHI - HF: 5655 / 8942 - VHF : 118.9 (LAXOR)	Aircraft operators may choose to avoid the Singapore FIR by using alternate ATS routes in other FIRs.
CRM-3	N884 (LAXOR - CAB)	East	FL310 FL350 FL390	Naha ACC	At CAB, contact Tokyo Radio: - HF: 8903 / 4666 - VHF: 123.9 (LEBIX)	Aircraft operators may choose to avoid the Manila FIR by using alternate ATS routes in other FIRs.
CRM-4	M767 (JOM - TEGID)	West	FL320 FL360 FL400	Singapore ACC	At JOM, contact Singapore ATC: - ADS/CPDLC: Logon WSJC - HF: 5655 / 8942	Aircraft operators may choose to avoid the Manila FIR by using alternate ATS routes in other FIRs.
N/A	M772	N/A	N/A	N/A	Not applicable. M772 will be suspended. No flight planning is allowed.	N/A

8.10.2 Between Singapore and Ho Chi Minh FIR

8.10.2.1 To be developed

8.10.3 Between Singapore and Kota Kinabalu FIR

8.10.3.1 To be developed

8.10.4 Between Singapore and Kuala Lumpur FIR

8.10.4.1 To be developed

8.11 TRAFFIC INFORMATION BROADCASTS BY AIRCRAFT (TIBA)

8.11.1 Introduction and applicability of broadcasts

8.11.1.1 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.

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

8.11.1.3 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.

8.11.1.4 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 8.11.1.3 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.

8.11.1.5 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).

8.11.2 Details of broadcasts

VHF RTF frequency to be used

8.11.2.1 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.

8.11.2.2 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

8.11.2.3 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

8.11.2.4 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

- 8.11.2.5 The broadcasts other than those indicating changes in flight level, i.e. the broadcasts referred to in paragraph 8.11.2.4 a., b., c., d. and g., should be in the following form:

ALL STATIONS (necessary to identify a traffic information broadcast)

(call sign)

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"

- 8.11.2.6 Before a change in flight level, the broadcast (referred to in paragraph 8.11.2.4 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)

- 8.11.2.7 Except as provided in paragraph 8.11.2.8, the broadcast at the time of a change in flight level (referred to in paragraph 8.11.2.4 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)

8.11.2.8 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

ENR 1.10 FLIGHT PLANNING

1 PROCEDURES FOR SUBMISSION OF A FLIGHT PLAN

1.1 *Requirement for submission of a Flight Plan*

- 1.1.1 The pilot-in-command or airline operator shall submit an ICAO flight plan to ATC via the AFS or the AIM-SG system (accessible by registration at <https://fpl-1.caasaim.gov.sg>) for the following flights:
- Flights on airways, associated holding areas and all other controlled airspace whether IFR or VFR;
 - Any flight or portion thereof to be provided with air traffic control service;
 - Any flight within or into designated areas, or along designated routes to facilitate co-ordination with appropriate military units or with air traffic service units in adjacent States in order to avoid the possible need for interception for the purpose of identification;
 - Any flight across international borders.
- 1.1.2 The pilot-in-command or the airline operator shall submit details of a test/training flight, planned to be conducted in the Seletar aerodrome circuit or in Light Aircraft Training Areas A, B and C, by electronic mail using the "Seletar Test/Training Form" retrievable from webpage: <https://fpl-1.caasaim.gov.sg>
- 1.1.3 For a flight that will be operating within Singapore only (except for flights mentioned in paragraph 1.1.2, the pilot-in-command or the operator shall submit the ICAO flight plan using the automated AIM-SG system and to include Military ATC addressee WSARYWYX. If for any reason a flight plan is not approved, the pilot-in-command shall contact RSAF Air Operations Control (AOC) at 67683702 for clarification.
- 1.1.4 The pilot-in-command or the operator of IFR flight operating out of Seletar is required to file via KK.
- 1.1.5 VFR flight operating between Seletar and Johor Bahru shall route via Point X (012830N1034954E), Tebrau City Mall (013259N1034748E), Felda Ulu Tebrau (013751N1034510E) and vice versa.

1.2 *Requirement for submission of a Flight Plan for Test Flights*

- 1.2.1 Test flights shall be conducted on Airway G580 between HOSBA and NIMIX to minimise disruption to civil scheduled flight movements and to facilitate the test flight operations.
- 1.2.2 A flight plan shall be submitted for a test flight at least one hour before departure. The pilot-in-command or the operator shall include in Item 18 of the flight plan 'RMK/TEST FLT APPROVED BY ATC'.
- 1.2.3 The pilot-in-command shall maintain a 2-way VHF communication with Singapore ATC on the assigned VHF frequency at all times.
- 1.2.4 The pilot-in-command of the test flight shall adhere to ATC instructions at all times. Test flight manoeuvres are subject to ATC clearance, real-time coordination and traffic.
- 1.2.5 Procedures for application to conduct test flights are provided on page GEN 1.2-6 paragraph 5.

1.3 *Lead time for filing flight plans and flight plan associated messages*

- 1.3.1 Flight plan shall be filed 120 hours, or five days, at the earliest but no later than 60 minutes prior to departure (estimated off-block time).
- 1.3.2 In the event of a delay of 30 minutes in excess of the estimated off-block time, the flight plan should be amended or a new flight plan submitted and the old flight plan cancelled, whichever is applicable. To indicate a delay to a flight, a DLA or a CHG message may be used depending on the circumstances.
- 1.3.3 The old flight plan shall be cancelled and a new flight plan shall be submitted when changes are made to any one of the following fields:
7/Aircraft Identification, 15/Route and/or 16/Destination Aerodrome.
- 1.3.4 A flight plan submitted in flight on HF RTF shall be submitted at least 20 minutes (or if on VHF RTF at least 10 minutes) prior to the intended point of entry into a control zone, control area, advisory area or advisory route.
- 1.3.5 A pilot-in-command may change from an IFR flight plan to a VFR flight plan by reporting "CANCELLING MY IFR FLIGHT" when weather conditions indicate that the remainder of the flight can be conducted under VFR. [However, within Singapore, all flights whether IFR or VFR shall be regulated in accordance with instrument flight rules.] (see note 2 below).

1.3.6 ATC will acknowledge:

“IFR flight cancelled at.....(time)” or

if information is available which indicates the likelihood of IMC prevailing along the route, will notify these conditions as follows:

“Instrument MET conditions reported (or forecast) in the vicinity of.....”

Note:

- 1) *The fact that pilot flying in VMC does not by itself constitute cancellation of an IFR flight plan.*
- 2) *Within the Singapore/Johor Airspace Complex and Control Zones all flights are regulated in accordance with IFR separation standards.*

1.4 Persons on board (POB)

1.4.1 The pilot-in-command or his representative is required to state the total number of persons on board (POB - i.e. passengers and crew) in the flight plan.

1.5 DATA LINK Communication and Surveillance

1.5.1 Aircraft using data link communications (see page ENR 1.1-15) must insert one or more of the following letters in Item 10a of their flight plan to indicate serviceable COM aid equipment and capabilities available:

- ← J1 CPDLC ATN VDL Mode 2
- ← J2 CPDLC FANS 1/A HFDL
- ← J3 CPDLC FANS 1/A VDL Mode A
- ← J4 CPDLC FANS 1/A VDL Mode 2
- ← J5 CPDLC FANS 1/A SATCOM (INMARSAT)
- ← J6 CPDLC FANS 1/A SATCOM (MTSAT)
- ← J7 CPDLC FANS 1/A SATCOM (Iridium)
- P1 CPDLC RCP 400
- P2 CPDLC RCP 240
- P3 SATVOICE RCP 400
- P4-P9 Reserved for RCP

1.5.2 Aircraft using data link surveillance (page ENR 1.1-15) must insert one or more of the following letters in Item 10b of their flight plan to indicate serviceable SUR equipment and capabilities available:

- D1 ADS-C with FANS 1/A capabilities
- G1 ADS-C with ATN capabilities

1.5.3 Additional surveillance equipment or capabilities are to be listed in Item 18 following the indicator SUR/ .

1.6 RNAV Approved Aircraft

← 1.6.1 Aircraft flying on RNAV routes A464, A576, B470, G334, L625, L642, L644, L649, M646, M751, M753, M758, M761, M767, M768, M771, M772, M774, N875, N884, N891 and N892 (see page ENR 1.8-12) must be RNAV equipped and should annotate their flight plan as follows:

	Item 10	Item 15	Item 18
RNAV equipment is carried	G (GNSS) I (Inertial Navigation) R (PBN approved) Guidance material in the application of performance based navigation to a specific route segment, route or area is contained in the Performance Based Navigation Manual (Doc 9613).	True Mach NR and FL at entry and exit points	The types of external GNSS augmentation, if any, are specified following the indicator NAV/ and separated by a space. The performance based navigation levels that can be met shall be specified following the indicator PBN/.

- ← 1.6.2 Aircraft flying on RNAV routes L642 (CHEUNG CHAU-MERSING), L644 (DUDIS-KIKOR), L649 (DAKIX-LAXOR), M771 (MERSING-CHEUNG CHAU), M772 (ASISU-LAXOR), N892 (HENGCHUN-MERSING), L625 (TOMAN-MEVIN), N884 (MERSING-MANILA) and M767 (JOMALIG-TOMAN) (see page ENR 1.8-16) must be RNP 10 approved and shall indicate in their flight plan:

Item 10 - "R" where R = PBN approved
Item 18 - PBN/A1 where A1 = RNAV 10 (RNP 10)

- 1.6.3 Operators of aircraft unable to meet the RNP 10 requirements (see page ENR 1.8-16) and wishing to operate at or above FL290 on RNAV routes specified in paragraph 1.6.2 shall annotate their flight plan as follows:

Item 18 - insert "RMK/REQ FL (insert level)" where FL = the preferred flight level (subject to ATC co-ordination)

- ← 1.6.4 Operators of aircraft approved for RNP 1 (P-RNAV) operations shall also include the following information in their flight plan:

Item 10 - "R" where R = PBN approved
Item 18 - PBN/O1 where O1 = Basic RNP1 all permitted sensors, or
PBN/O2 where O2 = Basic RNP1 GNSS, or
PBN/O3 where O3 = Basic RNP1 DME/DME, or
PBN/O4 where O4 = Basic RNP1 DME/DME/IRU

1.7 ***RVSM and NON-RVSM Approved Aircraft***

- ← 1.7.1 Operators of RVSM approved or non-RVSM approved aircraft operating in RVSM airspace (see page ENR 1.8-5) shall annotate their flight plan as follows:

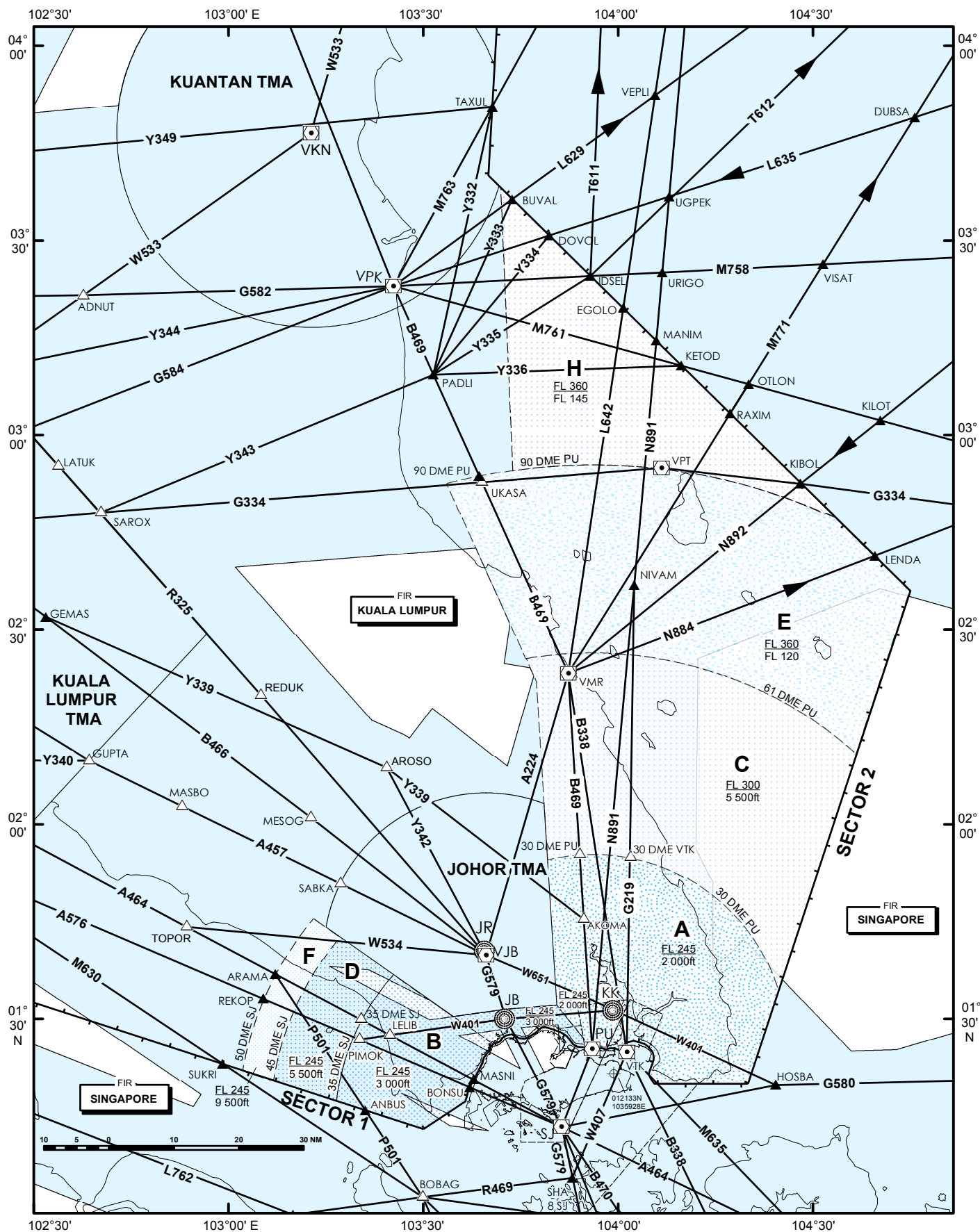
	Item 10	Item 18
RVSM approved aircraft	W	
Non-RVSM approved aircraft		STS/NONRVSM

1.8 ***Other Documentary and / or Permit Requirements***

- 1.8.1 In addition to the flight planning requirements, all pilots-in-command and aircraft operators should consult the respective AIPs for other documentary and / or permit requirements for flights intending to enter, depart, and / or overfly the sovereign airspaces of States along the planned flight routes.

