Australian Government
Civil Aviation Safety Authority

Baro-VNAV ground validation

Presented by Steven Kreusser (Aviation Safety Inspector)

Regulatory Context

Civil Aviation Safety Regulations (CASR) – Part 173

→ Establishes requirements for Certified Procedure Designer

→ Establishes requirements for Procedure Design Verification

→ Establishes requirements for Procedure Design Validation

Manual of Standards (MOS) – Part 173
(currently under review)

→ Establishes standards for compliance with CASR 173

→ Establishes standards for Procedure Design Validation

Regulatory Context – CASR 173

Civil Aviation Safety Regulations (CASR) – Part 173

→ Establishes requirements for Procedure Design Verification

173.090 Verification of terminal instrument flight procedures

(1) A certified designer must establish procedures for verifying terminal instrument procedures that it is authorised to design under the designer's procedure design certificate or on which the designer is authorised to carry on design work.

(2) The verification procedures:

(a) must provide for 2 qualified designers to check independently the design of each terminal instrument flight procedure designed, or on which design work is carried on, under the certified designer's procedure design certificate; and

(b) must provide for one of those checks to be made by a qualified designer who did not carry on the design work concerned.

Regulatory Context – CASR 173

Civil Aviation Safety Regulations (CASR) – Part 173

→ Establishes requirements for Procedure Design Validation

173.095 Validation of terminal instrument flight procedures

(1) A certified designer must ensure that each terminal instrument flight procedure designed under the designer's procedure design certificate is validated by a CASA pilot in accordance with any applicable standards set out in the Manual of Standards.

(2) In this regulation:

CASA pilot means a pilot:

(a) who is an officer of CASA; and

(b) who meets the standards set out in the Manual of Standards for carrying out a validation flight check of a terminal instrument flight procedure.

validation flight check has the same meaning as in the Manual of Standards.

Regulatory Context – MOS 173

Manual of Standards (MOS) – Part 173
(currently under review)

→ Establishes standards for Procedure Design Validation

7.1.1 Overview

7.1.1.1 Flight validation is required for:

(a) instrument approach procedures;

(b) revised instrument approach procedures where the final course has been re-aligned by 3° or more.

7.1.1.2 Validation of an instrument flight procedure comprises:

(a) a review of the draft procedures from an operational perspective conducted by the validation pilot; and

(b) a validation flight check.

7.1.1.3 The process of instrument approach procedure design focuses on those controlling obstacles that affect the procedure. This focus is facilitated through the use of various obstacle and terrain databases. The purpose of flight validation is to verify database information, to check all obstacles (including the identification of any unforeseen obstacles) that affect the safety of the procedure, and to assess the 'flyability' of the procedure.

Regulatory Context – MOS 173

Manual of Standards (MOS) – Part 173
(currently under review)

→ Establishes standards for Flight Validation Pilots

7.1.24 Pilots

7.1.24.1 The standard for the qualifications and experience of Pilots-in-Command of instrument flight procedure validation flights is:

(a) ATPL;

(b) current command instrument rating, endorsed for the type of procedure under validation;

(c) relevant experience in multi-engine IFR procedures;

(d) completion of a course in PANS-OPS procedures design principles;

(e) a thorough knowledge of ICAO PANS-OPS procedures design principles and methods;

(f) adequate knowledge of the design of procedures in accordance with the MOS;

(g) satisfactory completion of a flight validation course conducted by CASA and possession of a letter of competency issued by CASA certifying his/her competence to conduct flight validation;

(h) satisfactory completion of a course in aerodrome lighting and visual approach slope guidance systems conducted by CASA and possession of a letter of competency issued by CASA certifying his/her competence to conduct aerodrome lighting inspections;

(i) a low flying permit issued in accordance with CAR 157(4)(b); and

(j) completion of a procedure flight validation flight within the previous year.

CASA Validation Process

Manual of Standards (MOS) – Part 173
(currently under review)

→ Application for validation

6.1.2.2 On completion of a design, a certified designer must apply to CASA for flight validation.

Note The address for applications is anaa.corro@casa.gov.au or Air Navigation, Airspace and Aerodromes Manager, Civil Aviation Safety Authority, GPO Box 2005, Canberra, ACT 2601.

CASA Validation Documentation

Certified Designers required to submit the following Validation Documentation

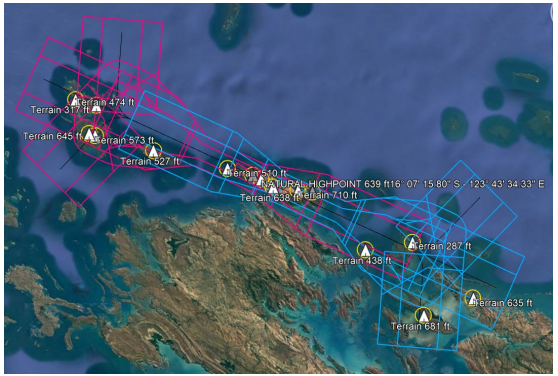
- ✓ Publication ready, draft instrument approach chart
- ✓ Recommended coding / waypoint information
- ✓ Procedure design calculations
- ✓ Flight validation form
- ✓ Controlling obstacles list
- ✓ Maps illustrating protection areas and controlling obstacles
- ✓ Google earth files of protection areas and controlling obstacles

