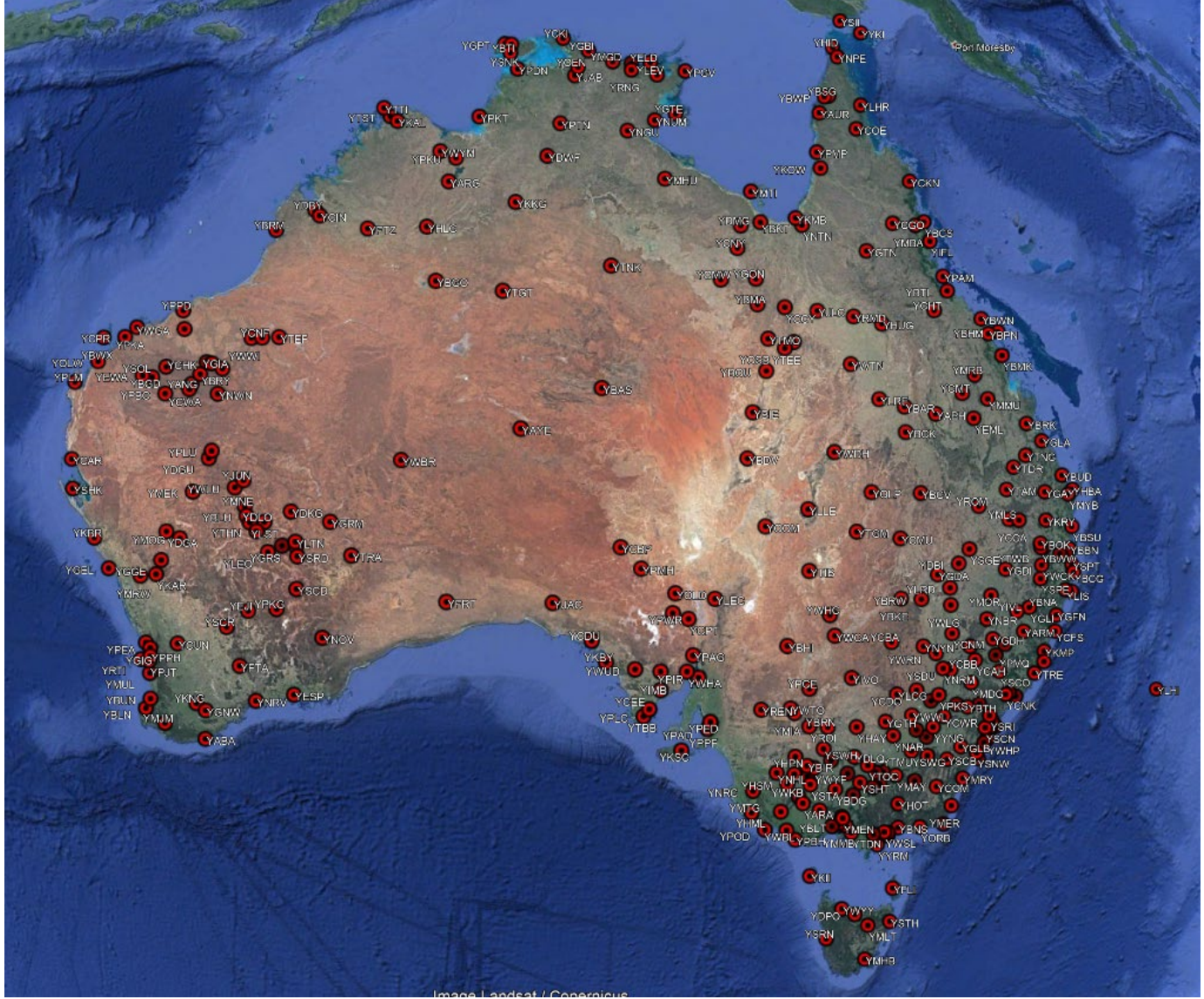
Australian Government
Civil Aviation Safety Authority