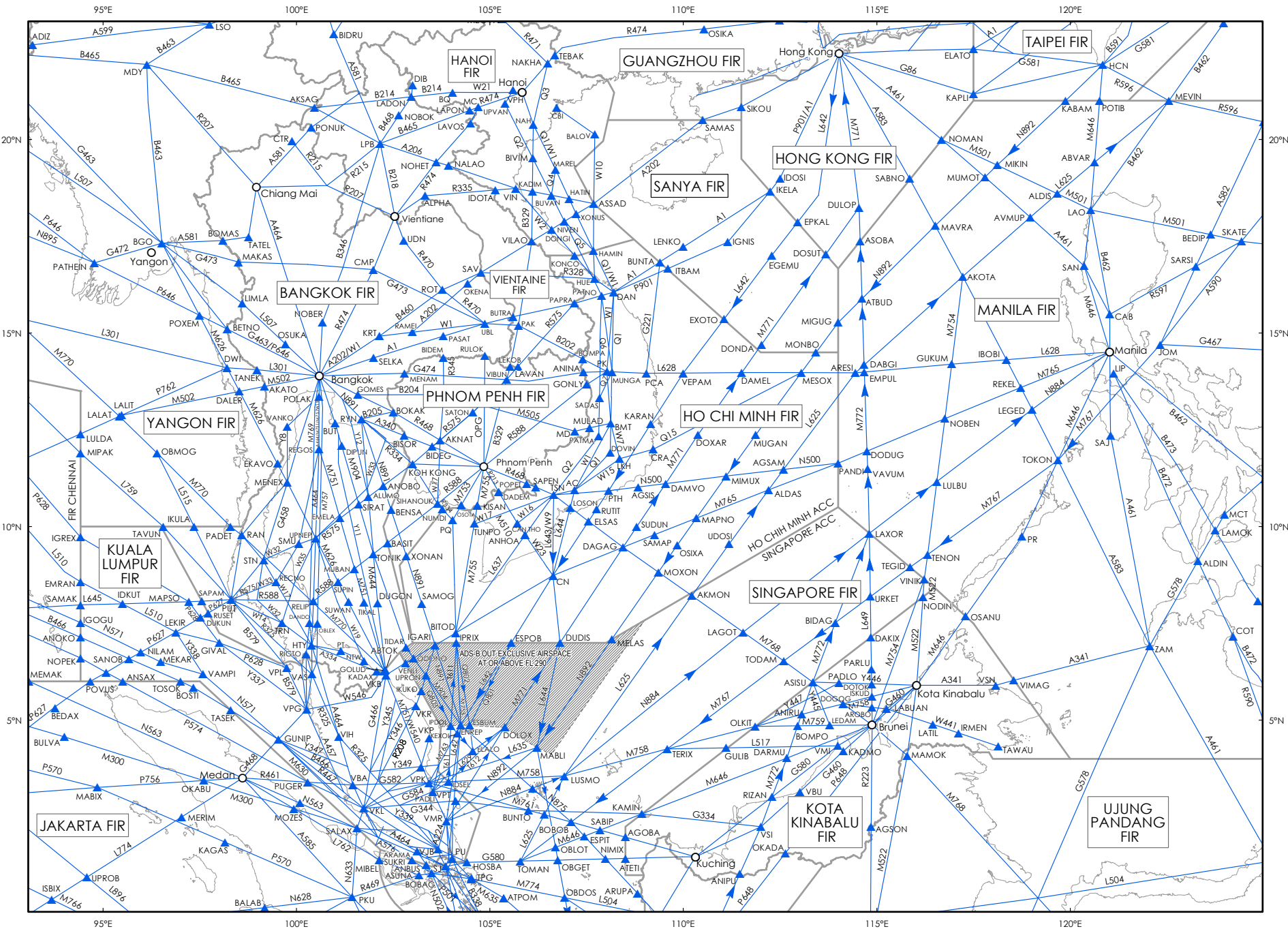
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AIRSPACE DIVISION KUALA LUMPUR/SINGAPORE AREAS CONTROL CENTRES



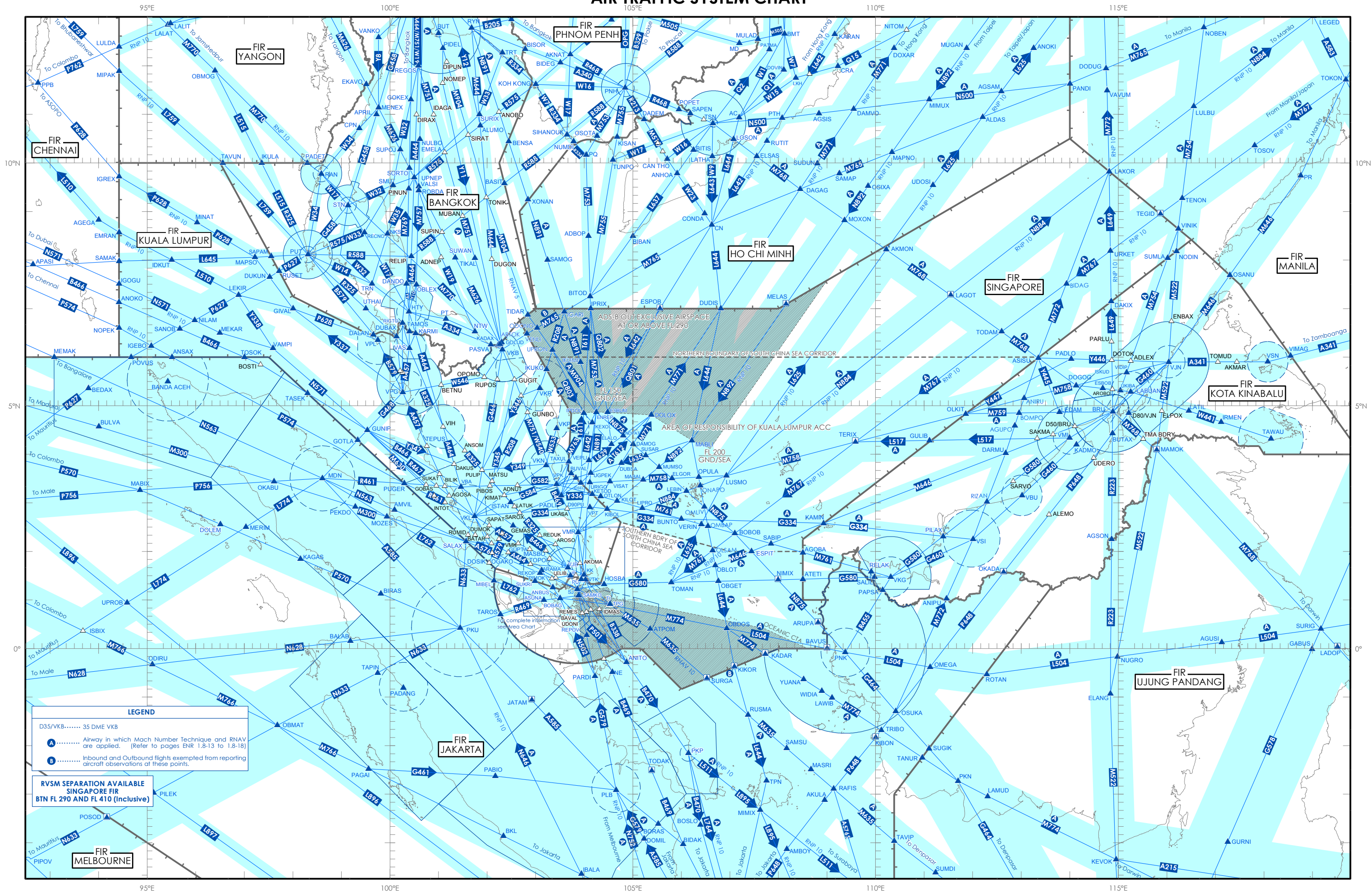
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ATS ROUTE STRUCTURE WITHIN SINGAPORE & ADJACENT FIRS



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AIR TRAFFIC SYSTEM CHART



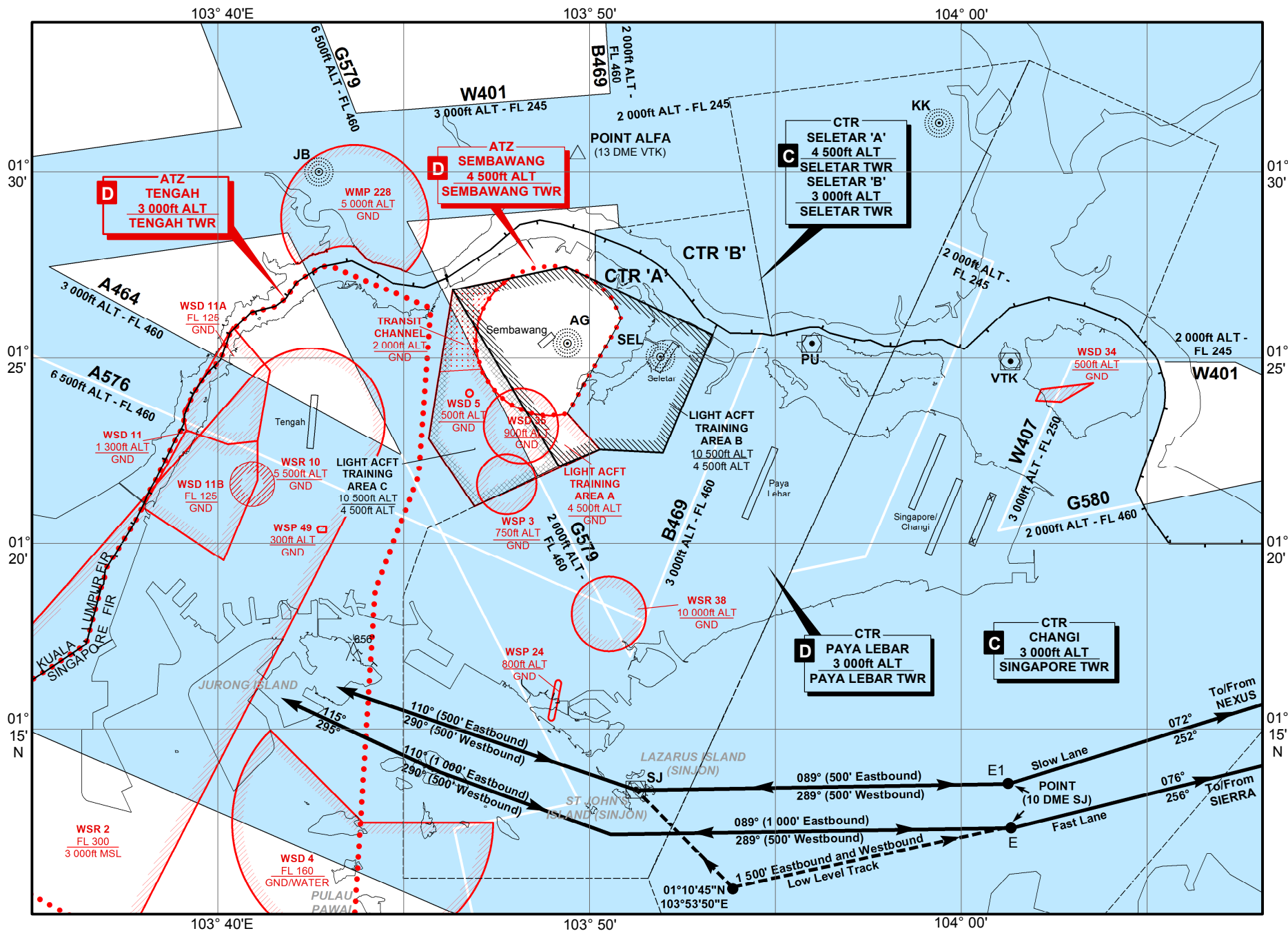
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Route Designator {RNP Type}		[Route Usage Notes]					
	Significant Point Name	Significant Point Coordinates				Remarks	
{RNP Type}		Initial Track MAG	Great Circle Dist NM	Upper limit Lower limit	FL series	Controlling unit Frequency {Airspace class} Remarks	
		↓ ↑			↓ ↑		
1		2	3	4	5	6	7
M630		Route availability: (1) H24					
▲	SUKRI	012306N 1025904E					
(5)			37.3NM	FL 460 5500 FT ALT	Odd ⁽¹⁾		[Class A - ABV FL150 Class B - BLW FL150]
Δ	BOBAG	010230N 1032954E					⁽²⁾
(5)			61.3NM	FL 460 5500 FT ALT	Odd ⁽¹⁾		[Class A - ABV FL150 Class B - BLW FL150]
▲	TANJUNG PINANG VOR/DME (TPG)	005413N 1043052E					
<u>Route Remarks:</u> Lateral Limits: 11.5NM either side of line joining SUKRI to TPG. Flight departing from aerodromes in Peninsular Malaysia and overflying WSJC are restricted to FL270 and above at waypoint SUKRI if the planned cruising level is FL270 or higher. <u>Flight Planning:</u> Southbound flight planning permitted for flights from Kuala Lumpur and airports beyond which are overflying beyond Singapore. Flights landing at Singapore Changi Airport to flight plan on A464. Singapore ACC FREQ: P133.25 MHz S135.8 MHz <u>Point/Segment Remarks:</u> (2) NIL							

Route Designator {RNP Type}		[Route Usage Notes]					
Significant Point Name		Significant Point Coordinates				Remarks	
{RNP Type}		Initial Track MAG	Great Circle Dist NM	Upper limit Lower limit	FL series		Controlling unit Frequency {Airspace class} Remarks
		↓ ↑			↓	↑	
1		2	3	4	5	6	7
M635		Route availability: (1) H24					
▲	TEKONG DVOR/DME (VTK)	012455N 1040120E				(4)	
			42.5NM	FL 460 5500 FT ALT	Odd ⁽¹⁾	Even ⁽¹⁾	[Class A - ABV FL150 Class B - BLW FL150] (2)
▲	TANJUNG PINANG VOR/DME (TPG)	005413N 1043052E					
			58.5NM	FL 460 5500 FT ALT	Odd ⁽¹⁾	Even ⁽¹⁾	[Class A - ABV FL150 Class B - BLW FL150] (3)
▲	ATPOM	002425N 1052114E					
			93.1NM	FL 460 5500 FT ALT	Odd ⁽¹⁾	Even ⁽¹⁾	[Class A - ABV FL150 Class B - BLW FL150] (2)
▲	SURGA (WSJC/WIIZ FIR BDRY)	003657S 1063119E					
Route Remarks: Lateral Limits: 25NM either side of line joining VTK to SURGA. Singapore ACC FREQ: P134.4 MHz S128.1 MHz Flight Planning: Flights overflying Singapore to destinations north of Kuala Lumpur and Subang are to flight plan via SURGA M635 TPG A464 SJ G579 VJB Y342 AROSO Y339. Flights overflying Singapore to land at Kuala Lumpur and Subang are to flight plan via SURGA M635 TPG A464 SJ G579 VJB A457. Point/Segment Remarks: (2) NIL (3) TPG 120.5° 58.5 (4) Kuala Lumpur / Singapore FIR boundary approximately 1.2NM north of VTK.							

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AIP AMDT 02/2018



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ENROUTE CHART - ICAO

LEGEND

Aerodrome

Flight Information Region (FIR)

Terminal Control Area (TMA)

Control Zone (CTR)

ATS route

ATS route reporting point by-pass
(No report is required on this route)

Reporting Point (REP)	Compulsory
On Request	▲

ATS/MET reporting point (MRP)

Compulsory
On Request

Restricted Airspace
(P-Prohibited, R-Restricted, D-Danger)

Note: Restricted airspace outside Singapore FIR are not shown

Collocated VOR and DME navigation aids (VOR/DME)

Compass rose oriented on the chart for Magnetic North

Identification for radio navigation aids (NAVAID)

Name
NAVAID, frequency, identification or call sign
Geographical coordinates in WGS 84
Elevation of DME site (to the nearest 30m)

SINGAPORE DME/DME 113.3 112.2 113.3 113.3 107.0, 200

COP at mid-point between VOR are not shown

Area Minimum Altitude (AMA)

Each 2° quadrilateral contains an area minimum altitude (AMA) which represents the lowest altitude which may be used under instrument meteorological conditions (IMC). The AMA provides a minimum clearance of 1 000 feet (300m) above all terrain and obstacles in the quadrilateral. It is represented in thousands and hundreds of feet above mean sea level.

Example : 3 300 feet **35**

A Airway in which Mach Number Technique and RNAV are applied
(Refer to pages ENR 1.8-1.3 to 1.8-1.8)

B Inbound and Outbound flights exempted from reporting aircraft observations at these points.