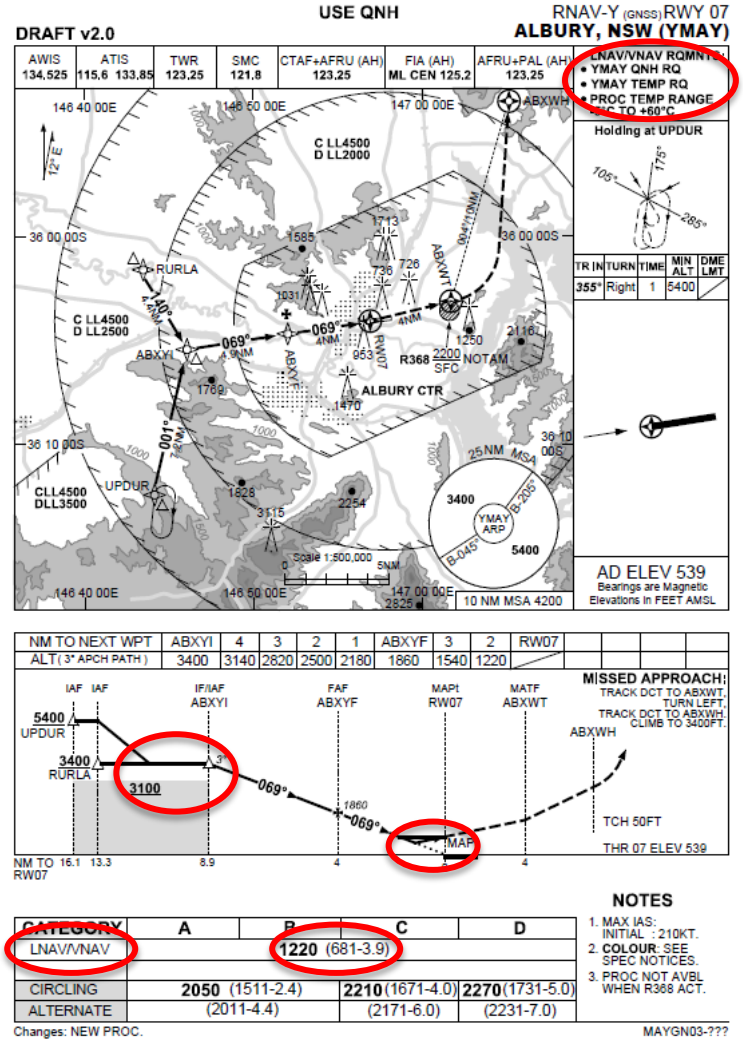
PROPOSED NAVIGATION DATABASE CODING TABLE

PATH DESCRIPTOR OR TERMINATOR	FIX TYPE (ID)	WAYPOINT IDENTIFIER (NAME)	FLYOVER	COURSE / TRACK °M (°T) - 000°	MAGNETIC VARIATION	DISTANCE (NM)	TIME (MIN)	TURN DIRECTION	ALTITUDE (FT)	SPEED (KT)	VPA / TCH (0.00/00)	NAVIGATION SPECIFICATION	RNP (NM)	ARC CENTRE ID (NAME)
TRANSITION														
IF	IAF	KLCWD	N		2 E	-	-	-	+2300	-210	-	RNP APCH	1	
TF	IF	KLCW1	N	043°M (045°T)	2 E	5.00	-	-	+2300	-	-	RNP APCH	1	
TRANSITION														
IF	IAF	KLCWE	N	-	2 E	-	-	-	+2300	-210	-	RNP APCH	1	
TF	IF	KLCW1	N	113°M (115°T)	2 E	5.00	-	-	+2300		-	RNP APCH	1	
TRANSITION														
IF	IAF	KLCWG	N	-	2 E	-	-	-	+2300	-210		RNP APCH	1	
TF	IF	KLCW1	N	183°M (185°T)	2 E	5.00	-	-	+2300			RNP APCH	1	
FINAL APPROACH														
IF	IF	KLCW1	N	-	2 E	-	-	-	+2300	-	-	RNP APCH	1	
TF	FAF	KLCWF	N	113°M (115°T)	2 E	5.00	-	-	+2200	-	-3.0	RNP APCH	1	
TF	MAPt	RW11	Y	113°M (115°T)	2 E	5.06	-	-	@587	-	-3.0	RNP APCH	0.3	
DF	MAHF	KLCWH	N		2 E	4.00	-	-	-	-	-	RNP APCH	1	
CA	-	-	-	113°M (115°T)	2 E	- -	-	-	+2300	-	-	RNP APCH	1	

WAYPOINTS INFORMATION - WGS84

Waypoint / Fix	Latitude	Longitude	Notes	Published Y / N
KLCWD	-16° 06' 38.00"	123° 30' 25.74"		N
KLCWE	-16° 00' 57.87"	123° 29' 21.34"		N
KLCWG	-15° 58' 03.18"	123° 34' 29.34"		N
KLCW1	-16° 03' 03.47"	123° 34' 04.48"		N
KLCWF	-16° 05' 08.96"	123° 30' 47.71"		N
RW11	-16° 07' 15.80"	123° 43 34.33"		N
KLCWH	-16° 08' 56.03"	123° 47' 21.07"		N