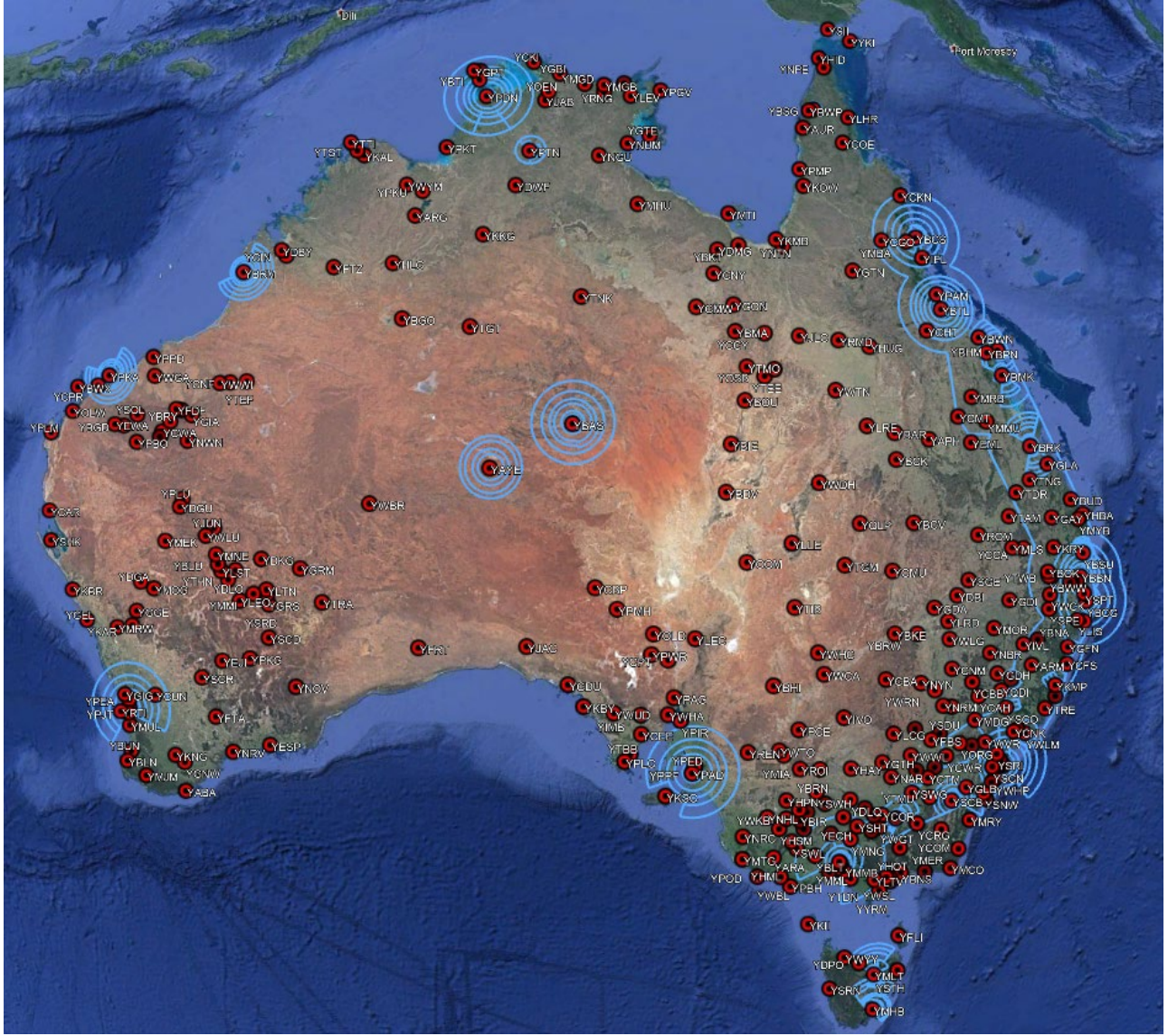
Baro-VNAV flight validation

Presented by Steven Kreusser (Aviation Safety Inspector)