WSJC/WMEC FIR BDRY REPORTING POINTS	TAXUL	MANIN
03 50 35N	03 14 31N	
103 40 37E	104 05 53E	
BUVAL	KEOD	
03 56 22N	03 10 42N	
103 43 41E	104 09 42E	
DOVOL	BAXUM	
03 50 47N	03 03 18N	
103 49 23E	104 17 13E	
IDOL	KIOL	
03 24 32N	02 52 29N	
103 55 44E	104 28 02E	
EGOLO	LEIDA	
03 19 54N	02 41 24N	
104 00 47E	104 39 32E	

**RVSM SEPARATION AVAILABLE
SINGAPORE FIR
BTM FL 290 AND FL 410 (Inclusive)**

AIRSPACE CLASSIFICATION IN THE SINGAPORE FIR

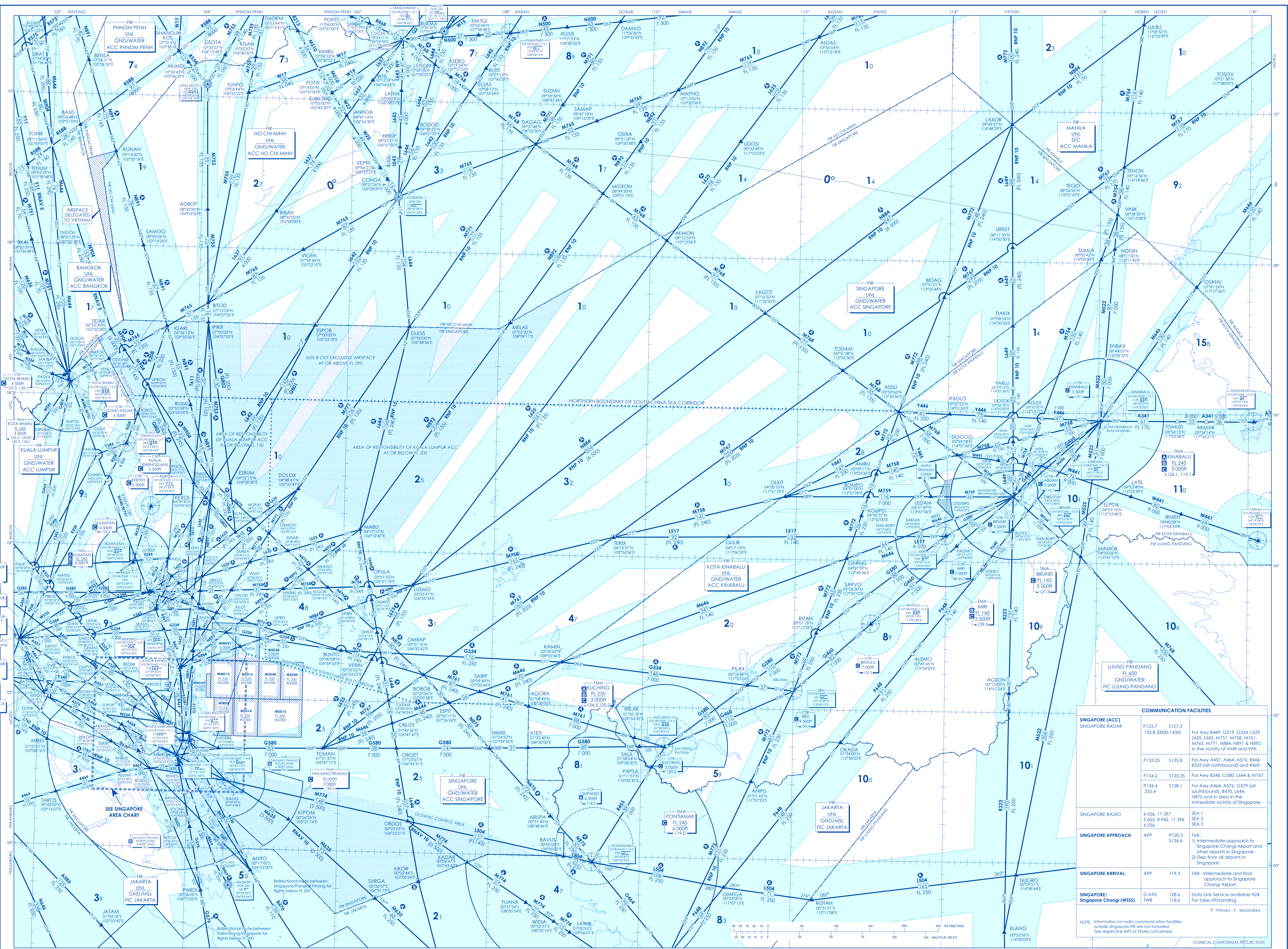
Airspace	Levels	Classification
Controlled airspace	FL 150 to FL 460	A
	Surface to FL 150	B
Controlled airspace more than 100 nm seaward from the shoreline	Lower limit to FL 1 400	A
Control zones (CTR)	Changi CTR	C
	Paya Lebar CTR	D
	Selebar CTR	C
ATZs	Surface to upper limit	D
Uncontrolled airspace		G*

* Aircraft operating in Light Aircraft Training Areas A, B and C (please refer to AIP Singapore page ENR 5.2-1) are required to have continuous two-way communications with the appropriate ATIS authority.

CAUTION

Consult respective NOTAMs and AIPs of States concerned for the latest information and the Civil Aviation Authority of Singapore does not accept responsibility for any errors or omissions in the information shown outside of Singapore FIR

MAGNETIC INFORMATION FOR THE YEAR 2015



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4 AIRFIELD GROUND LIGHTING CONTROL AND MONITORING SYSTEM (AGLCMS) AND MARKINGS

4.1 INTRODUCTION

4.1.1 The taxiing guidance system at Singapore Changi Airport consists of stop bars and selectable segments of green taxiway centreline lights. The system is designed to provide pilots with visual guidance while taxiing during night operations and during periods of low visibility. It is controlled by the Ground Movement Controller (GMC) at Changi Control Tower using the Airfield Ground Lighting Control and Monitoring System (AGLCMS).

4.2 ROUTE SELECTION AND PRIORITY

4.2.1 When a taxiing route is selected on the AGLCMS, corresponding segments of taxiway centreline lights on the manoeuvring area are switched on automatically. When two or more routes are selected, the system will give priority to the first route and activate red stopbar lights across conflicting routes, as necessary. A segment of the centreline lights of the conflicting routes that cut across the first route will also be suppressed. The GMC has the option of over-riding the taxiing route priority by selecting or deselecting the appropriate stopbar lights.

4.2.2 All taxiing guidance lights on taxiways leading to the runways terminate at the runway holding positions where, by default, red stopbar lights remain on unless deselected by the runway controller. When deselected, these stopbar lights will re-activate automatically after 60 seconds. Pilots and drivers shall not cross any lighted red stopbar lights.

4.2.3 Pilots and drivers shall enter / cross the runway or taxiway only when **both** the following conditions are met:
The crew have

- a. received positive ATC clearance to enter / cross the runway or taxiway, and
- b. observed that the red stop-bar lights are turned off.

4.3 INFORMATION AND MANDATORY SIGNS/MARKINGS

4.3.1 When following the directional guidance provided by the green taxiway centreline lights and red stop bar lights, pilots are advised to also navigate their taxi route with reference to information and mandatory signs/markings provided at the airport so as to maintain situational awareness of their whereabouts at all times.

4.4 TAXI INSTRUCTIONS USING THE GREEN TAXIWAY CENTRELINE LIGHTS

4.4.1 ATC will use the phraseology "Taxi on the greens" when issuing a clearance to pilots to taxi along the directional guidance provided by the green taxiway centreline lights.

WSSS AD 2.10 AERODROME OBSTACLES

IN APPROACH / TKOF AREAS			IN CIRCLING AREA AND AT AD	
RWY/Area affected	OBST type, ELEV, Markings/LGT	Coordinates	OBST type, ELEV, Markings/LGT	Coordinates
1	2	3	1	2
a) RWY 20R APCH RWY 02L TKOF	Mast HGT ranging fm 98ft AMSL and above.	Shipping channel aprx 1290m from THR RWY 20R.	a) Surface wind direction sleeves	LOC at each end of RWY adjacent to GP hut
b) RWY 20C APCH RWY 02C TKOF	Mast HGT ranging fm 98ft AMSL and above.	Shipping channel aprx 2630m from THR RWY 20C.	b) PAR hut	Besides RWY 02L/20R, opposite the PTB
c) RWY 02L/20R APCH RWY 02L/20R TKOF RWY 02C/20C APCH RWY 02C/20C TKOF	ILS LLZ co-located with LLZ antennas.	Within the RWY strip.	c) Frangible PAR reflectors	Located at ends of RWY 02L/20R
d) RWY 20R APCH	Two antennae, HGT 72ft AMSL, marked and LGTD	012311N 1035928E	d) GP huts co-located with GP antennas	Within the RWY strip
e) RWY 20R APCH	Antenna, HGT 88ft AMSL, marked and LGTD	012315N 1035931E	e) Antenna, HGT 82ft AMSL, marked and LGTD	012036N 1035819E
f) RWY 02L APCH	Antenna, HGT 82ft AMSL, marked and LGTD	012051N 1035827E	f) Antenna, HGT 85ft AMSL, marked and LGTD	012039N 1035821E

IN APPROACH / TKOF AREAS			IN CIRCLING AREA AND AT AD		
RWY/Area affected		OBST type, ELEV, Markings/LGT	Coordinates	OBST type, ELEV, Markings/LGT	
1	2	3	1	2	
g) RWY 02L APCH	Pole, HGT 128ft AMSL, marked and LGTD	011859N 1035748E	g) Antenna, HGT 78ft AMSL, marked and LGTD	012042N 1035823E	
h) RWY 02L APCH	Pole, HGT 160ft AMSL, marked and LGTD	012058N 1035814E	h) Antenna, HGT 82ft AMSL, marked and LGTD	012053N 1035827E	
i) RWY 02L APCH	Pole, HGT 131ft AMSL, marked and LGTD	012038N 1035848E	i) Antenna, HGT 78ft AMSL, marked and LGTD	012049N 1035826E	
j) RWY 20L APCH	Shipping channel	Aprx1600m from THR RWY 20L.	j) Frangible poles, HGT 9ft AMSL	Installed APRX 200m from centre of RET to identify 58m away from TWY WP CL towards RWY 02L/20R	

Obstacles in the APCH/TKOF areas, circling area and at the aerodrome are shown on the AOC, IAC and VAC.

WSSS AD 2.11 METEOROLOGICAL INFORMATION PROVIDED

1	Associated MET Office	Singapore Changi (WSSS)
2	Hours of service	H24
3	Office responsible for TAF preparation Periods of validity	Singapore Changi (WSSS) 12, 30
4	Type of landing forecast, Interval of issuance	TREND
5	Briefing/consultation provided	P
6	Flight documentation, Language used	Charts or Tabular forms, English
7	Charts and other information available for briefing or consultation	S, U, P
8	Supplementary equipment available for providing information	HRPT: High Resolution Picture Transmission APT: Automatic Picture Transmission MDWR: MET Doppler Weather Radar MAINT: Second WED of every month BTN 0200-0900 ALTN period: THU following the second WED.
9	ATS units provided with information	Singapore ACC, Singapore RCC
10	Additional information	Tel: 65422837 (MET Office)

WSSS AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

Designations RWY NR	TRUE BRG	Dimensions of RWY	Strength (PCN) and surface of RWY and SWY	THR coordinates (THR Geoid Undulation)	THR elevation and highest elevation of TDZ of precision APCH RWY
1	2	3	4	5	6
02L	023.02°	4000 M x 60 M	72/F/B/W/U Grooved Bituminous concrete	012056.27N 1035838.82E (10.24 M)	6.66 M 6.23 M
20R (Threshold displaced by 740m southwards)	203.02°	4000 M x 60 M	72/F/B/W/U Grooved Bituminous concrete	012233.95N 1035920.06E (10.25 M)	4.01 M 4.31 M
02C	023.03°	4000 M x 60 M	72/F/B/W/U Bituminous concrete	011943.51N 1035905.86E (10.27 M)	4.22 M 4.52 M

Designations RWY NR	TRUE BRG	Dimensions of RWY	Strength (PCN) and surface of RWY and SWY	THR coordinates (THR Geoid Undulation)	THR elevation and highest elevation of TDZ of precision APCH RWY
1	2	3	4	5	6
20C	203.03°	4000 M x 60 M	72/F/B/W/U Bituminous concrete	012143.37N 1035956.46E (10.30 M)	4.48 M 4.56 M

Slope of RWY-SWY Transverse / Longitudinal	SWY Dimensions (m)	CWY Dimensions (m)	STRIP dimensions (m)	OFZ	Remarks
7	8	9	10	11	12
RWY 02L 0.76 / 0.24%	60 X 60	270 X 150	4240 X 300	Yes	Scheduled closure of runways (see below)
RWY 20R 1.45 / 0.25%	60 X 60	270 X 150	4240 X 300		
RWY 02C 1.50 / 0.03%	60 X 60	60 X 150	4240 X 300		
RWY 20C 1.38 / 0.07%	60 X 60	60 X 150	4240 X 300		

Remarks (continued from above)

Scheduled Closure of RWY 02L/20R

- 1a) BTN 1630-2200 on every MON and THU of the month (*preventive maintenance work*).
In the event of an emergency, RWY will be re-opened within 30 minutes.
- 1b) BTN 0225-0240 0630-0635 1000-1005 2300-2305 daily (*inspection*).
In the event of an emergency, RWY will be re-opened within 5 minutes.

Scheduled Closure of RWY 02C/20C

- 2a) BTN 1630-2200 on every first, second and fourth WED of the month (*preventive maintenance work*).
In the event of an emergency, RWY will be re-opened within 30 minutes.
- 2b) BTN 0300-0315 0650-0655 1020-1025 2320-2325 daily (*inspection*).
In the event of emergency, RWY will be re-opened within 5 minutes.

WSSS AD 2.13 DECLARED DISTANCES

RWY Designator	Intersection Departures	TORA (m)	TODA (m)	ASDA (m)	LDA (m)	Remarks
1	2	3	4	5	6	7
20R	Not applicable	4000	4270	4060	3260	Thr displaced by 740m southwards
	W2	3850	4120	3910	Not applicable	
	W3	3050	3320	3110	Not applicable	
	W4	2600	2870	2660	Not applicable	
	W5	2150	2420	2210	Not applicable	
02L	Not applicable	4000	4270	4060	4000	NIL
	W8	3850	4120	3910	Not applicable	
	W7	3050	3320	3110	Not applicable	
	W6	2600	2870	2660	Not applicable	
20C	Not applicable	4000	4060	4060	4000	NIL
	E2	3850	3910	3910	Not applicable	
	E3	3425	3485	3485	Not applicable	
	E4	2750	2810	2810	Not applicable	
	E5	2250	2310	2310	Not applicable	
02C	Not applicable	4000	4060	4060	4000	NIL
	E10	3850	3910	3910	Not applicable	
	E9	3345	3405	3405	Not applicable	
	E8	3205	3265	3265	Not applicable	
	E7	2555	2615	2615	Not applicable	
	E6	2105	2165	2165	Not applicable	

Note: Intersection departures are allowed subject to the following:

- initiated by pilot and approved by ATC, traffic permitting.
- ATC is able to keep aircraft visual at all times

WSSS AD 2.14 APPROACH AND RUNWAY LIGHTING

RWY	APCH LGT Type, LEN, Intensity	THR LGT colour WBAR	PAPI (MEHT)	TDZ LGT LEN	RWY Centreline LGT, LEN, spacing, colour, INTST	RWY Edge LGT, LEN, spacing, colour, INTST	RWY End LGT colour	SWY LGT colour
1	2	3	4	5	6	7	8	9
02L	CAT II High Intensity approach lighting (900m) consisting of extended centreline and Red row barrettes, 2 crossbars, 2 approach beacons and sequenced flashing lights.	Green supplemented by Green wing-bar and 2 THR ident lights.	PAPI 003° located either side of RWY, 422m behind RWY THR. 2 White LGT and 2 Red LGT (20.0m), 3 White LGT and 1 Red LGT (24.0m), 4 White LGT (26.4m). ACFT with eye-to-wheel height greater than 8m are advised to fly with 2 White and 2 Red LGT visible so as to achieve sufficient wheel clearance.	White	Inset High Intensity centreline lights as follow: From THR to 900m from RWY end: White, 300m to 900m from RWY end: ALTN Red/ White, 300m to RWY end: Red.	Bi-directional raised White/Amber edge lights.	Red	Elevated Red

<i>RWY</i>	<i>APCH LGT Type, LEN, Intensity</i>	<i>THR LGT colour WBAR</i>	<i>PAPI (MEHT)</i>	<i>TDZ LGT LEN</i>	<i>RWY Centreline LGT, LEN, spacing, colour, INTST</i>	<i>RWY Edge LGT, LEN, spacing, colour, INTST</i>	<i>RWY End LGT colour</i>	<i>SWY LGT colour</i>
1	2	3	4	5	6	7	8	9
20R	CAT I High Intensity approach lighting (900m) distance coded centreline lights showing variable White and crossbars at 150m, 300m, 450m, 600m and 750m.	Green supplemented by Green wing-bar and 2 THR ident lights.	PAPI 003° located either side of RWY, 410m from THR. 2 White LGT and 2 Red LGT (20.0m), 3 White LGT and 1 Red LGT (22.6m), 4 White LGT (25.0m). ACFT with eye-to-wheel height greater than 8m are advised to fly with 2 White and 2 Red LGT visible so as to achieve sufficient wheel clearance.	NIL	Inset High Intensity centreline lights as follow: From THR to 900m from RWY end: White, 300m to 900m from RWY end: ALTN Red/ White, 300m to RWY end: Red.	Red RWY edge lights in the direction of Rwy 20R before the displaced THR. Bi-directional raised White/Amber edge lights after the displaced THR.	Red	Elevated Red
02C	CAT I High Intensity reduced approach lighting (810m) consisting of centreline barrettes showing variable White, 1 crossbar, 2 approach beacons and sequenced flashing lights.	Green supplemented by Green wing-bar and 2 THR ident lights.	PAPI 003° located either side of RWY, 418m from THR. 2 White LGT and 2 Red LGT (19.8m), 3 White LGT and 1 Red LGT (23.7m), 4 White LGT (26.2m). ACFT with eye-to-wheel height greater than 8m are advised to fly with 2 White and 2 Red LGT visible so as to achieve sufficient wheel clearance.	NIL	Inset High Intensity centreline lights as follow: From THR to 900m from RWY end: White, 300m to 900m from RWY end: ALTN Red/ White, 300m to RWY end: Red.	Bi-directional raised White/Amber edge lights.	Red	Elevated Red
20C	CAT II High Intensity reduced approach lighting (720m) consisting of extended centreline and Red row barrettes, 2 crossbars, 2 approach beacons and sequenced flashing lights.	Green supplemented by Green wing-bar and 2 THR ident lights.	PAPI 003° located left side of RWY, 418m from THR. 2 White LGT and 2 Red LGT (19.8m), 3 White LGT and 1 Red LGT (23.7m), 4 White LGT (26.2m). ACFT with eye-to-wheel height greater than 8m are advised to fly with 2 White and 2 Red LGT visible so as to achieve sufficient wheel clearance.	White	Inset High Intensity centreline lights as follow: From THR to 900m from RWY end: White, 300m to 900m from RWY end: ALTN Red/White, 300m to RWY end: Red.	Bi-directional raised White/Amber edge lights.	Red	Elevated Red

