

RNAV_(GNSS) SIDS AND STARS

1. INTRODUCTION

- 1.1 The RNAV_(GNSS) SIDs and STARS are designed in accordance with the ICAO RNAV_(GNSS) Departure and Arrival criteria as stipulated in the ICAO PANS-OPS (Doc 8168) Volume II.
- 1.2 For RNAV_(GNSS) SIDs and STARS operations, the aircraft shall be GNSS-equipped and the navigation systems shall meet ICAO RNP-1 standard of accuracy, or equivalent, such as JAA TGL 10 or FAA AC 90-96A Appendix 2 - Precision Area Navigation (P-RNAV).
- 1.3 To avoid proliferation of SIDs and STARS, the basic RNAV SIDs and STARS have been modified to follow similar tracks as the RNAV_(GNSS) SIDs and STARS using the same set of SIDs and STARS identification.
- 1.4 Operators/pilots who are not approved to fly the RNAV_(GNSS) SIDs and STARS shall fly the alternate basic RNAV SIDs and STARS or expect radar vectors from ATC.

2. ARRIVALS

- 2.1 STARS are presented in diagrammatic and textual format on a chart which comprises two main elements:
 - a) A TRANSITION route; and
 - b) An ARRIVAL route.
- 2.2 A TRANSITION starts at a waypoint on the ATS route and then requires VOR/DME or RNAV tracking to position the aircraft for the ARRIVAL route.
- 2.3 All arriving aircraft are required to follow the appropriate TRANSITION and ARRIVAL routes. The TRANSITION routes are as follows:

ATS Route	Transition	Transition Route	RNAV STAR
B469 (southbound to Singapore) L642 N892	BIKTA VEPLI MABAL	BIKTA-PIBAP-PASPU VEPLI-VINIL-PIBAP-PASPU MABAL-KILOT-VINIL-PIBAP-PASPU	PASPU ARRIVAL
A464 (southbound to Singapore) A576 (southbound to Singapore) R469	ARAMA REKOP no transition	ARAMA-BOBAG REKOP-BOBAG no transition	BOBAG ARRIVAL
G579	no transition	no transition	REMES ARRIVAL
A464 (northbound to Singapore) A576 (northbound to Singapore) W36	ATVIX AKTOD GOBIK	ATVIX-IKIMA-IBULA-LAVAX AKTOD-IKIMA-IBULA-LAVAX GOBIK-IKIMA-IBULA-LAVAX	LAVAX ARRIVAL
M767 / G580 B348 / G580 G580	TOMAN	TOMAN-KARTO-KEXAS-LAVAX	

Note: Aircraft landing at Singapore Changi Airport operating on N891, M753 and L642 shall flight plan only on L642 after ENREP.

- 2.4 Additional elements on the STAR chart include the following:
- a) *Vertical restrictions*, designed to contain aircraft in controlled airspace and to separate aircraft from obstacles and to avoid, to the degree possible, conflict with departing traffic.
 - b) *Speed restrictions*, designed for flow control purposes.
 - c) *Minimum safe altitude (MSA)* within 25NM of VTK and SJ DVOR/DME. The MSA provides a minimum of 1000ft vertical clearance within 5NM of any obstacle.
- 2.5 Arrivals to Singapore Changi Airport can expect radar vectors to intercept the localizer for an ILS approach after the initial approach fix on the RNAV STARs.
- 2.6 STARs shall be issued by ATC in the following order:
- a) ARRIVAL identifier;
 - b) TRANSITION identifier;
 - c) Runway-in-use;
 - d) An assigned level

Example:

<Callsign>cleared to Singapore via PASPU 1A ARRIVAL, VEPLI TRANSITION, Runway 02, maintain / descend to flight level one five zero.

3. DEPARTURES

- 3.1 All departing aircraft will be cleared on the appropriate RNAV_(GNSS) SID.
- 3.2 Operators are to note that RNAV_(GNSS) SIDs VENTU 1A and 1B will be assigned to departures from Singapore Changi Airport that flight plan to destinations south of Singapore on A576, A464 and W36.

There will be 3 Transitions as shown below:

ATS Route	Transition	Transition Route	RNAV SID
A464 (southbound from Singapore)	KIKOR	VENTU-KIKOR	VENTU DEPARTURE
A576 (southbound from Singapore)	SANOS	VENTU-SANOS	
W36	GOBIK	VENTU-GOBIK	

- 3.3 A Transition will be issued by ATC in conjunction with the RNAV_(GNSS) SID, for example a departure from Singapore to Brisbane via airway A464 will read as follows:

Example:

<Callsign> cleared to Brisbane via VENTU 1A departure Transition KIKOR, airway A464, flight plan route, maintain FL330, squawk alfa 2234 on departure.

4. TRANSITION

- 4.1 Aircraft may be radar vectored off a Transition / RNAV SID / RNAV STAR. Such aircraft will subsequently be given an instruction to intercept the appropriate Transition / RNAV SID / RNAV STAR.