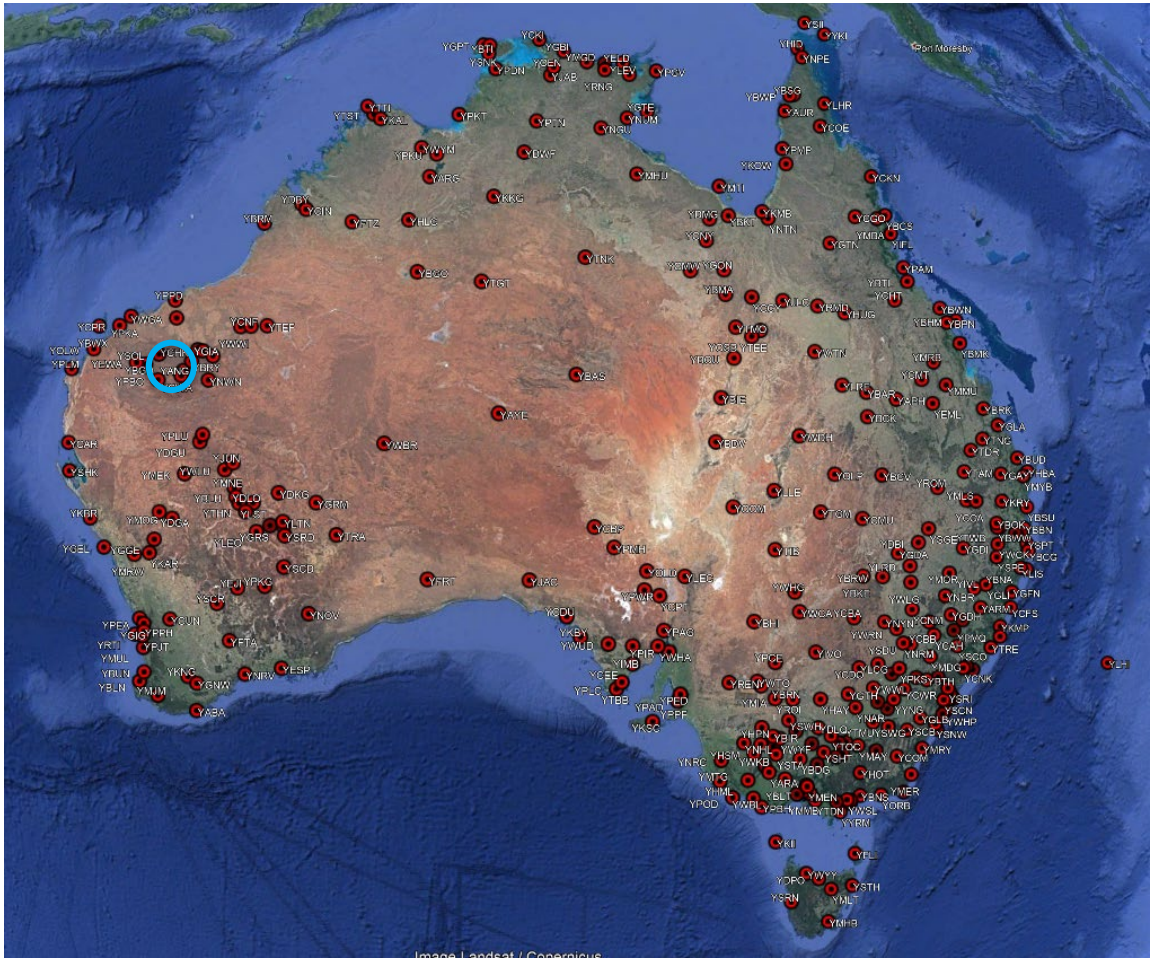
Registered Aerodromes



Controlled Airspace

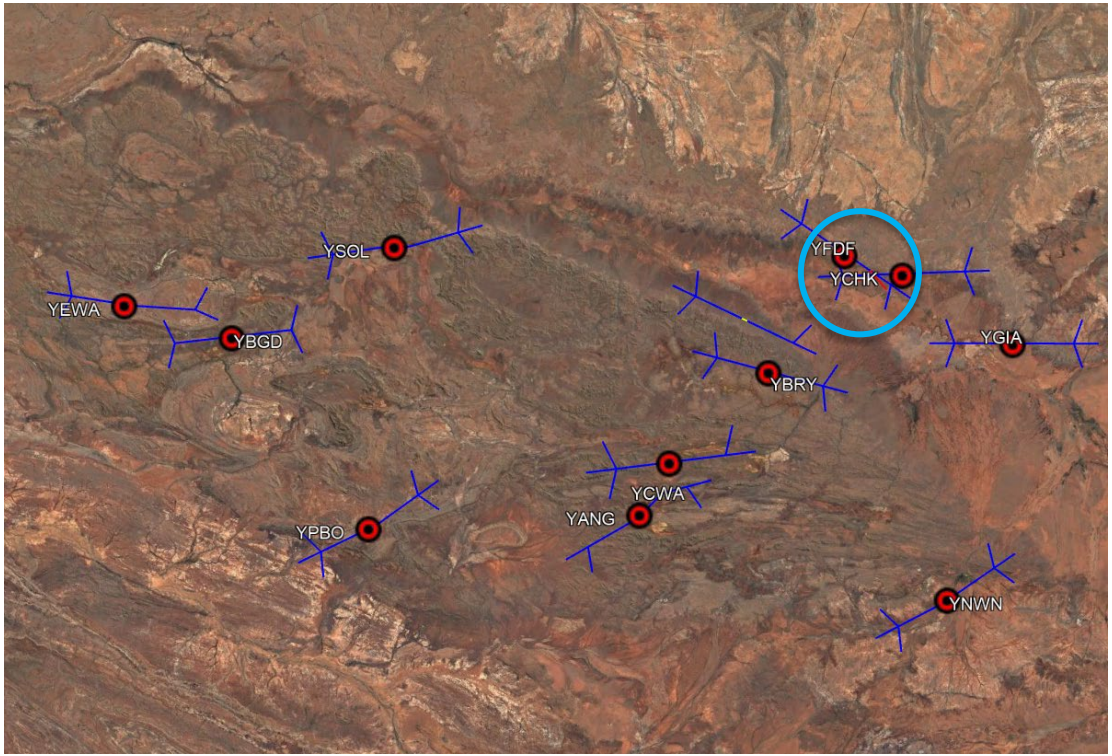


Flight Validation – Why?