Draft Approach Chart

- LNAV/VNAV requirements
- Final descent to land
- DA depiction
- Appropriate DA
- LNAV/VNAV annotation

Recommended Coding

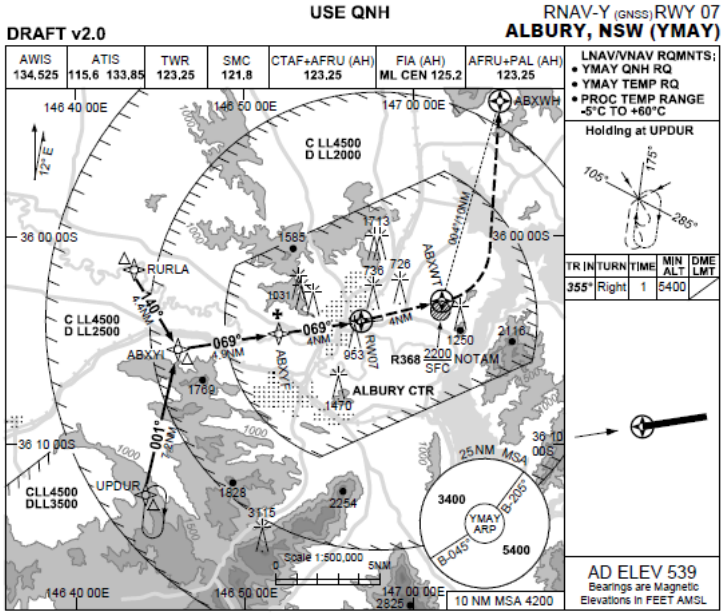
Aerodrome (ICAO)	YMAY
Procedure Name	RNAV-Y (GNSS) RWY 07
Effective Date	Draft v2.0
PBN Nav Spec	RNP-APCH

Airservices - Recommended Coding

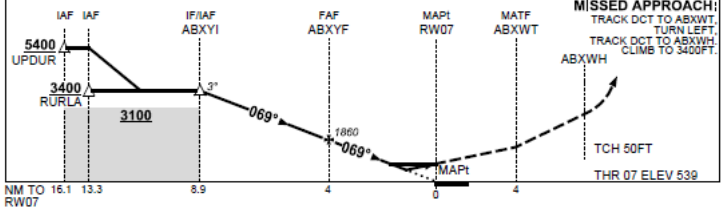
Sequence Number	Fix Identifier (WAYPOINT NAME)	Path Terminator	Flyover (Y, -)	Course °M	Course °T	Mag Var +°E / -°W	Turn Direction (L/R)	Altitude (FT) (+ / - / @)	Speed Constraint (KT) (+ / - / @)	Leg Distance (NM)	Time (MIN)	VPA (°)	TCH (FT)	Arc Centre Fix	Arc Radius (NM)	RNP Value
10	UPDUR	IF						+5400	-210							
20	ABXYI	TF		001	012.69	11.81		+3400		7.2						RNP APCH
10	RURLA	IF						+3400	-210							
20	ABXYI	TF		140	151.37	11.81		+3400		4.4						RNP APCH
10	ABXYI	IF						+3400								
20	ABXYF	TF		069	081.30	11.81		+1860		4.9		3.00				RNP APCH
30	RW07	TF	Y	069	081.30	11.81		589		4.0		3.00	50			RNP APCH
40	ABXWT	DF	Y							4.0						RNP APCH
50	ABXWH	DF					L	+3400								RNP APCH
Remarks																

- Path Terminators
- Altitudes
- Speeds
- VPA

Cross check!



NM TO NEXT WPT	ABXYI	4	3	2	1	ABXYF	3	2	RW07
ALT (3° APCH PATH)	3400	3140	2820	2500	2180	1860	1540	1220	



CATEGORY	A	B	C	D
LNAV/VNAV	1220 (681-3.9)			
CIRCLING	2050 (1511-2.4)		2210 (1671-4.0)	2270 (1731-5.0)
ALTERNATE	(2011-4.4)		(2171-6.0)	(2231-7.0)

NOTES

1. MAX IAS: INITIAL : 210KT.
2. **COLOUR**: SEE SPEC NOTICES.
3. PROC NOT AVBL WHEN R368 ACT.

Changes: NEW PROC.

MAYGN03-???