WSSS AD 2.15 OTHER LIGHTING, SECONDARY POWER SUPPLY

1	<i>ABN/IBN location, characteristics and hours of operation</i>	ABN: 012209.20N 1035858.43E (western side of RWY 02L/20R) ALTN FLG W G EV 2.3 SEC, Operating hours HN + IMC IBN: 012301.27N 1035959.49E (top of Cargo Agents Building E) FLG G 'CH' EV 7 SEC, Operating hours HN + IMC
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2	<i>LDI location and LGT Anemometer location and LGT</i>	Pressure tube anemometer and wind vane situated 345m west of middle of RWY 02L/20R. Cup anemometers and wind vanes at ends and middle of both runways. Windsocks at ends of both runways. Transmissometers at both ends and in the middle of both runways
3	<i>TWY Edge and Centreline Lighting</i>	RWY 02L/20R and RWY 02C/20C: Blue lights on TWY curved edges and apron TWY edges and Green centreline lights on all TWY.
4	<i>Secondary power supply/switch-over time</i>	Automatic standby generator power supply AVBL for airfield lighting with switchover time of 1 second during Category II low visibility operations.
5	<i>Remarks</i>	Vehicles painted yellow or displaying chequered red/white or orange/white flag at highest point of vehicle

WSSS AD 2.16 HELICOPTER LANDING AREA

Refer to [ENR 3.4](#)

WSSS AD 2.17 ATS AIRSPACE

1	<i>Designation and Lateral Limits</i>	CHANGI CTR 013300N 1040149E 013042N 1040654E 012542N 1040448E thence along Kuala Lumpur/Singapore FIR BDRY to 012000N 1041218E 010018N 1035524E 011100N 1035134E 013300N 1040149E
2	<i>Vertical Limits</i>	SFC to 3,000ft ALT
3	<i>Airspace Classification</i>	C
4	<i>ATS Unit Callsign Language(s)</i>	Singapore Tower English
5	<i>Transition Altitude</i>	11000 FT (3,350m)
6	<i>Remarks</i>	A helicopter shall not be operated within the Changi CTR unless prior permission has been obtained from the Director-General of Civil Aviation, CAAS. Email to caas_ats_ansp@caas.gov.sg

WSSS AD 2.18 ATS COMMUNICATION FACILITIES

Service Designation	Call sign	Frequency (P-Pri, S-Sec)	Hours of operation	Remarks
ACC	Singapore Radar	P123.7 MHz S127.3 MHz	H24	for ATS Routes B469, G219, G334, R208, L625, L629, L635, L642, L644, M751, M753, M758, M761, M763, M771, N884, N891 and N892.
		133.8 MHz	0000-1430	
		P133.25 MHz S135.8 MHz	H24	for ATS Routes A457, A464, A576, B466, L762, R325 (all northbound) and R469.
		P134.2 MHz S133.35 MHz		for ATS Routes , G580, L644, M646 and M767
		P134.4 MHz S128.1 MHz 255.4 MHz		for ATS Routes A464, A576, G579 (all southbound), B470, L644, N875 and in area in the immediate vicinity of Singapore.
		124.05 MHz	0000-1530	Flow control service provided for ARR/DEP ACFT
	MAINT Period: Monthly - EV third SAT 1601-2359			
	Singapore Radio	6556 kHz 11297 kHz	H24	SEA 1, Emission: A3AJ. SSB suppressed carrier, SATCOM service available
		5655 kHz 8942 kHz 11396 kHz		SEA 2, Emission: A3AJ. SSB suppressed carrier, SATCOM service available
		6556 kHz		SEA 3, Emission: A3AJ. SSB suppressed carrier, SATCOM service available
APP	Singapore Approach	P120.3 MHz S124.6 MHz	H24	TAR - Intermediate approach to Singapore Changi AP and other airports in Singapore. DEP from all airports in Singapore.
	Singapore Arrival	119.3 MHz		TAR - Intermediate and final approach to Singapore Changi Airport.
	ASR I MAINT Period: Monthly, EV first SAT 1601-2359 ASR II MAINT Period: Monthly, EV fourth SAT 1601-2359			
TWR	Singapore Tower	118.6 MHz	H24 0000-1600	for TKOF/LDG. for ACFT OPR on RWY 02L/20R
		118.25 MHz	0000-1600	for ACFT OPR on RWY 02C/20C
	Singapore Ground	124.3 MHz	1600-0000 0000-1600	for start-up / push-back / taxiing of all aircraft for ground movement of aircraft west of Terminal 3
		121.725 MHz	0000-1700 2100-0000	for ground movement of aircraft east of Terminal 2
		121.85 MHz	0000-1800 2300-0000	for ground movement of aircraft north of Terminal 1
		129.95 MHz	H24	for ground emergency
		122.55 MHz	H24	for ground movement of aircraft east of Terminal 4
		125.65 MHz	H24	for ground movement of aircraft west of Terminal 4
		Singapore Delivery	121.65 MHz	H24
	Changi Tower / Changi Apron	121.9 MHz	H24	for vehicular movements on taxiways and runways. Towing of all aircraft and requests for engine runs on apron and taxiways, excluding runways, will be regulated by Changi Apron. All personnel operating the radio station on board an aircraft that is on the ground should possess the Aircraft Radio Operator Approval (AROA) or other equivalent certification.
	D-ATIS	Singapore Changi Airport Information	128.6 MHz	H24

WSSS AD 2.19 RADIO NAVIGATION AND LANDING AIDS

<i>Type of aid and Variation</i>	<i>Ident</i>	<i>Frequency</i>	<i>OPR Hr</i>	<i>Position of Transmitting Antenna Coordinates</i>	<i>DME Transmitting Antenna Elevation / Remarks</i>
1	2	3	4	5	6 & 7
SINJON DVOR/DME	SJ	113.5 MHz CH82X	H24	011319.28N 1035120.08E	201° MAG 14.5km from THR RWY 02 (Paya Lebar). Antenna HGT: 194ft AMSL. Coverage 200NM. EM: F1. Maintenance period: Third Thursday of every month between 0200-0600
TEKONG DVOR/DME	VTK	116.5 MHz CH112X	H24	012455.36N 1040120.17E	023° MAG 6.4km from THR RWY 20C (Singapore Changi). Antenna HGT: 150ft AMSL. Coverage 200NM. EM: F1 Maintenance Period: Third Friday of every month between 0200-0600
RWY 20C ILS LLZ	ICC	109.7MHz	H24	011932.48N 1035901.21E	Located 368m (1207ft) from THR RWY 02C, along RWY centreline. Course width 3.38°. EM: A0/A2.
RWY 20C ILS GP	-	333.2MHz	H24	012131.70N 1035955.79E	Located 338m (1109ft) from THR RWY 20C on left side of RWY, 120m (394ft) from RWY centreline. GP angle 3°. HGT of ILS Reference Datum: 17m (56ft). EM: A0/A2.
RWY 20C ILS DME	ICC	CH34X	H24	012131.70N 1035955.79E	DME co-located with GP. EM: P9.
RWY 20C ILS MM	-	75MHz	H24	012212.07N 1040001.14E	Located 957m (3140ft) from THR RWY 20C along extended centreline of RWY. No back beam.
RWY 02C ILS LLZ	ICE	108.3MHz	H24	012154.39N 1040001.14E	Located 368m (1207ft) from THR RWY 20C, along RWY centreline. Course width 3.38°. EM: A0/A2.
RWY 02C ILS GP	-	334.1MHz	H24	011952.09N 1035913.75E	Located 338m (1109ft) from THR RWY 02C on left side of RWY, 120m (394ft) from RWY centreline. GP angle 3°. HGT of ILS Reference Datum: 17m (56ft). EM: A0/A2.
RWY 02C ILS DME	ICE	CH20X	H24	011952.09N 1035913.75E	DME co-located with GP. EM: P9.
RWY 02C ILS MM	-	75MHz	H24	011915.04N 1035853.83E	Located 945m (3100ft) from THR RWY 02C along extended centreline of RWY. No back beam.
RWY 20R ILS LLZ	ICH	108.9MHz	H24	012045.23N 1035834.17E	Located 368m (1207ft) from THR RWY 02L, along centreline of the RWY. Course width 3.38°. EM: A0/A2.
RWY 20R ILS GP	-	329.3MHz	H24	012225.59N 1035912.29E	Located 330m (1083ft) from displaced THR RWY 20R on right side of the RWY, 120m (394ft) from RWY centreline. GP angle 3°. HGT of ILS Reference Datum: 17m (56ft). EM: A0/A2.
RWY 20R ILS DME	ICH	CH26X	H24	012225.59N 1035912.29E	DME co-located with GP. RWY 20R ILS DME not available beyond 15 degrees west of RWY 20R centreline below 2500ft. EM: P9.
RWY 20R ILS MM	-	75MHz	H24	012307.51N 1035934.24E	Located 1122m (3681ft) from displaced THR RWY 20R, along centreline of the RWY.
RWY 02L ILS LLZ	ICW	110.9MHz	H24	012307.03N 1035934.03E	Located 1105m (3625ft) from displaced THR RWY 20R, along centreline of RWY. Course width 2.81°. EM:A0/A2.

<i>Type of aid and Variation</i>	<i>Ident</i>	<i>Frequency</i>	<i>OPR Hr</i>	<i>Position of Transmitting Antenna Coordinates</i>	<i>DME Transmitting Antenna Elevation / Remarks</i>
1	2	3	4	5	6 & 7
RWY 02L ILS GP	-	330.8MHz	H24	012108.35N 1035838.86E	Located 343m (1125ft) from THR RWY 02L on left side of RWY, 143m (469ft) from RWY centreline. GP angle 3°. HGT of ILS Reference Datum: 17m (56ft). EM:A0/A2.
RWY 02L ILS DME	ICW	CH46X	H24	012108.35N 1035838.86E	DME co-located with GP. EM:P9.
RWY 02L ILS MM	-	75MHz	H24	012027.54N 1035826.68E	Located 957m (3140ft) from THR RWY 02L along extended centreline of RWY. No back beam.

WSSS AD 2.20 LOCAL TRAFFIC REGULATIONS

1 DESIGNATION OF PAYA LEBAR AIRPORT AS AN ALTERNATE AERODROME FOR SINGAPORE CHANGI AIRPORT

Please refer to section WSAP AD 2.20 for details.

2 WRONG APPROACHES AND LANDINGS OF AIRCRAFT BOUND FOR SINGAPORE CHANGI AND PAYA LEBAR AIRPORTS

2.1 INTRODUCTION

2.1.1 The attention of all pilots is drawn to the existence of Paya Lebar Airport close to Singapore Changi Airport. The runway at Singapore Changi Airport is orientated in the same true bearing as the runway at Paya Lebar Airport i.e. 023°/203°. Due to the close proximity of these two runways, pilots are cautioned against mistaking Paya Lebar Airport for the runway of Singapore Changi Airport and thus making an inadvertent visual landing or approach to land at Paya Lebar.

2.1.2 Erroneous approaches or landings usually occurred during the hours of darkness. In almost every instance, the weather prevailing at the time of the incident was generally good or fair.

2.1.3 There is intensive local flying at Paya Lebar and Seletar during the day and night. Thus, the risk of collision is very great if a wrong approach is made to any of the above two airports. Likewise, wrong approaches into Singapore Changi Airport can also be disastrous.

2.2 POINTS TO BEAR IN MIND WHEN APPROACHING SINGAPORE CHANGI AIRPORT OR PAYA LEBAR

2.2.1 The following points are highlighted to serve as a guide to assist pilots in making a correct approach into Singapore Changi Airport or Paya Lebar Airport and should be remembered and followed:

- a. The runways at Singapore Changi Airport and Paya Lebar Airport are identically aligned on 02/ 20. Therefore exercise extreme vigilance when leaving NYLON or SAMKO Holding Areas inbound and maintain correct tracks to the respective runways as listed below.
- b. Adhere strictly to IFR procedures even in VMC which calls for a procedure turn over NYLON Holding Area or SAMKO Holding Area as prescribed.
- c. Make full use of all available navigational and landing aids available and positively identify every aid used.
- d. Switch to the correct ILS localizer frequency at Singapore Changi Airport under all conditions.

2.3 AERODROME CHARACTERISTICS OF SINGAPORE CHANGI AND PAYA LEBAR AIRPORTS

2.3.1 Tabulated below are details of aerodrome characteristics of Singapore Changi Airport and Paya Lebar Airport which indicate the similarities and significant differences for ease of identification by pilots operating into these two airports.

Aeronautical Service	PAYA LEBAR Airport	SINGAPORE CHANGI Airport	Significant Differences and Remarks
Magnetic heading of RWY	02/20	02L/20R 02C/20C	Exercise caution due to similar RWY alignment

Aeronautical Service	PAYA LEBAR Airport	SINGAPORE CHANGI Airport	Significant Differences and Remarks
Approach Lights	RWY 02 Modified Calvert High INTST with centreline and 3 crossbars. High INTST white LGT with brilliancy control and sequenced flashing lights.	RWY 02L Precision APCH LGT CAT II. Extended centreline with red side row barettes, 2 crossbars, 2 APCH beacons and sequenced flashing lights.	
	RWY 20 Modified Calvert High INTST with centreline and 3 crossbars. High INTST white LGT with brilliancy control and sequenced flashing lights.	RWY 20R Precision APCH LGT CAT I. Centreline barettes flashing white, 2 APCH beacons and sequenced flashing lights. (refer to chart AD-2-WSSS-ADC-2)	
ILS	RWY 20 - NIL	RWY 20R IDENT ICH No back beam LLZ 108.9 MHz GP 329.3 MHz	
	RWY 02 - NIL	RWY 02L IDENT ICW No back beam LLZ 110.9 MHz GP 330.8 MHz	
IBN	Flashing R 'PL' HN and IMC	Flashing G 'CH' HN and IMC	
ABN	NIL	ALTN Flashing W G every 2.3 SEC	

WSSS AD 2.21 NOISE ABATEMENT PROCEDURES

- 1.1 To alleviate the problem of noise, all aircraft on AWY G579 between SINJON (SJ) and JAYBEE (JB) shall operate at/above 5,000ft.
- 1.2 The Standard Instrument Departure routes for aircraft departing on RWY 20R/20C are for the purpose of noise abatement in addition to being used for air traffic control.
- 1.3 Departures on RWY 20R are restricted between 1600-2200UTC. This restriction is not applicable when RWY 20C/02C is unavailable because of maintenance works or for other reasons.
- 1.4 Unless it is necessary for operational or safety reasons, when using engine reverse, arrivals on RWY 02L/20R between 1600-2200UTC may not exceed idle reverse thrust.

WSSS AD 2.22 FLIGHT AND GROUND PROCEDURES

1 LOW VISIBILITY PROCEDURES (LVP) FOR CATEGORY II ILS OPERATIONS

1.1 Introduction

- 1.1.1 Category II ILS approaches will be made available at Singapore Changi Airport to authorised flights during prolonged periods of low visibility, except during thunderstorms. RVR minima for CAT II ILS operations is limited to 350m due to runway and taxiway light spacing requirements on the airfield.

1.2 Authorisation for Category II ILS Approaches

- 1.2.1 Operators who wish to conduct Category II ILS operations at Singapore Changi Airport must have obtained operational approval from the relevant State of Operator and be authorised by the Civil Aviation Authority of Singapore.

1.3 Category II ILS Runways

- 1.3.1 At Singapore Changi Airport, Category II ILS approaches are available only on RWY 02L and RWY 20C, which are also equipped with precision approach Category II lighting system. When required, pilots making Category II ILS approaches to Singapore Changi Airport should refer to the procedures in the Instrument Approach Charts

AD-2-WSS-1AC-1 to AD-2-WSS-1AC-11 and the Precision Approach Terrain Charts for RWY 02L and RWY 20C at AD-2-WSS-PATC-1 and AD-2-WSS-PATC-2 respectively.

1.4 Initiation of Category II ILS Operations

- 1.4.1 Preparations will be made to implement LVP for Category II ILS operations at Singapore Changi Airport during prolonged period of low visibility, except during thunderstorms, when the RVR drops below 800 metres.
- 1.4.2 Availability of the Category II ILS approaches will be made known through NOTAM and ATIS broadcasts as well as air traffic control radio communications.
- 1.4.3 During LVP operations, aircraft will not be cleared for Category II ILS approach if any of the ILS or approach/runway lights fall below Category II requirements. Aircraft will not be cleared for landing if the Touchdown Zone RVR is unserviceable.