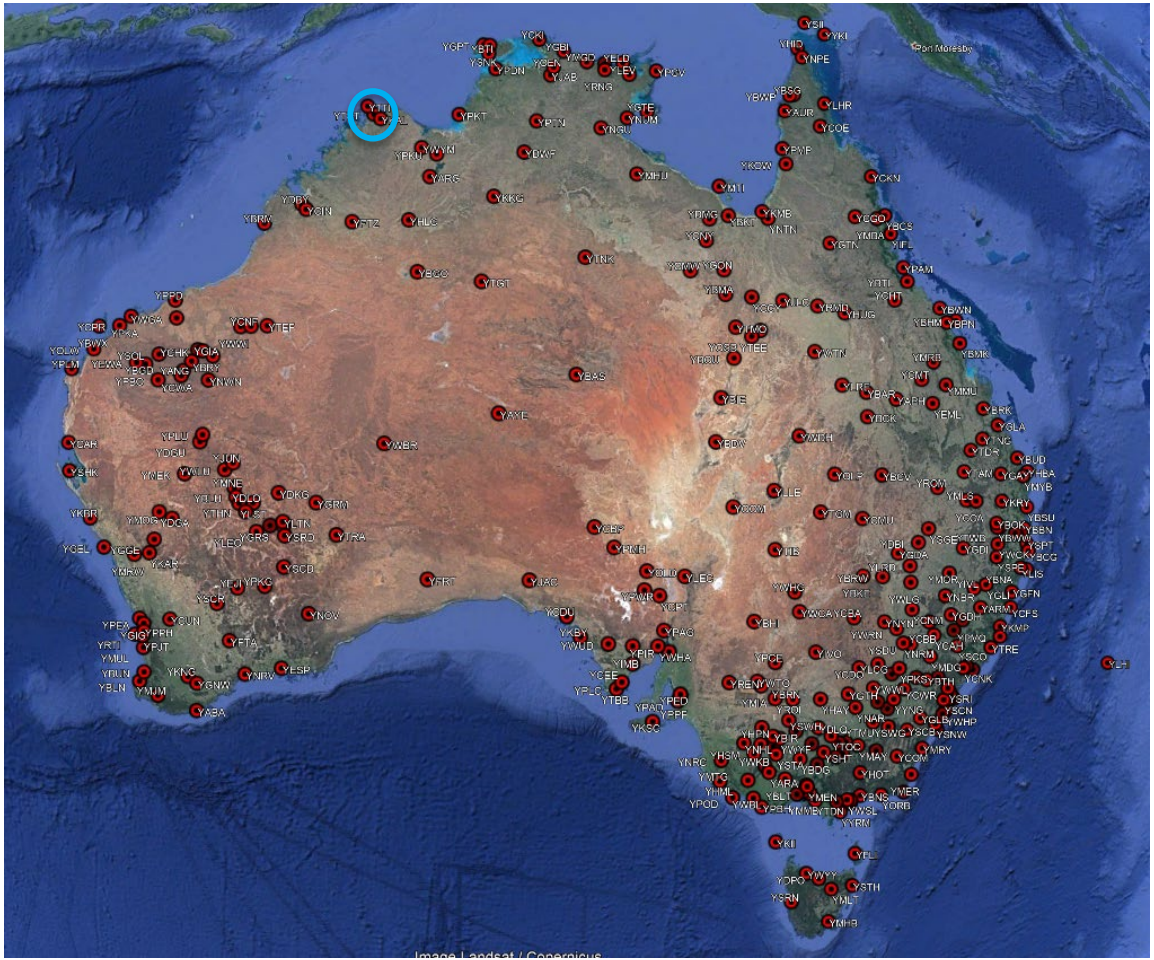
- Lack of ICAO compliant obstacle data - no eTOD
- Lack of mature AIM process
- Aerodrome remoteness
- Airspace/Approach complexity
- Flyability