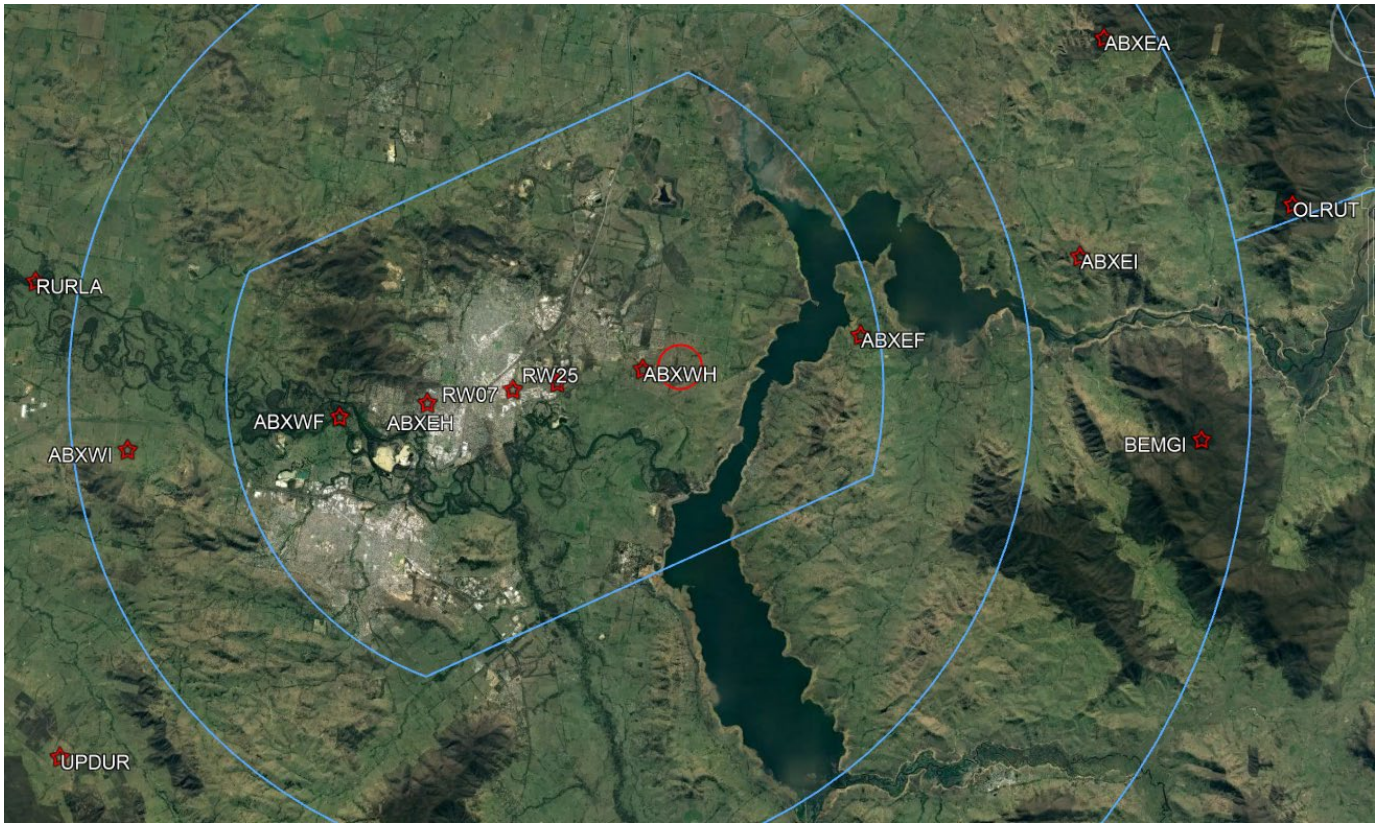
Aerodrome (ICAO)	YMAY
Procedure Name	RNAV-Y (GNSS) RWY 07
Effective Date	Draft v2.0
PBN Nav Spec	RNP-APCH