1.5 ILS Sensitive Areas

- 1.5.1 Upon landing, pilots shall report to Changi Tower once the aircraft has cleared the runway and has passed the ILS sensitive areas demarcated by alternate yellow and green lights along the centrelines of Rapid Exit Taxiways and Cross Taxiways.

1.6 Termination of LVP for Category II ILS Operations

- 1.6.1 LVP for Category II ILS operations will be terminated when RVR has improved above 800 metres. Termination of LVP for Category II ILS operations will be made known through NOTAM and ATIS broadcasts as well as air traffic control radio communications.

1.7 Operations of flights Not Authorised for Category II ILS Operations

- 1.7.1 During Category II ILS operations, if the RVR is 550 metres or above, flights not authorised for Category II ILS operations may continue to make approaches and land. Airlines planning to operate flights not authorised for Category II ILS operations into Changi shall monitor the METAR to ascertain the RVR values when launching their flights and be prepared to divert if the RVR is below 550 metres.

2 RUNWAY UTILISATION

2.1 Runway-in-use

- 2.1.1 The runway-in-use (Departure/Arrival) is selected by Aerodrome Control as the optimum for general purposes and to maximise runway utilisation. If the assigned runway is unsuitable for a particular operation, the pilot can obtain permission from ATC to use another runway but should anticipate delay.

2.2 Departures

- 2.2.1 Pilots should arrange their taxi such that they are ready to depart without delay on reaching the runway holding point. As standard ICAO wake turbulence separation is being applied, pilots are to advise ATC early if more time is needed for the aircraft to be ready for departure. When informed, ATC will be able to make changes in the departure sequence, if necessary, to minimise delays to other succeeding departures.
- 2.2.2 Pilots should complete cockpit checks prior to line-up for departure and keep any checks on the runway to a minimum.
- 2.2.3 Conditional line-up clearance may be used by ATC to facilitate an expeditious flow of traffic. On receipt of line-up clearance, pilots should taxi into position promptly without delay. Unless given instructions to line-up and wait, pilots should be ready and prepared to depart without stopping. On receipt of take-off clearance, pilots to commence take-off roll without delay.

2.3 Clearance for Immediate Take-Off

- 2.3.1 A pilot receiving the ATC instruction 'cleared for immediate take-off' is required to act as follows:
- if waiting clear of the runway, taxi immediately on to it and begin take-off run immediately without stopping the aircraft;
 - if already lined-up on the runway, take-off without delay;
 - if unable to comply with the instruction, inform ATC immediately.

2.4 Arrivals - Minimum Runway Occupancy Time (ROT)

- 2.4.1 Arriving aircraft upon landing are reminded that it is imperative to vacate the runway as quickly as practicable to enable ATC to apply minimum spacing on final approach and minimise the occurrence of "go-arounds".

- 2.4.2 To achieve minimum ROT and reduce missed approaches due to occupied runway, pilots should vacate the runway via the first available exit taxiway corresponding to operational requirements, or as instructed by ATC. If an exit taxiway other than the first available exit taxiway is required, pilots shall advise the Tower Controller on first contact.
- 2.4.3 To enhance planning, pilots can make reference to the Landing Exit Distance (LED), the distance from threshold to the furthest edge of the exit taxiway:

RWY	Exit Taxiway (LED in metres)	Remarks
20R	<u>W6*(1655)</u> , <u>W7*(2123)</u> and W8 (3061)	Note 1: Recommended exit taxiways are bold and underlined. Note 2: * Indicates Rapid Exit Taxiway (RET) and maximum design ground speed for the exit taxiway is 50kts.
20C	<u>E6*(1948)</u> , <u>E7*(2391)</u> and E8 (3152)	
02L	<u>W5*(1966)</u> , <u>W4*(2491)</u> and W3* (2876)	
02C	<u>E5*(2055)</u> , <u>E4*(2565)</u> and E3* (3267)	

- 2.4.4 Pilots can expect initial taxi instructions from the Runway Controller before clearing the exit taxiway. Aircraft vacating the runway-in-use should not stop on the exit taxiway until the entire aircraft has passed the runway holding point.
- 2.4.5 BTN 0830-1030 daily estimated delays of about 15 minutes can be expected for arrivals into Singapore Changi Airport.

2.5 Land after Procedures

- 2.5.1 Normally, only one aircraft is permitted to land or take-off on the runway-in-use at any one time. However, when the traffic sequence is two successive landing aircraft, the second aircraft may be allowed to land before the first aircraft has cleared the runway-in-use provided:
- the runway is long enough;
 - during daylight hours;
 - the second aircraft will be able to see the first aircraft clearly and continuously until it is clear of the runway;
 - the second aircraft has been warned.

- 2.5.2 ATC will provide this warning in the landing clearance as shown in para 2.7.

- 2.5.3 Responsibility for ensuring adequate separation between the two aircraft rests with the pilot of the second aircraft.

2.6 Special Landing Procedures

- 2.6.1 Special landing procedures may be in force at Singapore Changi Airport in conditions shown as follows:

- When the runway-in-use is temporarily occupied by other traffic, landing clearance may be issued to an arriving aircraft provided that at the time the aircraft crosses the threshold of the runway-in-use the following separation distances will exist:
 - Landing following landing - The preceding landing aircraft will be clear of the runway-in-use or will be at least 2,500m from the threshold of the runway-in-use.
 - Landing following departure - The departing aircraft will be airborne and at least 2,500m from the threshold of the runway-in-use, or if not airborne, will be at least 2,500m from the threshold of the runway-in-use.

- 2.6.2 These procedures will be used only under the following conditions:

- during daylight hours;
- visibility of at least 5km;
- cloud ceiling of 1,500ft in the departure/missed approach area;
- ATC is satisfied that the pilot of the next arriving aircraft will be able to observe continuously the relevant traffic;
- no unfavourable surface wind conditions (including significant tailwind, windshear, turbulence, etc);
- when the runway is dry and free of all precipitants such that there is no evidence that the braking action may be adversely affected.

2.7 Phraseology

- 2.7.1 When issuing a landing clearance following the application of these procedures, ATC will issue the second aircraft with the following instructions:

.... (call sign) after the landing / departing (Aircraft Type) Runway(Designator) cleared to land.

3 AIRPORT COLLABORATIVE DECISION MAKING (A-CDM) MODE OF OPERATIONS

3.1 A-CDM aims to optimise airport operations by having an efficient turnaround process and improving the predictability of operational events. It also helps to improve gate management, flight punctuality, reduce apron taxiway and holding point congestion which is beneficial to all airport partners. A-CDM involves sharing of accurate and timely operational information amongst airport partners through different airport systems and improving work processes by implementing a set of operational procedures.

3.2 The A-CDM procedures apply to all scheduled flights departing Singapore Changi Airport except for VVIP, CASEVAC, SAR and aircraft on special tasks. ATC shall have full discretion in conduct of such operations.

3.3 Definition of commonly used terms in A-CDM

- a. Target Off Block Time (TOBT) – The time an aircraft operator (AO) or ground handling agent (GHA) estimates that an aircraft will be ready, all doors closed, boarding bridge removed, pushback vehicle available and ready to start-up / pushback immediately upon receipt of clearance from ATC.
- b. Target Start Up Approval Time (TSAT) – The time provided by ATC that an aircraft can expect start-up / push back approval.
- c. Calculated Take Off Time (CTOT) – A time calculated as a result of tactical slot allocation, at which a flight is expected to become airborne.

4 A-CDM PRE-DEPARTURE PROCEDURES

4.1 Singapore Changi Airport's A-CDM portal will automatically calculate a system TOBT for each departure flight taking into account the estimated or actual in-block time (EIBT / AIBT), minimum turnaround time (MTT) and scheduled time of departure (STD)

4.2 If the calculated TOBT (EIBT / AIBT + MTT) is earlier than STD, the system will take the STD as TOBT.

4.3 If the calculated TOBT (EIBT / AIBT + MTT) is later than STD, the amount of turnaround delay that system predicts is equal to TOBT – STD.

4.4 AO are required to assess the system generated TOBT at 40 minutes prior to departure and update it if the prediction of departure readiness is different. Thereafter, TOBT needs to be monitored and updated constantly if it is expected to differ by 5 minutes or more until the flight commences pushback. AO can consider delegating the responsibility of TOBT submission to their ground handling agent (GHA) subject to prior internal arrangements between AO and GHA.

4.5 TOBT shall be updated through the following systems:

- a. Airport Operations Centre System (AOCS) A-CDM web based portal; or
- b. Gate Message Input Display (GMID) at boarding rooms;

4.6 AO/GHA is encouraged to update TOBT through ONLY one of the above systems in order to avoid any chance of a miscommunication.

4.7 TOBT information is available through the following channels:

- a. AOCS A-CDM portal;
- b. GMID;
- c. Aircraft Docking Guidance System (ADGS) at contact stands;
- d. Radio communication with GHA or AO.

4.8 The Pre-Departure Sequencer (PDS) will calculate the TSAT automatically by taking into account factors such as TOBT, calculated take-off time (CTOT), variable taxi times (VTT), wake turbulence category, departure separation, etc. A pre-departure sequence is determined from the calculated TSATs, thus the accuracy of TOBT is vital to an optimal TSAT.

4.9 Flights with an invalid or expired TOBT will be instructed by ATC to update TOBT when requesting for clearance. For non-compliant flights, delays can be expected. AO or GHA are strongly encouraged to update TOBT as soon as any expected delay to the aircraft readiness for pushback is made available to avoid unnecessary hold-ups.

4.10 TSAT information is available through the following channels:

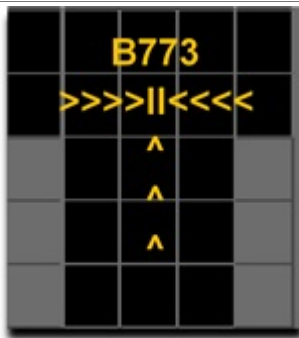





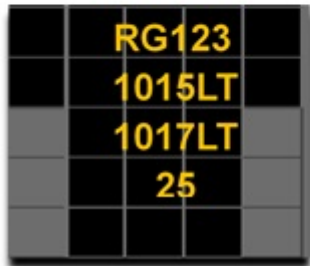
- a. AOCS A-CDM portal;
- b. GMID;
- c. ADGS at contact stands;
- d. Radio communication with GHA or AO;
- e. ATC - Upon issuance of ATC clearance (for flights parked at aircraft stands without ADGS).



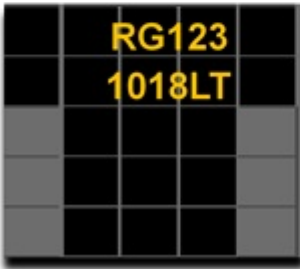
5 A-CDM START-UP PROCEDURES

- 5.1 Pilot shall ensure aircraft is ready for pushback at TOBT.
- 5.2 Pilot to maintain communication with the AO / GHA as they are responsible for updating the TOBT. Notify the AO / GHA to update the TOBT if it is expected to differ by 5 minutes or more.
- 5.3 Pilot to contact Ground Movement Planner (Clearance Delivery) and request for ATC clearance within 5 minutes of TOBT using the following phraseology:
- Callsign
 - Destination
 - Proposed flight level and alternate level, if any
 - Parking position
- a. Pilot shall only request for ATC clearance provided aircraft is ready to pushback at TOBT. Any updates to TOBT after receipt of ATC clearance will result in cancellation of clearance issued as the ATC clearance validity is based on the initial TOBT.
- 5.4 ATC will advise the pilot whether the proposed flight level or other alternate flight level is available and an ATC clearance will be issued accordingly. If pre-departure coordination with an adjacent unit or centre is required, the pilot will be instructed to standby.
- 5.5 ATC will update TSAT changes if any, during issuance of ATC clearances. Note that TSAT displayed on ADGS may not be final and can be revised due to en-route clearance restrictions, ground congestion or flow measures.
- 5.6 Pilot shall request for pushback from Ground Movement Control within 5 minutes of TSAT after obtaining ATC clearance, or as directed by ATC.
- a. ATC may swap pushback sequence based on real-time readiness of aircrafts to maximise apron and runway capacity and reduce the overall delay to traffic as and when required.
- b. At the end of pushback, the departing aircraft must have all engines started and be ready to taxi immediately, unless otherwise instructed by ATC.
- Note: The first aircraft to taxi may not necessarily be the first aircraft to take-off as distances between aircraft stands and the departure runway vary.
- 5.7 A flight issued with gate hold (TSAT>TOBT) but chooses to commence pushback before the assigned time will be allowed to do so subject to traffic. However, the flight should not expect an earlier departure time as the planned pre-departure sequence will be maintained.
- 5.8 If a flight is unable to pushback by TSAT + 5 minutes due to the aircraft being unready, ATC clearance and TSAT will be cancelled. Pilot must notify the AO / GHA to update the TOBT for a new TSAT before requesting for a new ATC clearance. This also applies to aircraft returning back to blocks after pushback.
- a. ATC will inform the aircraft when a clearance is cancelled using the phraseology; "(Callsign of aircraft) your ATC clearance and TSAT is cancelled (reason). Update TOBT before requesting for new clearance".
- b. Flight may also have its ATC clearance cancelled if it develops a technical problem after pushback and is unable to taxi for prolonged duration.
- 5.9 Non-compliance of initial TSAT may result in an aircraft losing its existing position in the pre-departure sequence. Delay can be expected as a result of re-sequencing based on new TOBT input.
- 5.10 If delay in pushback is due to ground traffic movement or ATC clearance restrictions, the ATC clearance and TSAT will remain valid even if it exceeds TSAT + 5 minutes. TOBT need not be updated for such situations.
- 5.11 In the event that A-CDM mode of operations need to be cancelled due to any reason, the termination will be communicated to relevant parties through email by the airport operator and a NOTAM will be issued by ATC. Pilot shall follow the non-CDM procedures detailed in para 12.

6 A-CDM INFORMATION VIA AIRCRAFT DOCKING GUIDANCE SYSTEM (ADGS)

- 6.1 All contact stands in Singapore Changi Airport will have ADGS. The fundamental operation and usage of ADGS still remain the same for flight crew. Additional information which includes TOBT, TSAT and TOBT count-down timer will be displayed in local times as part of the improvements to support A-CDM operations.

Aircraft Docking Guidance System (ADGS)	
Description	Display on ADGS
Aircraft arrival to stand <ul style="list-style-type: none"> No change in existing functionality and display 	
40 minutes prior to TOBT <ul style="list-style-type: none"> ADGS will display TOBT submitted by AO / GHA and a count down timer (2 digits) to TOBT in minutes As ADGS can only display up to 7 characters per line, the displayed message will be scrolling. Timings displayed will be in Local Time (LT) TOBT timings will change instantly if there is an update done by AO / GHA 	<div> <div>Snapshot 1</div>  </div> <div> <div>Snapshot 2</div>  </div> <div> <div>Snapshot 3</div>  </div>
25 minutes prior to TOBT <ul style="list-style-type: none"> ADGS will display TSAT derived by PDS As ADGS can only display up to 7 characters per line, the displayed message will be scrolling. TSAT timings may change as the PDS is continuously optimising push back times based on real time traffic conditions 	<div> <div>Snapshot 1</div>  </div> <div> <div>Snapshot 2</div>  </div> <div> <div>Snapshot 3</div>  </div>

Aircraft Docking Guidance System (ADGS)	
Description	Display on ADGS
Aircraft departure from stand <ul style="list-style-type: none"> ADGS will display the actual off-block time (AOBT) As ADGS can only display up to 7 characters per line, the displayed message will be scrolling TOBT, TSAT and TOBT countdown timer will be removed AOBT display will be removed 3 minutes after AOBT 	<div>Snapshot 1</div> 
	<div>Snapshot 2</div> 
	<div>Snapshot 3</div> 

7 CONTACT AND INFORMATION

7.1 Please contact the airport operator, Changi Airport Group (CAG), at a-cdm@changiairport.com for application of AOCs A-CDM and GMID account or if you have any queries.

7.2 Aircraft operators may also contact their ground handling agent directly on queries regarding TOBT submission.

8 ASSIGNMENT OF FLIGHT LEVELS TO AIRCRAFT DEPARTING FROM SINGAPORE CHANGI AIRPORT

8.1 Assignment of flight levels to departing aircraft is made on a best-planned-best-served basis (with reference to TOBT for ATC clearance request detailed in para 5.3). Aircraft will normally be assigned the level requested unless an alternate level is offered after coordination with the adjacent ATC centres.