Airspace / Approach complexity



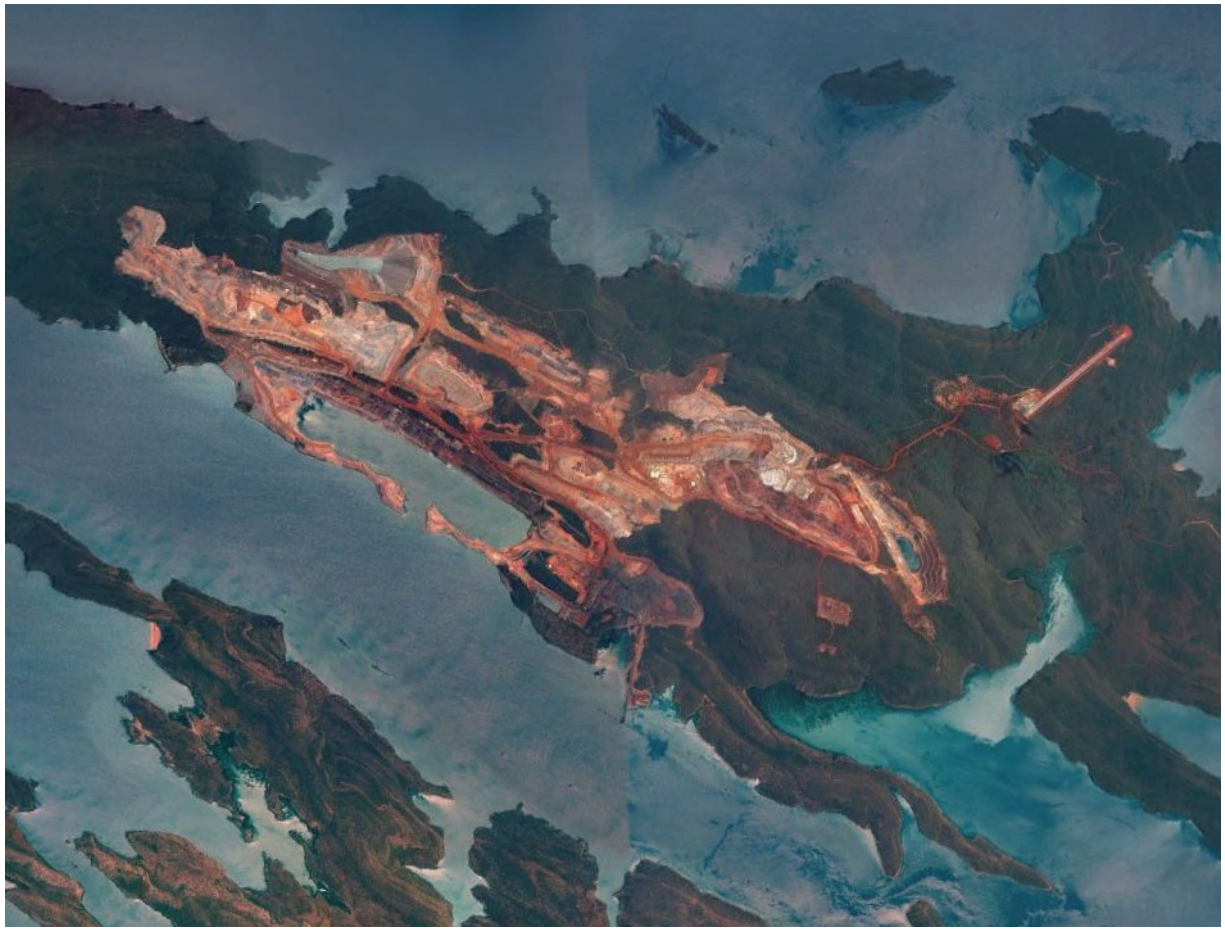
- All OCTA – no airspace
- 12 aerodromes
- 200nm across
- Procedures designed to be separated. Not always possible.
- Exemptions required