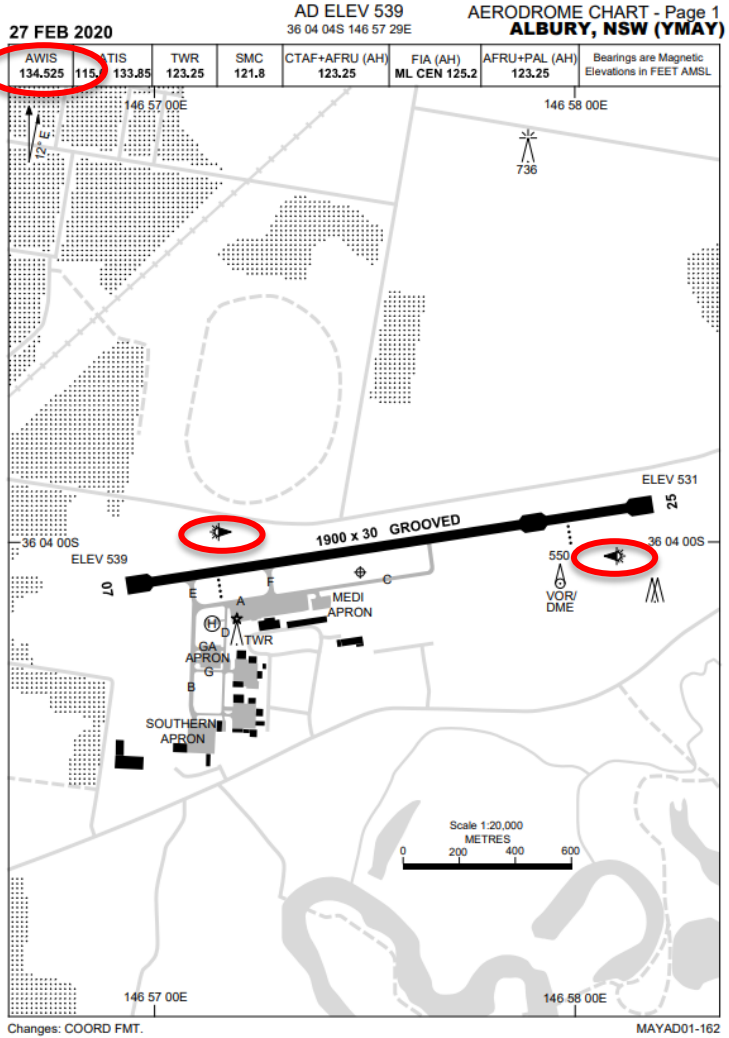
Airservices - Recommended Coding

Sequence Number	Fix Identifier (WAYPOINT NAME)	Path Terminator	Flyover (Y, -)	Course °M	Course °T	Mag Var +°E / -°W	Turn Direction (L/R)	Altitude (FT) (+, -, @)	Speed Constraint (KT) (+, -, @)	Leg Distance (NM)	Time (MIN)	VPA (°)	TCH (FT)	Arc Centre Fix	Arc Radius (NM)	RNP Value
10	UPDUR	IF						+5400	-210							
20	ABXYI	TF		001	012.69	11.81		+3400		7.2						RNP APCH
10	RURLA	IF						+3400	-210							
20	ABXYI	TF		140	151.37	11.81		+3400		4.4						RNP APCH
10	ABXYI	IF						+3400								
20	ABXYF	TF		069	081.30	11.81		+1860		4.9		3.00				RNP APCH
30	RW07	TF	Y	069	081.30	11.81		589		4.0		3.00	50			RNP APCH
40	ABXWT	DF	Y							4.0						RNP APCH
50	ABXWH	DF					L	+3400								RNP APCH
Remarks																

Approach Waypoints

UPDUR	S36 12 26.22	E146 44 08.05
RURLA	S36 01 35.98	E146 43 29.40
ABXWI	S36 05 26.52	E146 46 04.50
ABXWF	S36 04 41.79	E146 52 03.31
RW07	S36 04 05.07	E146 56 56.01
ABXWH	S36 03 37.40	E147 00 35.49
ABXEA	S35 56 04.23	E147 13 33.29
OLRUT	S35 59 51.00	E147 18 52.54
BEMGI	S36 05 12.46	E147 16 19.55
ABXEI	S36 01 02.92	E147 12 53.53
ABXEF	S36 02 50.79	E147 06 43.08
RW25	S36 03 55.62	E146 58 11.07
ABXEH	S36 04 23.22	E146 54 31.57





Aerodrome Infrastructure

- AWIS (Mandatory for Baro-VNAV)
- Wind Direction Indicator
- Registered or Certified

Threshold Coordinates

ALBURY	81.19	07	360405.07S	1465656.01E
ALBURY	261.18	25	360355.62S	1465811.07E

airservices

DESIGNATED AIRSPACE HANDBOOK

EFFECTIVE 05 NOV 2020

202011041600 UTC AIRAC

Compiled from data held by AIS at 21 MAY 2020

NEXT ISSUE EFFECTIVE DATE 17 JUNE 2021

IMPORTANT NOTICE

The information in this publication may be superseded by NOTAM. Consult NOTAM for latest information.

WGS84

The Horizontal Datum used in this document is the World Geodetic Datum 1984 (WGS84). The Vertical Datum is the Australian Height Datum (AHD).

Published under the authority of Airservices Australia in accordance with the requirements of AIP ENR 1.4 Sections 1 and 3, and GEN 3.2 Section 2, Manual of Air Traffic Services and the Air Standardisation Coordinating Committee

UPDUR	S36 12 26.22	E146 44 08.05
RURLA	S36 01 35.98	E146 43 29.40
ABXWI	S36 05 26.52	E146 46 04.50
ABXWF	S36 04 41.79	E146 52 03.31
RW07	S36 04 05.07	E146 56 56.01
ABXWH	S36 03 37.40	E147 00 35.49
ABXEA	S35 56 04.23	E147 13 33.29
OLRUT	S35 59 51.00	E147 18 52.54
BEMGI	S36 05 12.46	E147 16 19.55
ABXEI	S36 01 02.92	E147 12 53.53
ABXEF	S36 02 50.79	E147 06 43.08
RW25	S36 03 55.62	E146 58 11.07
ABXEH	S36 04 23.22	E146 54 31.57

Controlling Obstacles – Common Segments

AERODROME: ALBURY (YMAY) **ARP:** S 36 04 03.51 E 146 57 29.35 **AD ELEV:** 539

MAG VAR: 11.81°

	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
25nm MSA	MAY01	S/East	Mt Tawonga 1271 spot	164°	55.7	30.0	4333	984	5400	**4420**	36 33.03	147 07.54
	MAY02	N/West	Table Top Ridge 668m spot	024°	24.6	13.3	2364	984	3400	**2420**	35 51.88	147 04.01

	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
10nm MSA	MAY03	10 MSA	Baranduda Towers 3115ft	204°	22.5	12.2	3115	984	4200	**3220**	36 15.21	146 51.43