8.2 Departing flights from Singapore requesting FL280 or FL320 on L759, M770, N571, N571/N877 or P628 will be cleared as follows:

- Aircraft departing Singapore will be cleared to FL280;
- Succeeding aircraft on the same route will be cleared to FL280 with 10min longitudinal separation provided there is no closing speed with the preceding aircraft;
- Additional longitudinal separation as appropriate shall be imposed by ATC when the succeeding aircraft is faster than the preceding aircraft on the same route;
- The first aircraft from either Singapore or Kuala Lumpur to be over GUNIP on N571 or N571/N877, the Kuala Lumpur/Bangkok FIR boundary on M770 or L759 and VPL on P628 can expect its requested flight level

9 DELAY IN PUSHBACK AND/OR TAXIING DUE TO OTHER AIRCRAFT

9.1 Delays may be expected for the second aircraft to pushback and to taxi when two or more aircraft are parked either adjacent to one another or close together. However, it will retain its ATC clearance even if the 5 minutes grace period allowed for under para 5.8 is exceeded.

Note: The TSAT may not be able to predict delays arising from apron congestion as traffic movement on ground is dynamic and situations may change on a real time basis depending on aircraft readiness. ATC will facilitate pushback as soon as possible when traffic permits.

10 DELAY IN TAKE-OFF DUE TO RESTRICTIONS IN THE ATC CLEARANCE

10.1 The ATC clearance may require an aircraft to arrive at a reporting point at a specified time and level or to depart a number of minutes behind a preceding traffic to establish the appropriate longitudinal separation. Such delay will not deprive a departing aircraft of its ATC clearance even though the 5 minutes grace period allowed for under para 5.8 is exceeded.

11 DELAY DUE TO OVERFLIGHTS

- 11.1 These are flights operating through Singapore FIR without landing at Singapore Changi Airport. Depending on their positions, a departing aircraft requesting the same level may have to accept an alternate level or may have to delay its departure in order to establish the prescribed separation.

12 NON-CDM MODE OF OPERATIONS

- 12.1 The non-CDM procedures is applicable for non-scheduled flights departing Changi Airport or when TOBT and TSAT references used in A-CDM mode of operations become unavailable due to system issues or maintenance.

- 12.2 If TOBT cannot be submitted or it is unavailable through different channels stated in para 4.5,

- a. Pilots shall notify ATC when the aircraft is ready to pushback within 5 minutes.
- b. ATC will advise the pilot whether the proposed flight level or other alternate flight level is available and an ATC clearance will be issued accordingly. If pre-departure coordination with an adjacent unit or centre is required, the pilot will be instructed to standby.
- c. Once flight level is accepted by the pilot and an ATC clearance issued, the aircraft must be pushed back within 5 minutes from the time the ATC clearance is accepted unless other ATC restrictions are imposed. The ATC clearance will be cancelled on expiry of the 5 minutes grace period. This also applies to situations when aircraft return to blocks after pushback or develop technical issues and is unable to continue taxi.
- d. Pilots who are ready to depart following the cancellation of an ATC clearance will adopt the procedures as if it is the first time they are ready to depart.

- 12.3 If TSAT is unavailable through different means stated in para 4.10,

- a. AO and GHA shall continue to submit TOBT and pilots shall request for ATC clearance 5 minutes within TOBT stated in para 5.3
- b. ATC will revert to the gate hold procedures stated in para 13 and issue estimated pushback times accordingly.

13 GATE HOLD PROCEDURES FOR DEPARTING AIRCRAFT (DURING NON-CDM MODE OF OPERATIONS)

- 13.1 Whenever there are about five to seven departing aircraft at the runway holding point, subsequent pushback of departures will be regulated such that the Ground Movement Planner (GMP) on VHF frequency 121.65MHz will start to issue pilots with Expected Pushback Time (EPT) as TSAT used in A-CDM operations is not available. The determination of EPT will take into account an aircraft's parking stand as well as taxi time to the runway-in-use holding point.

- 13.2 When an EPT is issued, pilots will be instructed to either remain on GMP frequency or to monitor Singapore Ground Control (frequencies 121.725MHz, 121.85MHz, 122.55MHz, 124.3MHz or 125.65MHz). It should be noted that when instructed to monitor the Singapore Ground frequencies, pilots shall not establish contact with the Singapore Ground Control, rather, pilots shall maintain listening watch on the assigned Singapore Ground Control frequency and wait for pushback instruction. This is to prevent unnecessary frequency congestion.

- 13.3 A flight issued with an EPT but chooses to commence pushback before the assigned time will be allowed to do so subject to traffic. However, the flight should not expect an earlier departure time as the planned pre-departure sequence will be maintained.

- 13.4 In a situation when a departing aircraft is occupying a gate that has been assigned to an arriving aircraft, the departing aircraft will be instructed by GMP to contact Singapore Ground Movement Control for pushback for the purpose of better gate utilisation.

- 13.5 To maximise runway utilisation, departure sequence will be planned on the basis of increasing runway throughput so as to enhance overall efficiency.

14 GROUND MOVEMENT PLANNER ON VHF 121.65MHz

- 14.1 The frequency shall be used for aircraft pre-flight checks and ATC clearances. Pilot-in-command to make his initial call from the parked position on this frequency.

- 15 GROUND MOVEMENT CONTROL ON VHF 121.725MHz, 121.85MHz, 122.55MHz, 124.3MHz and 125.65MHz**
- 15.1 This frequency shall be used for aircraft start-up/push-back clearance.
- 15.2 Unless otherwise instructed by ATC, the pilot-in-command shall prior to starting engines listen out on the Ground Movement Control frequency on 121.725MHz, 121.85MHz, 122.55MHz, 124.3MHz or 125.65MHz.
- 15.3 The pilot-in-command shall:
- a. Request and obtain taxi instructions prior to taxiing;
Note: ATC clearance, including the assigned SSR code will normally be issued prior to push back. Pilot shall squawk the SSR code immediately when airborne.
 - b. Change from Ground Movement Control frequency to the Runway Control frequency when instructed (118.6MHz or 118.25MHz). It should be noted that when instructed to monitor Singapore Tower frequencies, pilots shall not establish contact with Singapore Tower; rather, pilots shall maintain a listening watch on the assigned Singapore Tower frequency and wait for instruction. This is to prevent unnecessary frequency congestion.
- 15.4 Departing aircraft will be instructed when to change from 118.6MHz or 118.25MHz to Singapore Departure frequency 120.3MHz.
- 15.5 In the case of the aircraft having landed, the pilot-in-command shall change from 118.6MHz or 118.25MHz to 121.725MHz, 121.85MHz, 122.55MHz, 124.3MHz or 125.65MHz immediately upon instructed by ATC after clearing the runway. He shall maintain watch on 121.725MHz, 121.85MHz, 122.55MHz, 124.3MHz or 125.65MHz for taxiing and parking instructions until he arrives at his aircraft stand.
- 16 TAXIING**
- 16.1 Taxi clearance given by Singapore Ground Movement Control will relate to movement on the manoeuvring area, but excluding the marshalling area.
- 16.2 Aircraft taxiing on the manoeuvring area will be regulated by ATC to avoid or reduce possible conflict and will be provided with traffic information and alerting service. ATC shall apply taxiing clearance limits whenever necessary.
- 16.3 The taxiway routes to be used by aircraft after landing or when taxiing for departure will be specified by ATC. The issuance by ATC of a taxi route to an aircraft does not relieve the pilot-in-command of the responsibility to maintain separation with other aircraft on the manoeuvring area or to comply with ATC directions intended to regulate aircraft on the manoeuvring area. **Pilots are also advised of the possibility of misjudging the clearance between the aircraft wing tips and other obstacles, especially in areas of hot-spots or during low-light / poor visibility conditions.**
- 16.4 Pilots are reminded to always use minimum power when starting engines, when manoeuvring within the apron area or when manoeuvring from apron taxiways to other parts of the aerodrome. It is especially critical when commencing to taxi that break-away thrusts are kept to an absolute minimum and then be reduced to idle thrusts as soon as possible.

17 TAKE-OFF AND LANDING

- 17.1 Departing aircraft will normally be directed by ATC to use the full length of the runway for take-off. On obtaining an ATC clearance the aircraft shall enter the runway via designated taxiways:
- RWY 02C - TWY E10 or E11
- RWY 02L - TWY W8, W9 or W10
- RWY 20C - TWY E1, E2
- RWY 20R - TWY W1, W2
- 17.2 The pilot-in-command shall not take-off or land without a clearance from Aerodrome Control.
- 17.3 The pilot-in-command shall not run-up on the runway in use unless authorised by Aerodrome Control. Engine run-ups in the holding pan or taxiway holding point clear of the runway in use may be carried out subject to approval by Aerodrome Control.
- 17.4 After landing, the pilot-in-command shall vacate the runway by the shortest suitable route and to contact Singapore Ground Movement Control who will issue specific taxi route instructions to its assigned aircraft stand.
- 17.5 Aircraft with radio communication failure shall vacate the runway and stop on the taxiway and watch for light signals from Aerodrome Control.

18 STANDARD INSTRUMENT DEPARTURE (SID) AND STANDARD INSTRUMENT ARRIVAL (STAR)

18.1 INTRODUCTION

- 18.1.1 The SIDs and STARs for Singapore Changi Airport require aircraft to be GNSS-equipped and approved with navigation systems that meet the ICAO RNAV-1 navigation specification in accordance to the ICAO Performance Based Navigation Manual (Doc 9613).
- 18.1.2 To avoid proliferation of SIDs and STARs, the basic RNAV SIDs and STARs follow similar tracks as the RNAV-1 (GNSS) SIDs and STARs using the same set of SIDs and STARs identification.
- 18.1.3 Operators / pilots who are not approved to operate on the RNAV-1 (GNSS) SIDs and STARs shall notify ATC and operate on the alternate basic RNAV SIDs and STARs or expect radar vectors from ATC.

18.2 ARRIVALS

- 18.2.1 Arriving aircraft from the various ATS routes shall plan for the respective RNAV-1 STARs with the associated flight planning requirement as shown below:

ATS Route	RNAV-1 STAR	Remarks and Flight Planning Requirement
A464 (southbound to Singapore)	ARAMA	Default STAR shall be ARAMA. When traffic permits and WSSS Runway 20 is in use, ATC will offer LELIB STAR. Pilots are to request for the STAR from Singapore ATC when the flight is within 120 DME SJ and Runway 20 is in use. Flight shall still remain under the control of WMKK ATC.
A576 (southbound to Singapore)	Not applicable	Southbound flight landing at WSSS are not permitted to flight plan via A576.
G579	REPOV	NIL
G580	KARTO	NIL
L504	OBDOS	NIL
L642	ELALO	ESPOB Q801 Q802 ELALO
L762	ASUNA	NIL
M635	SURGA	NIL
M646	KARTO	NIL
M751 / B469	Not applicable	M751 VPK B469 90 DME PU PIBAP PASPU. After PASPU, expect radar vectors.
M753	ELALO	IPRIX Q802 ELALO
M767	KARTO	NIL
M774	OBDOS	NIL
M904	ELALO	UPRON Q803 ELALO
N891	ELALO	N891 ENREP direct ELALO
N892	MABAL	NIL
R469	ASUNA	NIL
Note: The LEBAR STAR serves as a transition option to the STARs listed above. This is to facilitate arrivals joining downwind to the west of Singapore Changi Airport. ATC may clear arrivals to join the LEBAR STAR when air traffic permits.		

- 18.2.2 All RNAV-1 (GNSS) STARs terminate at the initial approach fix (IAF). Arrivals can expect radar vectors to intercept the localizer for an ILS approach to the respective runways.

18.3 DEPARTURES

- 18.3.1 All departing aircraft will be cleared on the appropriate RNAV-1 (GNSS) SIDs and shall climb initially to 3,000ft.
- 18.3.2 RNAV-1 (GNSS) SIDs will be assigned to departures from Singapore Changi Airport that flight plan on the following ATS routes:

ATS Route	RNAV-1 SID	Remarks and Flight Planning Requirements
A457	MASBO	NIL
B470	ANITO	NIL
G580 / M646	TOMAN	NIL
L504	BAVUS	NIL
L625 / N884	TOMAN	NIL

ATS Route	RNAV-1 SID	Remarks and Flight Planning Requirements
L762	ADMIM	NIL
M635	VENIX	NIL
M751	MERSING	NIL
M753	MERSING	VMR L642 ENREP M753 Expect radar vectors or further ATC clearance on approaching VMR.
M771	MERSING	VMR DOLOX M771 Expect radar vectors or further ATC clearance on approaching VMR.
M774	KADAR	NIL
N884	Not applicable	Not available for flight planning between VMR and LUSMO. Flight plan via TOMAN L625 LUSMO N884.
N891	MERSING	VMR ENREP N891 Expect radar vectors or further ATC clearance on approaching VMR.
R469	ADMIM	NIL
Y339	AROSO	Flight planning permitted for flights departing from or overflying Singapore to destinations north of Kuala Lumpur and Subang Airports. For flights operating at FL220 and below, to flight plan on A457.

18.4 VERTICAL AND SPEED RESTRICTIONS

- 18.4.1 Pilots shall comply with an ATC assigned level. Pilots shall also adhere to the vertical and speed restrictions depicted on the SIDs and STARs. ATC clearance will take precedence when the ATC clearance does not allow the pilots to adhere to the vertical and speed restrictions depicted on the SIDs and STARs.

18.5 OPERATORS' PROCEDURES

- 18.5.1 The operator shall ensure that in-flight procedures, crew manuals and training programmes are established in accordance with RNAV-1 (GNSS) navigation requirements.
- 18.5.2 Pilots shall inform ATC when on-board equipment does not meet the RNAV-1 (GNSS) navigation requirements. Pilots can then expect radar vector from ATC.

19 COORDINATES OF SID/STAR WAYPOINTS (WGS84 DATUM)

Name	Latitude	Longitude	Radius/Distance from VTK	Radius/Distance from SJ
ABVIP	010008N	1035032E	VTK R-203.5 / D27.0	SJ R-183.5 / D13.2
ADMIM	005733N	1033033E	VTK R-228.4 / D41.2	SJ R-232.8 / D26.1
AGROT	010108N	1035808E	VTK R-187.7 / D24.0	SJ R-150.8 / D14.0
AGVAR	014719N	1034145E	VTK R-318.8 / D29.8	SJ R-344.3 / D35.3
AKMET	015355N	1034339E	VTK R-328.6 / D34.0	SJ R-349.3 / D41.3
AKOMA	014522N	1035443E	VTK R-342.0 / D21.4	SJ R-006.2 / D32.0
ALFA	013033N	1034942E	VTK R-295.7 / D12.9	SJ R-354.8 / D17.2
ANITO	001700S	1045200E	VTK R-153.4 / D113.4	SJ R-146.0 / D108.6
ARAMA	013654N	1030712E	VTK R-282.4 / D55.5	SJ R-298.0 / D50.0
AROSO	020846N	1032421E	VTK R-319.9 / D57.4	SJ R-334.0 / D61.7
ASUNA	005948N	1030954E	VTK R-244.1 / D57.3	SJ R-252.0 / D43.6
ATKAX	000512N	1065946E	VTK R-113.9 / D195.5	SJ R-109.7 / D200.6
ATRUM	013256N	1040057E	VTK R-357.3 / D8.0	SJ R-026.1 / D21.8
BAVUS	000000N	1090000E	VTK R-105.9 / D310.5	SJ R-103.4 / D317.3
BETBA	013302N	1035331E	VTK R-316.1 / D11.3	SJ R-006.3 / D19.8
BIBVI	024336N	1040618E	VTK R-003.5 / D78.4	SJ R-009.6 / D91.1
BIDUS	013554N	1035755E	VTK R-326.0 / D13.2	SJ R-006.9 / D22.6
BIPOP	013122N	1041018E	VTK R-054.5 / D11.0	SJ R-046.8 / D26.2
BOBAG	010230N	1032954E	VTK R-234.7 / D38.6	SJ R-243.2 / D24.0
BOKIP	010421N	1034353E	VTK R-220.5 / D27.0	SJ R-219.5 / D11.6
BTM	010813N	1040758E	VTK R-158.2 / D17.9	SJ R-107.0 / D17.5
DIVSA	011105N	1040303E	VTK R-172.9 / D13.9	SJ R-100.8 / D11.9
DOGRA	010525N	1041423E	VTK R-146.2 / D23.5	SJ R-108.9 / D24.4