Flight Validation – Koolan Island



- New runway
- Runway surface extracted from surrounding mine
- Detailed topographic information not available
- LNAV + LNAV/VNAV

Flight Validation – Koolan Island



Flight Validation – Koolan Island

Flight Validation – Koolan Island

What information did we have?
Aerodrome survey

Koolan Island Central - Aerodrome Survey — Date 26/06/2020

Position 160733S 1234405E — Elevation 538 FT

Note ARP may vary slightly to ERSA due to rounding.

Runway Details	Dimensions	2100 m x 30 m		Slope	0.34% down to E		Surface	Sealed
	Levels TKOF 11	RWY END	156.396		TKOF 29 RWY END	163.637		
		RWS END	155.866		RWS END	163.418		

Declared Distances

RWY	TORA	TODA	ASDA	LDA
11	2100	2160 (1.87%)	2100	2100
29	2100	2160 (1.2%)	2100	2100

Supplementary Take-Off Distances

RWY	1.6%	1.9%	2.2%	2.5%	3.3%	5.0%
11	2076	NA	NA	NA	NA	NA
29	NA	NA	NA	NA	NA	NA

Survey Specs

Code 3 Non-Instrument

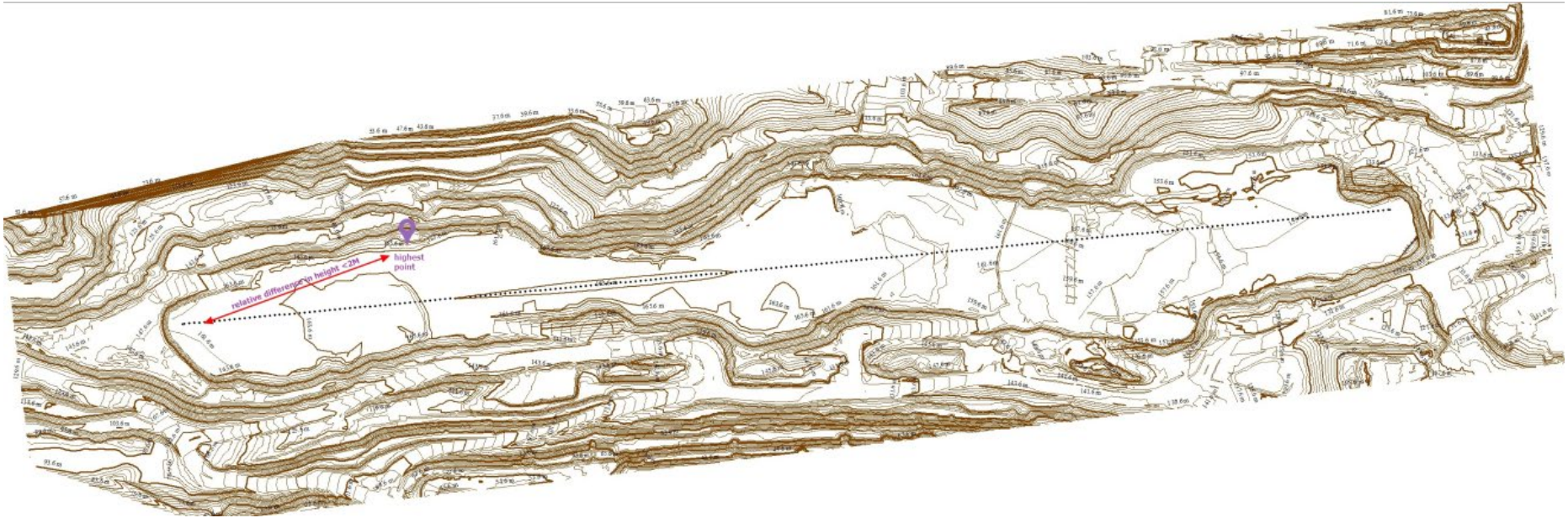
Take-Off SFC		Approach SFC	
Inner Edge	180 m	Inner Edge	150 m
Dist FM THR	60 m	Dist FM THR	60 m
Divergence	12.5%	Divergence	10%
Final Width	1800 m	1st Sect Slope	3.33%
Length	15000 m	1st Sect Length	3000 m