	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
Circling	MAY04	A/B	One Tree Hill 440m Contour	003°	5.3	2.8	1642	295	1950	**1660**	36 01.22	146 57.68
	MAY04	C	One Tree Hill 440m Contour	003°	5.3	2.8	1642	394	2110	**1720**	36 01.22	146 57.68
	MAY05	D	Terrain - 483m Peak	313°	9.3	5.0	1774	394	2170	**1780**	36 00.65	146 52.98

Runway Data			
Runway 07	**S 36 04.08**	**E 146 56.93**	**539ft**
Runway 25	**S 36 03.93**	**E 146 58.18**	**531ft**

AERODROME: ALBURY (YMAY)

RNAV (GNSS) RWY 07

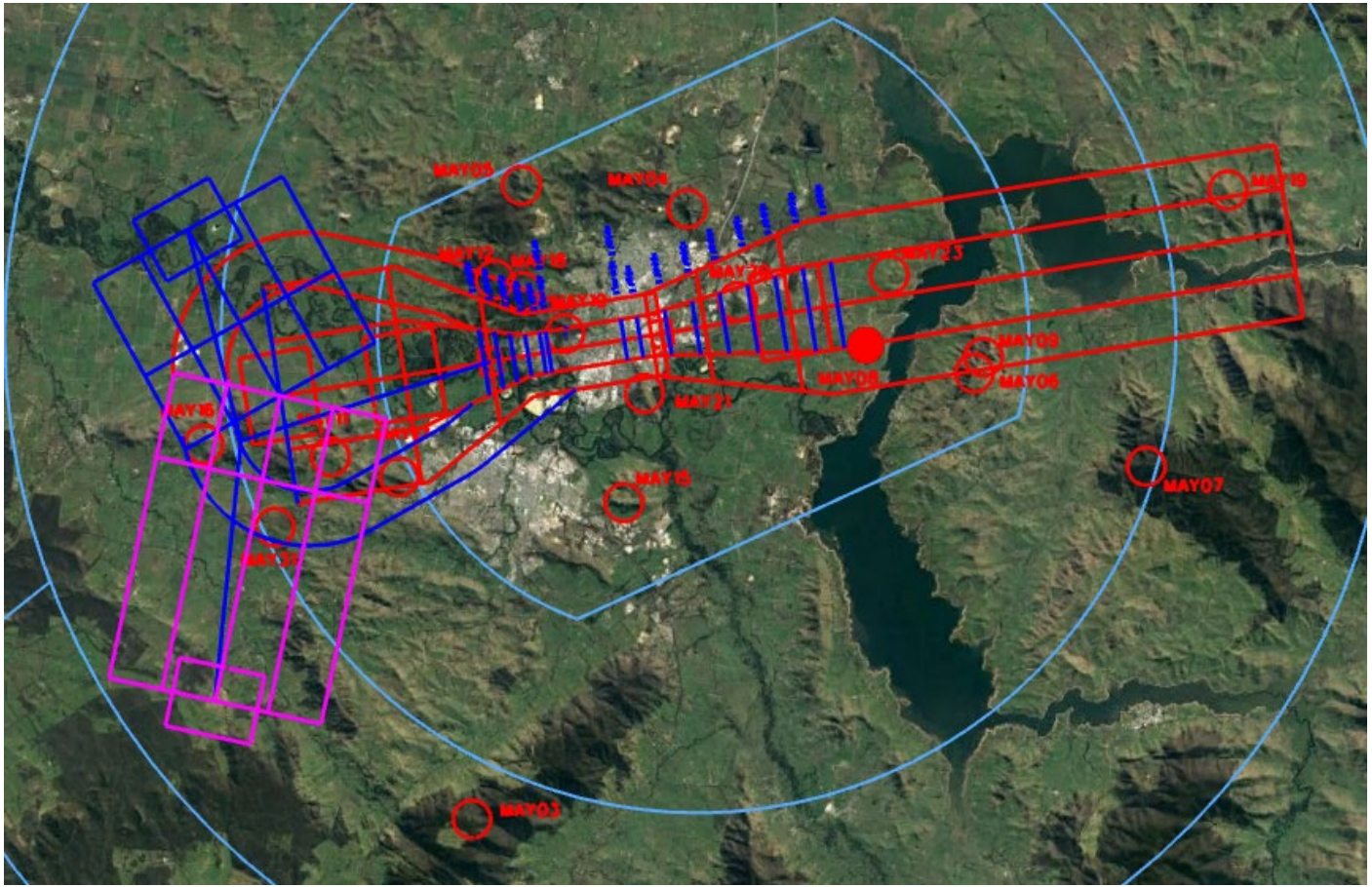
	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
Holding			Holding at 25nm MSA					984	5400	**4420**		
Initial	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
	MAY31	Right IAF	520m CONT	245°	19.2	10.38	1905	984	3100	**2120**	36 08.46	146 45.89
	MAY16		Mt Lady Franklin 546m	257°	20.9	11.30	1971	984	3100	**2120**	36 06.54	146 43.89
Intermediate	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
	MAY16		Mt Lady Franklin 546m	257°	20.9	11.30	1971	492	2500	**2010**	36 06.54	146 43.89
Final	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
	MAY10	LNAV	2019 Survey Obstacle - Tree	270°	4.90	2.65	1002	208	1210	**1010**	36 04.07	146 54.18
		VNAV	2019 Survey Obstacle - Haz Light	273°	5.00	2.70	1077	143	1220	**1080**		
				Start of Climb:				1.26	nm fm MAPt	**MAYW**		
Missed Approach	Serial	Segment	Description	BRG °T ARP	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
	MAY08	LNAV	380m Contour	094°	7.79	4.25	1446	164	1700	**1540**	36 04.39	147 02.72
		VNAV	Nil Signifant Obs					161	1220	**1060**		