Name	Latitude	Longitude	Radius/Distance from VTK	Radius/Distance from SJ
DOKTA	012606N	1041040E	VTK R-083.0 / D9.4	SJ R-057.0 / D23.2
DONDI	011252N	1035855E	VTK R-191.3 / D12.3	SJ R-093.4 / D7.6
DOSNO	004757N	1041409E	VTK R-160.8 / D39.0	SJ R-137.8 / D34.1
DOSPA	011459N	1040441E	VTK R-161.4 / D10.5	SJ R-082.9 / D13.5
DOVAN	011938N	1041249E	VTK R-114.6 / D12.7	SJ R-073.9 / D22.5
ELALO	041240N	1043329E	VTK R-010.6 / D169.9	SJ R-013.4 / D183.3
HOSBA	011948N	1042418E	VTK R-102.5 / D23.6	SJ R-079.0 / D33.7
IBIVA	011351N	1035637E	VTK R-203.1 / D12.0	SJ R-084.3 / D5.3
IBIXU	011621N	1035740E	VTK R-203.2 / D9.3	SJ R-064.4 / D7.0
IBULA	005036N	1043600E	VTK R-134.5 / D48.7	SJ R-116.8 / D50.2
IGNON	010847N	1041257E	VTK R-144.1 / D19.8	SJ R-101.8 / D22.2
IKAGO	003816N	1052931E	VTK R-117.7 / D99.8	SJ R-109.5 / D104.4
IKIMA	004314N	1045500E	VTK R-127.6 / D67.9	SJ R-115.1 / D70.5
JB (JAYBEE)	013000N	1034242E	VTK R-285.1 / D19.3	SJ R-332.6 / D18.6
KADAR	000647S	1074342E	VTK R-112.4 / D240.5	SJ R-109.0 / D245.8
KANLA	034556N	1043606E	VTK R-013.8 / D144.5	SJ R-016.5 / D158.3
KARTO	011124N	1053343E	VTK R-098.3 / D93.5	SJ R-091.1 / D102.6
KEXAS	011019N	1044818E	VTK R-107.2 / D49.2	SJ R-093.0 / D57.2
KILOT	030217N	1044023E	VTK R-022.0 / D104.5	SJ R-024.4 / D119.0
LAVAX	010950N	1042714E	VTK R-120.1 / D30.0	SJ R-095.5 / D36.2
LEDOX	011642N	1035651E	VTK R-208.6 / D9.4	SJ R-058.5 / D6.5
LELIB	012729N	1032450E	VTK R-274.0 / D36.6	SJ R-298.0 / D30.0
LETGO	011411N	1035548E	VTK R-207.3 / D12.1	SJ R-079.1 / D4.6
MABAL	032826N	1051236E	VTK R-030.1 / D142.1	SJ R-031.2 / D157.2
MASBO	020248N	1025251E	VTK R-299.0 / D78.3	SJ R-310.2 / D76.6
MIBEL	012351N	1020816E	VTK R-269.5 / D113.2	SJ R-275.8 / D103.7
NYLON	013657N	1040624E	VTK R-023.0 / D13.0	SJ R-032.9 / D30.0
OBDOS	002503N	1065551E	VTK R-108.9 / D184.5	SJ R-104.7 / D190.7
PALGA	011059N	1034759E	VTK R-223.8 / D19.3	SJ R-235.1 / D4.1
PAMSI	010459N	1034845E	VTK R-212.3 / D23.6	SJ R-197.2 / D8.7
PASPU	015915N	1040618E	VTK R-008.3 / D34.5	SJ R-018.3 / D48.1
PIBAP	023023N	1040618E	VTK R-004.4 / D65.3	SJ R-011.1 / D78.1
POSUB	012725N	1040748E	VTK R-069.0 / D6.9	SJ R-049.8 / D21.7
PU	012524N	1035600E	VTK R-275.2 / D5.4	SJ R-021.1 / D13.0
REMES	004342N	1035735E	VTK R-185.2 / D41.2	SJ R-167.9 / D30.2
REPOV	001623N	1040300E	VTK R-178.6 / D68.2	SJ R-168.3 / D57.9
RUVIK	011422N	1042033E	VTK R-118.8 / D21.9	SJ R-088.0 / D29.2
RWY 02C DER	012152N	1040000E	VTK R-203.5 / D3.3	SJ R-046.0 / D12.2
RWY 02L DER	012305N	1035933E	VTK R-224.1 / D2.5	SJ R-040.6 / D12.8
RWY 20C DER	011935N	1035902E	VTK R-203.3 / D5.8	SJ R-051.5 / D10.0
RWY 20R DER	012047N	1035835E	VTK R-213.7 / D4.9	SJ R-044.8 / D10.4
SABKA	015051N	1031713E	VTK R-300.4 / D51.2	SJ R-317.7 / D50.7
SAMKO	010530N	1035255E	VTK R-203.5 / D21.1	SJ R-168.0 / D8.0
SANAT	010749N	1035930E	VTK R-186.1 / D17.1	SJ R-123.7 / D9.9
SJ (SINJON)	011319N	1035120E	-	-
SURGA	003657S	1063119E	VTK R-129.1 / D193.3	SJ R-124.6 / D194.3
TOKIM	012933N	1040315E	VTK R-022.7 / D5.0	SJ R-036.7 / D20.1
TOMAN	012147N	1054717E	VTK R-091.7 / D106.2	SJ R-085.9 / D116.5
TOPOM	012955N	1040227E	VTK R-012.8 / D5.1	SJ R-034.2 / D20.0
VENIX	002156S	1060521E	VTK R-130.6 / D163.5	SJ R-125.3 / D164.3
VENPA	002141N	1044955E	VTK R-142.3 / D79.6	SJ R-131.2 / D78.1
VMR	022318N	1035218E	VTK R-351.2 / D58.8	SJ R-000.9 / D69.6
VTK (TEKONG)	012455N	1040120E	-	-

20 SID / STAR PHRASEOLOGIES

- 20.1 SID / STAR phraseologies allow ATC and pilot to communicate and understand detailed clearance information that would otherwise require long and potentially complex transmissions. To eliminate safety risk due to a mismatch between ATC and pilot expectations when SID / STAR phraseologies are used, and what certain terms may mean, ICAO has published Amendment 7-A to Doc 4444, PANS- ATM to harmonise the core phraseologies that positively reinforce the lateral, vertical and speed requirements embedded in a SID or STAR that will continue to apply, unless explicitly cancelled or amended by the controller.
- 20.2 The core phraseologies are:
- i. CLIMB VIA SID TO (level)
 - ii. DESCEND VIA STAR TO (level)
- 20.3 These require the aircraft to:
- i. Climb / descend to the cleared level in accordance with published level restrictions;
 - ii. Follow the lateral profile of the procedure; and
 - iii. Comply with published speed restrictions or ATC-issued speed control instructions as applicable.
- 20.4 Phraseologies for removal of speed or level restrictions are:
- i. CLIMB VIA SID TO (level), CANCEL SPEED RESTRICTION(S)
 - ii. DESCEND VIA STAR TO (level), CANCEL LEVEL RESTRICTION(S) AT (point(s))
- 20.5 These phraseologies mean that:
- i. The lateral profile of the procedure continue to apply and
 - ii. Speed or level restrictions which have not been referred to will continue to apply.
- 20.6 Phraseologies for variations to the lateral profile of the SID / STAR are:
- i. PROCEED DIRECT (waypoint), or
 - ii. VECTORING
- 20.7 These phraseologies mean that speed and level restrictions associated with the bypassed waypoints are cancelled.
- 20.8 Phraseology to clear aircraft to return to SID / STAR is: REJOIN SID / STAR
- 20.9 This phraseology means that speed and level restrictions associated with the waypoint where the rejoin occurs, as well as those associated with all subsequent waypoints must be complied with.
- 20.10 The term 'VIA' will no longer be used when issuing lateral routing clearances.

21 ARRIVING AIRCRAFT

- 21.1 The pilot-in-command of an arriving aircraft shall contact the appropriate Approach Control Unit 10 minutes before entering the CTR or ATZ.

22 LIGHT AIRCRAFT OPERATIONS

- 22.1 Light aircraft operations into and out of Singapore Changi Airport may be approved subject to the following conditions:
- a. Prior permission has been granted;
 - b. Aircraft is suitably equipped;
 - c. Pilot is appropriately rated;
 - d. Subject to ATC.
- 22.2 Flight notification shall be given by filing a flight plan.
- 22.3 All such operations will be regulated in accordance with IFR procedures.

23 SIMULTANEOUS INDEPENDENT PARALLEL APPROACHES**23.1 Introduction**

23.1.1 Simultaneous independent parallel approaches will be implemented daily between 0000UTC and 1500UTC to optimize runway utilization and enhance air traffic efficiency.

23.2 Procedures for simultaneous independent parallel approaches

23.2.1 To ensure safe operations between aircraft on parallel approaches, Normal Operating Zones (NOZs) are established for each extended runway centreline and a No Transgression Zone (NTZ) is established between the NOZs.

23.2.2 ATC will vector arriving flights into Singapore Changi Airport from the final waypoint of the respective STARs to the respective NOZs.

23.2.3 Within the NOZ, ATC shall provide a minimum vertical separation of 1,000ft or 3NM surveillance separation between pairs of aircraft until both aircraft are established on the ILS Localizer course.

23.2.4 ATC is not required to provide separation between aircraft on adjacent ILS Localizers and will monitor aircraft for deviation from the approach path.

23.2.5 Aircraft can expect to maintain altitude 3,500ft till Glide Path Interception for Runway 20R / 02L and 2,500ft till Glide Path Interception for Runway 20C / 02C. This is to ensure the necessary vertical separation prior to establishing on the respective ILS Localizer course.

23.2.6 Aircraft can expect the following radiotelephony phraseology when intercepting the ILS:

- a. to intercept the Localizer before clearing for ILS

“TURN LEFT (RIGHT) HEADING (three digits) MAINTAIN (altitude) REPORT ESTABLISHED ON THE LOCALIZER RUNWAY (number) LEFT (CENTRE / RIGHT)”

followed by ...

“MAINTAIN (altitude), CLEARED FOR ILS APPROACH RUNWAY (number) LEFT (CENTRE/RIGHT)”

or

- b. to intercept ILS

“TURN LEFT (RIGHT) HEADING (three digits) MAINTAIN (altitude) CLEARED FOR ILS APPROACH RUNWAY (number) LEFT (CENTRE / RIGHT)”

23.2.7 Aircraft can expect to maintain speed 180kt at base turn or earlier till 8NM from touchdown.

23.3 Break-out manoeuvre

23.3.1 When an aircraft is observed to have not established on the appropriate Localizer course or deviated from its course towards the NTZ, ATC will instruct the aircraft to return immediately to the correct Localizer course with the following radiotelephony phraseology:

“YOU HAVE CROSSED THE LOCALIZER, TURN LEFT (or RIGHT) IMMEDIATELY AND RETURN TO THE LOCALIZER”

or

“TURN LEFT (or RIGHT) TO RETURN TO LOCALIZER COURSE”

23.3.2 When ATC observed aircraft to be penetrating or will penetrate the NTZ, ATC will instruct the aircraft on the adjacent Localizer course to alter course to avoid the deviating aircraft with the following radiotelephony phraseology:

“TRAFFIC ALERT, TURN LEFT (or RIGHT) IMMEDIATELY HEADING (degrees), CLIMB AND MAINTAIN (altitude)”

23.4 Pilot notification and conditions for operations

23.4.1 Simultaneous approaches to parallel runways operation will be broadcasted on ATIS during the active period.

23.4.2 Simultaneous approaches to the parallel runways will be suspended in the event of adverse weather or any other conditions that may affect the safe conduct of such approaches to the parallel runways.

WSSS AD 2.23 ADDITIONAL INFORMATION

1 BIRD CONCENTRATION IN THE VICINITY OF THE AIRPORT

- 1.1 A number of varieties of birds are found in Singapore throughout the year. The larger birds commonly found in Singapore Changi Airport include the following:
- cattle egrets (weighing approximately 300g each)
 - grey herons (weighing approximately 500g each)
 - brahmyny kites (weighing approximately 600g each)
- 1.2 There could be an increase in bird activities during the migratory months of September to April. During this period, migratory birds may use the airport as their feeding ground.
- 1.3 Handheld laser device, long range acoustic device and alternating amplified bird cries of distress are used for bird dispersal within Singapore Changi Airport.

WSSS AD 2.24 CHARTS RELATED TO AN AERODROME

Location of RWY 02R/20L in relation to RWY 02L/20R and RWY 02C/20C	AD-2-WSSS-ADC-1
Aerodrome Chart - ICAO	AD-2-WSSS-ADC-2
Aerodrome Advisory Chart - ICAO	AD-2-WSSS-ADC-3
Aerodrome Obstacle Chart - ICAO - TYPE A - RWY 02L/20R	AD-2-WSSS-AOC-1
Aerodrome Obstacle Chart - ICAO - TYPE A - RWY 02C/20C	AD-2-WSSS-AOC-2
Aerodrome Obstacle Chart - ICAO - TYPE B	AD-2-WSSS-AOC-3
Precision Approach Terrain Chart - ICAO - RWY 02L	AD-2-WSSS-PATC-1
Precision Approach Terrain Chart - ICAO - RWY 20C	AD-2-WSSS-PATC-2
RNAV_(GNSS) SIDs and STARs - Introduction	
RNAV _(GNSS) SID - RWY 02L/20R - ANITO 6E/ANITO 6F	AD-2-WSSS-SID-1 to 1.1
RNAV _(GNSS) SID - RWY 02C/20C - ANITO 6A / ANITO 6B	AD-2-WSSS-SID-2 to 2.1
RNAV _(GNSS) SID - RWY 02L/20R - ADMIM 1E / ADMIM 2F	AD-2-WSSS-SID-3 to 3.1
RNAV _(GNSS) SID - RWY 02C/20C - ADMIM 1A / ADMIM 2B	AD-2-WSSS-SID-4 to 4.1
RNAV _(GNSS) SID - RWY 02L/20R - TOMAN 2E / TOMAN 3F	AD-2-WSSS-SID-5 to 5.1
RNAV _(GNSS) SID - RWY 02C/20C - TOMAN 2A / TOMAN 3B	AD-2-WSSS-SID-6 to 6.1
RNAV _(GNSS) SID - RWY 02L/20R - BAVUS 1E / BAVUS 2F	AD-2-WSSS-SID-7 to 7.1
RNAV _(GNSS) SID - RWY 02C/20C - BAVUS 1A / BAVUS 2B	AD-2-WSSS-SID-8 to 8.1
RNAV _(GNSS) SID - RWY 02L/20R - AROSO 2E / AROSO 3F	AD-2-WSSS-SID-9 to 9.1
RNAV _(GNSS) SID - RWY 02L/20R - MASBO 2E / MASBO 3F	AD-2-WSSS-SID-10 to 10.1
RNAV _(GNSS) SID - RWY 02C/20C - AROSO 2A / AROSO 3B	AD-2-WSSS-SID-11 to 11.1
RNAV _(GNSS) SID - RWY 02C/20C - MASBO 2A / MASBO 3B	AD-2-WSSS-SID-12 to 12.1
RNAV _(GNSS) SID - RWY 02L/20R - MERSING 5E / MERSING 7F	AD-2-WSSS-SID-13 to 13.1
RNAV _(GNSS) SID - RWY 02C/20C - MERSING 5A / MERSING 7B	AD-2-WSSS-SID-14 to 14.1
RNAV _(GNSS) SID - RWY 02C/20C - VENIX 1A / VENIX 2B	AD-2-WSSS-SID-15 to 15.1
RNAV _(GNSS) SID - RWY 02L/20R - VENIX 1E / VENIX 2F	AD-2-WSSS-SID-16 to 16.1
RNAV _(GNSS) SID - RWY 02C/20C - KADAR 1A / KADAR 2B	AD-2-WSSS-SID-17 to 17.1
RNAV _(GNSS) SID - RWY 02L/20R - KADAR 1E / KADAR 2F	AD-2-WSSS-SID-18 to 18.1
RNAV _(GNSS) STAR - RWY 02L/02C - ARAMA 1A	AD-2-WSSS-STAR-1 to 1.1
RNAV _(GNSS) STAR - RWY 02L/02C - ASUNA 1A	AD-2-WSSS-STAR-2 to 2.1
RNAV _(GNSS) STAR - RWY 20R/20C - ARAMA 1B	AD-2-WSSS-STAR-3 to 3.1
RNAV _(GNSS) STAR - RWY 20R/20C - ASUNA 1B	AD-2-WSSS-STAR-4 to 4.1
RNAV _(GNSS) STAR - RWY 02L/02C - KARTO 1A	AD-2-WSSS-STAR-5 to 5.1
RNAV _(GNSS) STAR - RWY 02L/02C - OBDOS 1A	AD-2-WSSS-STAR-6 to 6.1
RNAV _(GNSS) STAR - RWY 20R/20C - KARTO 1B	AD-2-WSSS-STAR-7 to 7.1
RNAV _(GNSS) STAR - RWY 20R/20C - OBDOS 1B	AD-2-WSSS-STAR-8 to 8.1
RNAV _(GNSS) STAR - RWY 20R/20C - LELIB 3B	AD-2-WSSS-STAR-9 to 9.1
RNAV _(GNSS) STAR - RWY 02L/02C - MABAL 2A	AD-2-WSSS-STAR-11 to 11.1
RNAV _(GNSS) STAR - RWY 20R/20C - MABAL 2B	AD-2-WSSS-STAR-13 to 13.1
RNAV _(GNSS) STAR - RWY 02L - LEBAR 2A	AD-2-WSSS-STAR-14 to 14.1
RNAV _(GNSS) STAR - RWY 20R - LEBAR 2B	AD-2-WSSS-STAR-15 to 15.1
RNAV _(GNSS) STAR - RWY 02L/02C - REPOV 1A	AD-2-WSSS-STAR-16 to 16.1
RNAV _(GNSS) STAR - RWY 02L/02C - SURGA 1A	AD-2-WSSS-STAR-17 to 17.1
RNAV _(GNSS) STAR - RWY 20R/20C - REPOV 1B	AD-2-WSSS-STAR-18 to 18.1
RNAV _(GNSS) STAR - RWY 20R/20C - SURGA 1B	AD-2-WSSS-STAR-19 to 19.1
RNAV _(GNSS) STAR - RWY 02L/02C - ELALO 1A	AD-2-WSSS-STAR-20 to 20.1
RNAV _(GNSS) STAR - RWY 20R/20C - ELALO 1B	AD-2-WSSS-STAR-21 to 21.1
Instrument Approach Chart - ICAO - RWY 02L - ICW ILS/DME	AD-2-WSSS-IAC-1
Instrument Approach Chart - ICAO - RWY 02C - ICE ILS/DME	AD-2-WSSS-IAC-2
Instrument Approach Chart - ICAO - RWY 20R - ICH ILS/DME	AD-2-WSSS-IAC-5
Instrument Approach Chart - ICAO - RWY 20C - ICC ILS/DME	AD-2-WSSS-IAC-6
Instrument Approach Chart - ICAO - RWY 20C - VTK DVOR/DME	AD-2-WSSS-IAC-7
Instrument Approach Chart - ICAO - RWY 02L - RNAV _(GNSS)	AD-2-WSSS-IAC-9
Instrument Approach Chart - ICAO - RWY 02C - RNAV _(GNSS)	AD-2-WSSS-IAC-10
Instrument Approach Chart - ICAO - RWY 20R - RNAV _(GNSS)	AD-2-WSSS-IAC-11
Instrument Approach Chart - ICAO - RWY 20C - RNAV _(GNSS)	AD-2-WSSS-IAC-12
Visual Approach Chart - ICAO	AD-2-WSSS-VAC-1