5. VERTICAL AND SPEED RESTRICTIONS

- 5.1 Pilots shall comply with an ATC assigned level. Pilots shall also adhere to the vertical and speed restrictions depicted on the cleared Transition and RNAV_(GNSS) SIDs / 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 Transition and RNAV_(GNSS) SIDs / STARs.

6. OPERATORS' PROCEDURES

- 6.1 The operator shall ensure that in-flight procedures, crew manuals and training programmes are established in accordance with RNAV requirements.
- 6.2 Pilots shall inform ATC when on-board equipment does not meet the requirements of RNAV. Pilots can then expect radar vector from ATC.

COORDINATES OF SID/STAR WAYPOINTS (WGS84 DATUM)

Name	Latitude	Longitude	Radius/Distance from VTK	Radius/Distance from SJ
AKOMA	014522N	1035443E	VTK R-342.0 / D21.4	SJ R-006.2 / D32.0
AKTOD	002448S	1055935E	VTK R-132.7 / D161.1	SJ R-127.2 / D161.4
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
ASUNA	005948N	1030954E	VTK R-244.1 / D57.3	SJ R-252.0 / D43.6
ATVIX	000224N	1061453E	VTK R-121.5 / D157.0	SJ R-116.1 / D160.3
BIDUS	013554N	1035755E	VTK R-326.0 / D13.2	SJ R-006.9 / D22.6
BIKTA	024337N	1034308E	VTK R-346.9 / D80.4	SJ R-355.0 / D90.2
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
DOBLU	010347N	1041315E	VTK R-150.4 / D24.2	SJ R-113.4 / D24.0
DOKTA	012606N	1041040E	VTK R-083.0 / D9.4	SJ R-057.0 / D23.2
DOSNO	004757N	1041409E	VTK R-160.8 / D39.0	SJ R-137.8 / D34.1
DOVAN	011938N	1041249E	VTK R-114.6 / D12.7	SJ R-073.9 / D22.5
DUNAL	010138N	1035808E	VTK R-187.9 / D23.4	SJ R-149.4 / D13.5
GOBIK	000000N	1080606E	VTK R-109.0 / D259.3	SJ R-106.0 / D265.5
HOSBA	011948N	1042418E	VTK R-102.5 / D23.6	SJ R-079.0 / D33.7
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
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
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
KIBOL	025229N	1042805E	VTK R-017.1 / D91.2	SJ R-020.5 / D105.3
KIKOR	002244S	1070524E	VTK R-022.0 / D104.5	SJ R-116.2 / D216.7
KILOT	030217N	1044023E	VTK R-022.0 / D104.5	SJ R-024.4 / D119.0
KK (KONG KONG)	013118N	1035924E	VTK R-343.1 / D6.6	SJ R-024.6 / D19.6
LAVAX	010950N	1042714E	VTK R-120.1 / D30.0	SJ R-095.5 / D36.2
LELIB	012729N	1032450E	VTK R-274.0 / D36.6	SJ R-298.0 / D30.0
MABAL	032826N	1051236E	VTK R-030.1 / D142.1	SJ R-031.2 / D157.2
NITAD	013257N	1040154E	VTK R-004.1 / D8.0	SJ R-028.7 / D22.2
NYLON	013657N	1040624E	VTK R-023.0 / D13.0	SJ R-032.9 / D30.0
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
PIMOK	012648N	1032008E	VTK R-272.6 / D41.3	SJ R-293.2 / D33.9
POSUB	012725N	1040748E	VTK R-069.0 / D6.9	SJ R-049.8 / D21.7
REKOP	013306N	1030521E	VTK R-278.3 / D56.6	SJ R-293.1 / D50.0
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
RUTOT	011453N	1041948E	VTK R-118.4 / D21.0	SJ R-087.0 / D28.6
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
SABUG	011554N	1040312E	VTK R-168.2 / D9.2	SJ R-078.1 / D12.2
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
SANOS	004204S	1061901E	VTK R-132.5 / D187.1	SJ R-127.8 / D187.4
SJ (SINJON)	011321N	1035115E	-	-
SUDPO	011731N	1035808E	VTK R-203.4 / D8.0	SJ R-059.0 / D8.0
SUNVA	011756N	1035722E	VTK R-209.7 / D8.0	SJ R-053.3 / D7.6
SUSIN	011229N	1035808E	VTK R-194.5 / D12.8	SJ R-097.2 / D6.9
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
VENTU	000548N	1050648E	VTK R-140.2 / D102.5	SJ R-131.6 / D101.2
VEPLI	035223N	1040542E	VTK R-001.7 / D146.8	SJ R-005.2 / D158.9
VINIL	025500N	1040618E	VTK R-003.2 / D89.8	SJ R-008.5 / D102.3
VJR	014348N	1033718E	VTK R-308.0 / D30.5	SJ R-335.2 / D33.4
VMR	022318N	1035218E	VTK R-351.2 / D58.8	SJ R-000.9 / D69.6
VPK	032259N	1032524E	VTK R-343.0 / D122.9	SJ R-348.7 / D131.6
VTK (TEKONG)	012455N	1040120E	-	-