	Basic MOC (164' or 98')	MAPT to SOC (nm)	MAPT to Validation SOC (nm)	MDA	ALT at Validation SOC	Rate of Climb	
	164	1.246	0.707	1210	964	2.5%	Approximate Position
VSS	*MDA*	*1210ft*	*MOC* *246ft*		*Altitude (MDA-MOC)*		SEE VOR 07

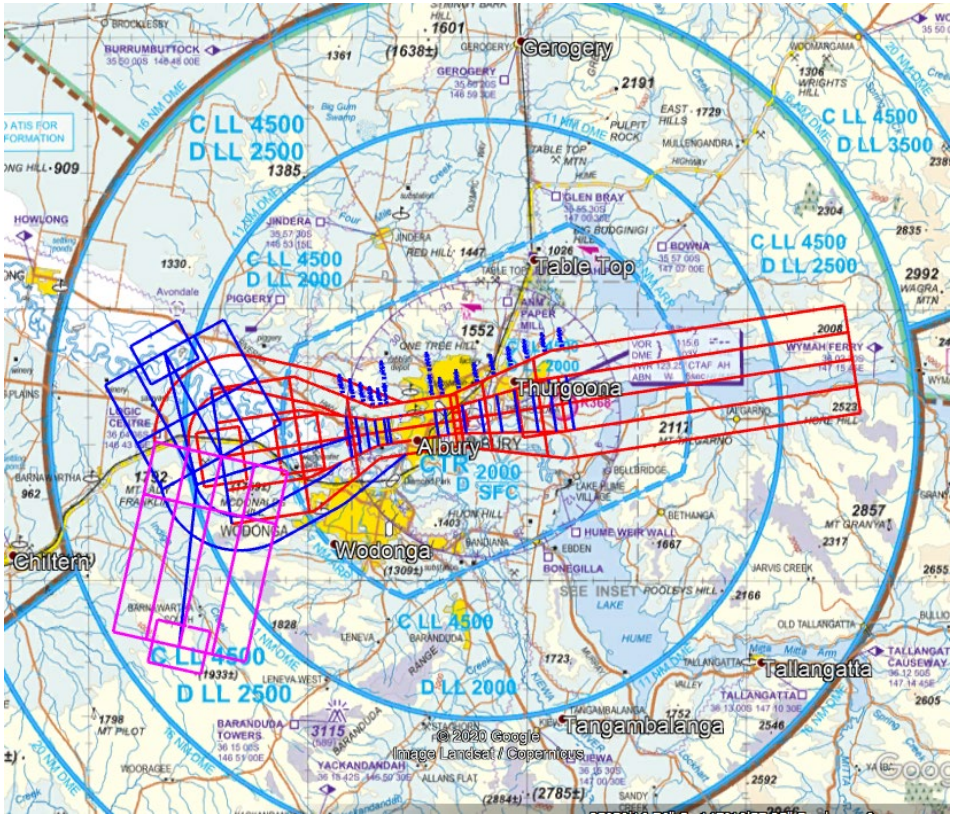
Waypoints						
UPDUR	RIGHT	36 12.44	146 44.13	36 12 26.22	146 44 08.05
RURLA	LEFT	36 01.60	146 43.49	36 01 35.98	146 43 29.40
MAYWI	INTERMED	36 06.46	146 44.95	36 06 27.89	146 44 56.94
MAYWF	FINAL	36 05.28	146 50.94	36 05 16.63	146 50 56.57
MAYWM	MISSED	36 04.08	146 56.93	36 04 05.07	146 56 56.01
MAYWT	TURN FIX	36 03.13	147 01.72	36 03 07.61	147 01 43.44
MAYWH	HOLD FIX	35 53.50	147 05.15	35 53 30.13	147 05 08.96

Controlling Obstacles Approach

Controlling Obstacles Approach



Airspace Containment



8.1.1.4 **Airspace Buffers.** Procedures within controlled airspace must be designed so that:

(a) horizontally:

(i) a 1 NM buffer is provided between the airspace boundary and the boundary of:

(A) for holding—the primary holding area;

(B) for non-precision approach segments—the primary area;