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AERODROME CHART - ICAO

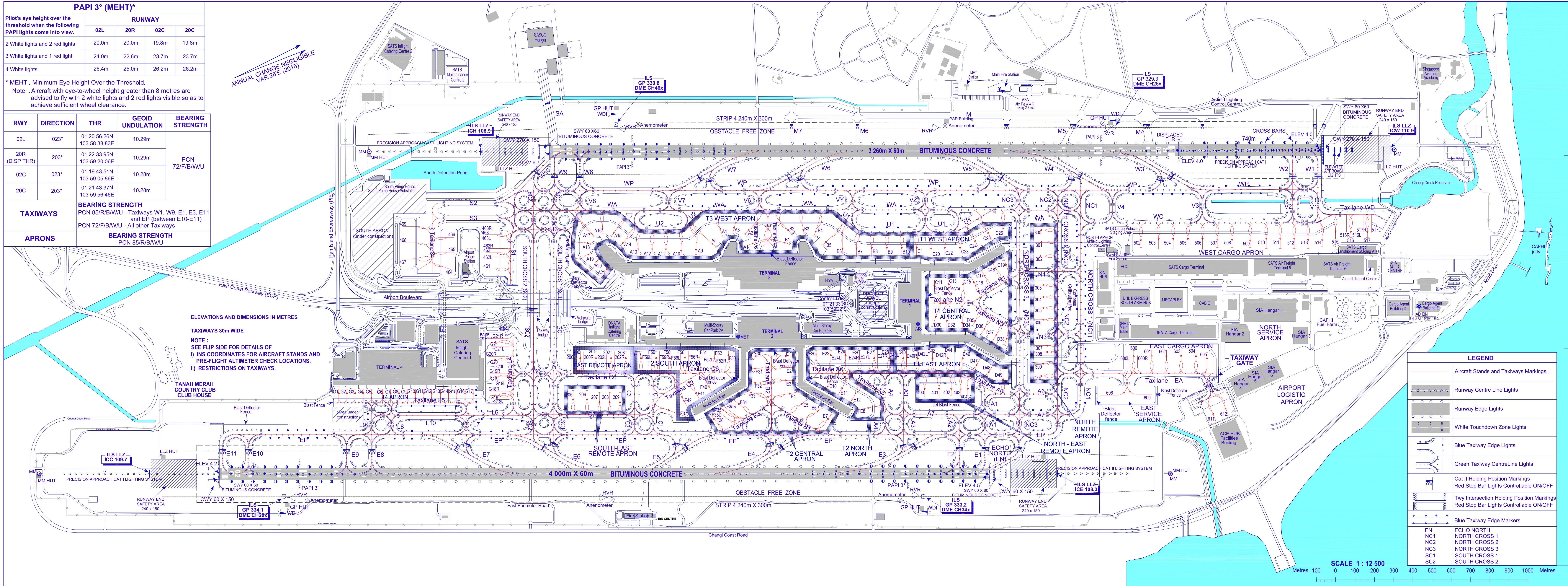
01° 21' 33"N
103°59' 22"E

AERODROME ELEVATION 6.66m

TWR 118.6 / 118.25
GND 124.3 / 121.85 / 121.725
DELIVERY 121.65

RAMP TWR 122.55 (GMC 4 EAST)
GND 125.65 (GMC 4 WEST)

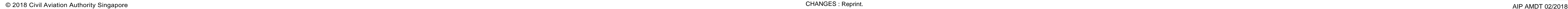
SINGAPORE/SINGAPORE CHANGI



INS COORDINATES FOR AIRCRAFT STANDS AND PRE-FLIGHT ALTIMETER CHECK LOCATIONS

LOCATION	STAND NR	NORTH LAT	EAST LONG	ELEVATION	
T3 WEST APRON	A1	01 21 21.52	103 59 06.25	4.75m (15.58ft)	
	A2	01 21 21.75	103 59 04.00	4.65m (15.26ft)	
	A3	01 21 19.86	103 59 02.79	4.66m (15.29ft)	
	A4	01 21 17.61	103 59 02.54	4.79m (15.72ft)	
	A5	01 21 15.50	103 59 03.62	4.86m (15.94ft)	
	A9	01 21 12.56	103 59 03.65	5.02m (16.47ft)	
	A10	01 21 10.34	103 59 02.40	5.04m (16.54ft)	
	A11	01 21 07.93	103 59 01.41	5.25m (17.22ft)	
	A12	01 21 05.76	103 59 00.49	5.38m (17.65ft)	
	A13	01 21 03.59	103 58 59.58	5.48m (17.98ft)	
	A14	01 21 01.66	103 58 57.59	5.57m (18.27ft)	
	A15	01 21 00.77	103 58 55.41	5.46m (17.91ft)	
	A16	01 20 59.27	103 58 54.20	5.51m (18.08ft)	
	A17	01 20 57.25	103 58 54.06	5.23m (17.16ft)	
	A18	01 20 55.87	103 58 55.25	5.37m (17.62ft)	
	A19	01 20 55.26	103 58 57.13	5.40m (17.72ft)	
	A20	01 20 56.09	103 58 58.83	5.45m (17.88ft)	
	A21	01 20 57.10	103 59 00.80	5.49m (18.01ft)	
	T3 NORTH APRON	B1	01 21 26.86	103 59 08.37	4.82m (15.81ft)
		B2	01 21 28.18	103 59 06.82	4.68m (15.35ft)
		B3	01 21 30.33	103 59 07.30	4.65m (15.26ft)
B4		01 21 32.03	103 59 08.60	4.75m (15.58ft)	
B5		01 21 32.98	103 59 10.89	4.80m (15.75ft)	
B6		01 21 35.15	103 59 13.16	4.96m (16.27ft)	
B7		01 21 37.65	103 59 13.93	4.97m (16.31ft)	
B8		01 21 39.94	103 59 15.20	5.09m (16.70ft)	
B9		01 21 42.19	103 59 16.16	5.13m (16.83ft)	
B10		01 21 44.47	103 59 17.12	5.10m (16.73ft)	
T1 WEST APRON	C1	01 21 46.75	103 59 18.08	5.09m (16.70ft)	
	C20	01 21 48.83	103 59 19.23	5.08m (16.67ft)	
	C22	01 21 51.00	103 59 20.13	5.15m (16.90ft)	
	C23	01 21 53.56	103 59 20.77	5.08m (16.67ft)	
	C24	01 21 56.54	103 59 20.97	4.89m (16.04ft)	
	C25	01 21 59.12	103 59 20.59	4.99m (16.37ft)	
	C26	01 22 01.48	103 59 20.76	5.01m (16.44ft)	
	T1 CENTRAL APRON	C11	01 21 47.42	103 59 23.82	5.07m (16.63ft)
C13		01 21 49.64	103 59 24.75	5.05m (16.57ft)	
C15		01 21 51.90	103 59 25.71	5.05m (16.57ft)	
C16		01 21 53.63	103 59 26.42	4.91m (16.11ft)	
C17		01 21 55.63	103 59 26.07	5.03m (16.50ft)	
C18		01 21 57.86	103 59 25.75	4.99m (16.37ft)	
C19		01 21 59.79	103 59 25.63	4.95m (16.24ft)	
T1 EAST APRON		D40	01 21 38.13	103 59 32.89	5.11m (16.77ft)
		D40L	01 21 37.38	103 59 32.83	5.09m (16.70ft)
	D40R	01 21 38.77	103 59 32.84	5.13m (16.83ft)	
	D41	01 21 40.30	103 59 33.81	5.07m (16.63ft)	
	D42	01 21 42.77	103 59 34.58	5.15m (16.89ft)	
	D42L	01 21 42.00	103 59 34.47	5.12m (16.79ft)	
	D42R	01 21 43.45	103 59 34.44	5.21m (17.09ft)	
	D44	01 21 44.97	103 59 35.44	5.14m (16.86ft)	
T2 NORTH APRON	E8	01 21 27.99	103 59 38.45	4.68m (15.35ft)	
	E10	01 21 24.15	103 59 32.67	4.71m (15.45ft)	
	E11	01 21 25.57	103 59 34.37	4.78m (15.68ft)	
	E12	01 21 27.20	103 59 36.42	4.75m (15.58ft)	
	E20	01 21 24.36	103 59 27.08	5.04m (16.54ft)	
	E22	01 21 26.64	103 59 28.04	5.07m (16.63ft)	
	E24	01 21 29.01	103 59 29.06	5.09m (16.70ft)	
	E24L	01 21 28.32	103 59 28.77	5.10m (16.73ft)	
	E24R	01 21 29.53	103 59 29.28	5.08m (16.67ft)	
	E26	01 21 31.19	103 59 29.96	5.08m (16.67ft)	
T2 SOUTH APRON	F37	01 20 59.83	103 59 27.87	4.75m (15.58ft)	
	F40	01 21 05.62	103 59 25.34	4.85m (15.91ft)	
	F41	01 21 03.19	103 59 25.58	4.82m (15.81ft)	
	F42	01 21 00.61	103 59 25.96	4.72m (15.49ft)	
	F50	01 21 10.69	103 59 21.32	5.03m (16.50ft)	
	F52	01 21 08.51	103 59 20.40	5.11m (16.77ft)	
	F52L	01 21 07.82	103 59 20.11	5.16m (16.93ft)	
	F52R	01 21 09.04	103 59 20.62	5.08m (16.67ft)	
	F54	01 21 06.14	103 59 19.40	5.22m (17.13ft)	
	F56	01 21 03.96	103 59 18.48	5.30m (17.39ft)	
EAST REMOTE APRON	200	01 20 47.83	103 59 11.67	6.23m (20.44ft)	
	200L	01 20 46.91	103 59 11.92	6.29m (20.64ft)	
	200R	01 20 48.35	103 59 11.89	6.18m (20.28ft)	
	201	01 20 49.99	103 59 12.62	5.96m (19.55ft)	
	202	01 20 52.34	103 59 13.57	5.94m (19.49ft)	
	202L	01 20 51.65	103 59 13.28	5.76m (18.90ft)	
	202R	01 20 52.87	103 59 13.79	5.73m (18.80ft)	
	203	01 20 54.52	103 59 14.47	5.92m (19.42ft)	
	SOUTH-EAST REMOTE APRON	205	01 20 43.91	103 59 17.06	4.77m (15.65ft)
		206	01 20 46.08	103 59 17.98	4.76m (15.62ft)
207		01 20 47.91	103 59 18.88	4.74m (15.55ft)	
208		01 20 49.48	103 59 19.54	4.74m (15.55ft)	
209		01 20 51.06	103 59 20.21	4.75m (15.58ft)	
NORTH REMOTE APRON		300	01 22 06.95	103 59 22.67	4.53m (14.86ft)
		301	01 22 06.41	103 59 24.69	4.93m (16.17ft)
		302	01 22 05.21	103 59 26.75	4.97m (16.31ft)
	303	01 22 03.55	103 59 31.40	5.32m (17.45ft)	
	304	01 22 02.84	103 59 33.06	5.35m (17.55ft)	
	305	01 22 02.14	103 59 34.71	5.30m (17.39ft)	
	306	01 22 01.41	103 59 36.42	5.16m (16.93ft)	
	307	01 21 59.39	103 59 40.36	5.16m (16.93ft)	
	308	01 21 58.96	103 59 41.35	5.10m (16.73ft)	
	309	01 21 58.52	103 59 43.17	5.06m (16.60ft)	
NORTH-EAST REMOTE APRON	400	01 21 38.71	103 59 40.14	4.31m (14.14ft)	
	401	01 21 40.98	103 59 41.10	4.31m (14.14ft)	
	402	01 21 42.85	103 59 41.89	4.30m (14.11ft)	
	403	01 21 44.37	103 59 42.53	4.29m (14.07ft)	
WEST CARGO APRON	502	01 22 22.23	103 59 31.62	4.35m (14.27ft)	
	503	01 22 24.98	103 59 32.78	4.29m (14.07ft)	
	504	01 22 27.26	103 59 33.74	4.29m (14.07ft)	
	505	01 22 29.54	103 59 34.70	4.32m (14.17ft)	
	506	01 22 31.81	103 59 35.66	4.38m (14.37ft)	
	507	01 22 34.11	103 59 36.64	4.36m (14.30ft)	
	508	01 22 36.41	103 59 37.61	4.29m (14.07ft)	
	509	01 22 39.12	103 59 38.76	4.09m (13.42ft)	
	510	01 22 41.37	103 59 40.18	4.19m (13.75ft)	
	511	01 22 43.54	103 59 41.09	4.22m (13.85ft)	
SOUTH APRON	F30	01 21 14.71	103 59 23.33	4.92m (16.14ft)	
	F31	01 21 13.87	103 59 25.30	4.91m (16.11ft)	
	F32	01 21 13.03	103 59 27.26	4.85m (15.91ft)	
	F33	01 21 11.30	103 59 28.54	4.91m (16.11ft)	
	F34	01 21 08.98	103 59 28.96	4.92m (16.14ft)	
	F35	01 21 06.60	103 59 29.55	4.91m (16.11ft)	
	F35L	01 21 06.06	103 59 30.13	4.74m (15.55ft)	
	F35R	01 21 06.96	103 59 29.05	5.04m (16.54ft)	
	F36	01 21 04.34	103 59 29.67	4.82m (15.81ft)	
	T4 APRON	G1	01 20 07.58	103 59 00.97	3.95m (12.96ft)
G2		01 20 08.88	103 59 01.52	3.95m (12.96ft)	
G3		01 20 10.18	103 59 02.07	3.95m (12.96ft)	
G4		01 20 11.48	103 59 02.07	3.94m (12.93ft)	
G5		01 20 12.77	103 59 03.17	3.94m (12.93ft)	
G6		01 20 14.49	103 59 03.89	3.93m (12.89ft)	
G7		01 20 15.70	103 59 04.57	3.89m (12.76ft)	
G8		01 20 17.01	103 59 05.12	3.85m (12.63ft)	
G9		01 20 18.31	103 59 05.67	3.85m (12.63ft)	
G10		01 20 19.60	103 59 06.22	3.86m (12.66ft)	
T2 CENTRAL APRON	E1	01 21 20.02	103 59 25.58	4.91m (16.11ft)	
	E2	01 21 19.28	103 59 27.30	4.90m (16.08ft)	
	E3	01 21 18.44	103 59 29.27	4.82m (15.81ft)</	

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