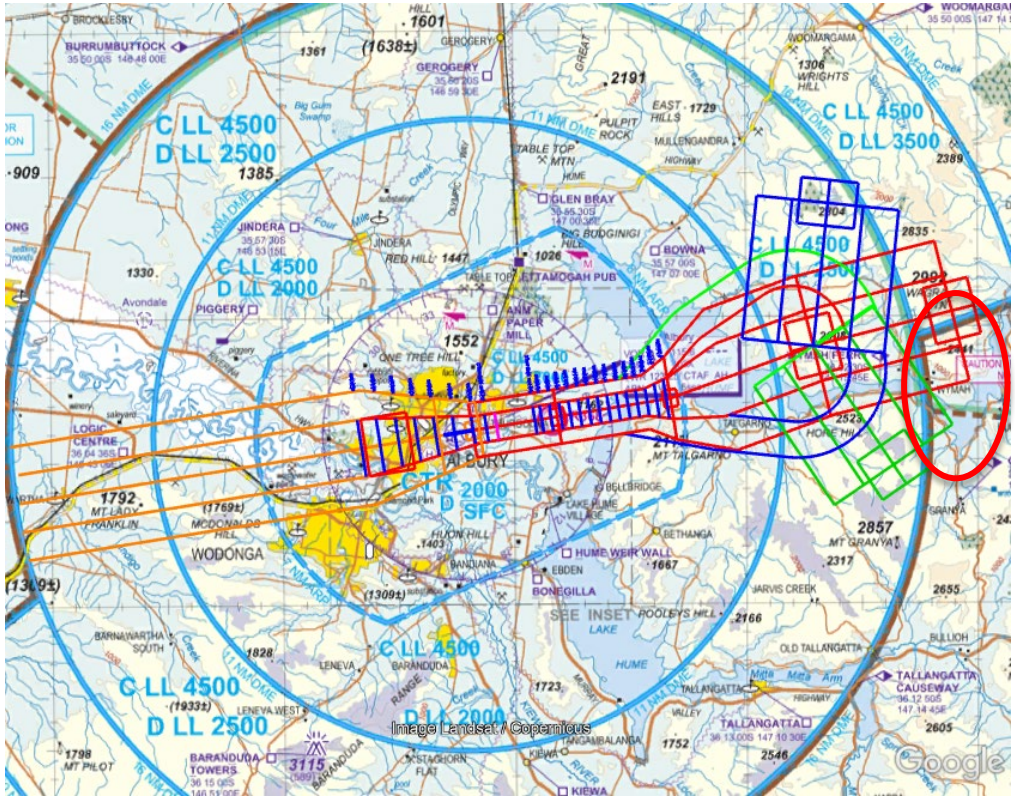
(C) for precision approach segments—the OAS W and X surfaces.

(b) vertically:

(i) A 500 ft buffer is provided between the nominal aircraft position and an airspace boundary set for VFR level; or

(ii) A 1,000 ft buffer is provided between the nominal aircraft position and an airspace boundary set at a useable IFR level;

Airspace Containment



Not Contained within controlled airspace!

Desktop Validation - Checklist

Australian Government
Civil Aviation Safety Authority

PRE VALIDATION CHECKLIST			
Date:	07 Feb 20	Validation Type:	New Procedures
Organisation:	Airservices	Evaluator Name:	Sophie Joshua 02 6217 1753
Procedure Title:	RNAV-Y(GNSS) RWY 07 RNAV-Z(GNSS) RWY 25	PBN Nav Spec:	RNP APCH Baro VNAV
Location:	Albury	Runways:	RWY 07 RWY 25
Airport:	Albury (YMAY)	RM8:	F19/7590-3

PRE-FLIGHT VALIDATION	SAT	UNSAT
1. IFP package forms, charts, and maps	✓	
2. Data verification (e.g. aerodrome/heliport, aeronautical, obstacle, ARINC coding)	✓	
3. Location of the controlling obstacles	✓	
4. Graphical depiction (Chart) correctness and complexity	✓	
5. Intended use and special requirements	✓	
6. Overall design is practical, complete, clear and safe	✓	
7. Consider impact on the procedure of differences to standard design criteria	✓	
8. Segment lengths and descent gradients allow for deceleration/ configuration	✓	
9. Comparison of FMS navigation database with the IFP design, coding, and relevant charting information	For sim validation	
10. Flight Validation Reports available	✓	
11. Charting of notification of cold/warm temperature limits	✓	
12. Overlapping secondary aerodrome procedures	✓	
13. Airspace containment	See comments	
14. Prohibited, Restricted or Danger Areas	✓	
15. Runway strip width – OCH adjustment	✓	
16. IWDIs/AWIB	✓	
17. Runway edge lighting	✓	
18. Aerodrome Registered/Certified	Certified	
19. TAF available	✓	
20. Aerodrome QNH & temp available	✓	

REMARKS:

13. No changes to current airspace containment.

Australian Government
Civil Aviation Safety Authority

Chart Version	Changes from current LNAV	Issues	Validation
RNAV-Y RWY 07 DRAFT V1.0	• New procedure, modified from RNAV-Z 07 (Final appraoch track now runway aligned)	• Nil	• Full validation of final approach track required.
RNAV-Z RWY 25 DRAFT V1.0	•Final approach track rotated 5° to be runway aligned. • VNAV minima added • Mapt move to THLD renamed	• Nil	• Full validation of final appraoch track required.

Simulator evaluation required	YES	NO
Flight evaluation required	YES	NO
SATISFACTORY FOR FLIGHT VALIDATION		~~UNSATISFACTORY FOR FLIGHT VALIDATION~~

EVALUATOR SIGNATURE: 10 Feb 2020

Thank You