Obstacle Information

TKOF RWY	Object No	Description	DIST OUT	HT ABV CWY	OBST GRAD	OBST RL	DIST FM SOT	OFFSET	Comment
11	1	Tree	2249.56 m	26.27 m	1.16%	182.67 m	4409.56 m	417.61 mL	Outside TKOF SFC
11	2	Tree	570.83 m	8.31 m	1.45%	164.71 m	2730.83 m	49.77 mR	
11	3	Tree	566.35 m	8.65 m	1.52%	165.05 m	2726.35 m	43.24 mR	
11	4	Tree	592.11 m	10.75 m	1.81%	167.14 m	2752.11 m	102.98 mR	
11	5	Tree	587.19 m	11.02 m	1.87%	167.41 m	2747.19 m	132.68 mR	Critical Object
11	6	Tree	607.49 m	11.16 m	1.83%	167.55 m	2767.49 m	133.56 mR	
11	7	Tree	489.63 m	9.19 m	1.87%	165.59 m	2649.63 m	186.64 mR	Outside TKOF SFC
11	8	Dome	913.83 m	9.88 m	1.08%	166.28 m	3073.83 m	73.4 mR	
11	9	Dome Antenna	924.86 m	11.63 m	1.25%	168.02 m	3084.86 m	68.1 mR	
29	No Objects Surveyed								

Note: No datum, or threshold coordinates

What information did we have?
Lidar topographic survey



Note: No vertical or horizontal datum

Conclusion – Flight Validation required

Typically we use C-441 conquest

Conclusion – Flight Validation required

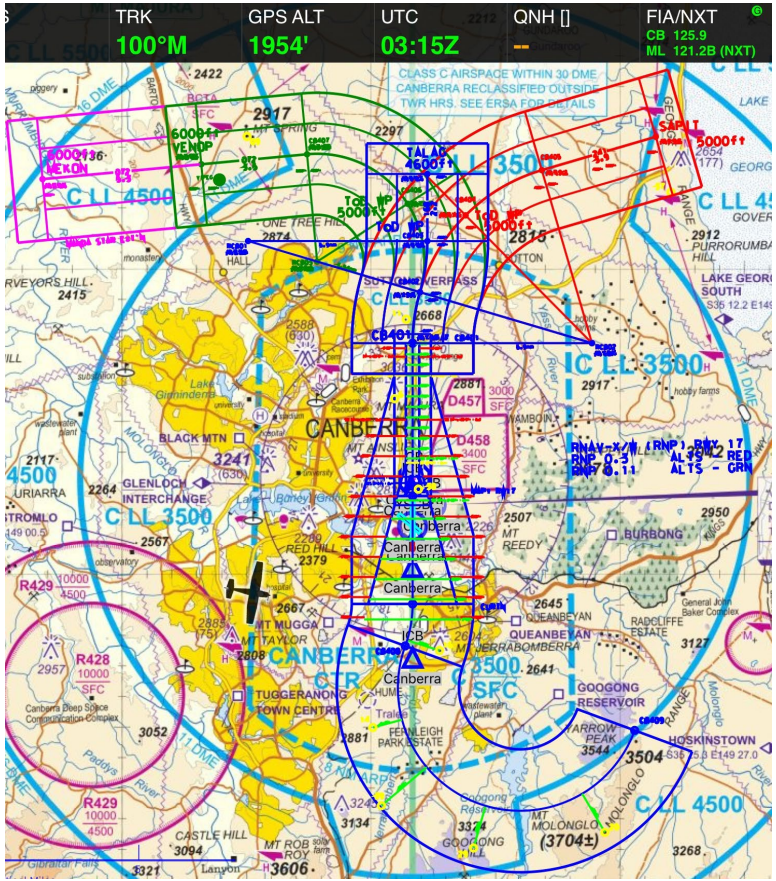
….sometimes we use a Beechcraft Baron

Information required for flight validation

» Waypoint and obstacle coordinates for GPS

Waypoint and obstacle information is manually loaded into GPS navigator. This allows us to check bearings and distance of procedure legs and cross check position of controlling obstacles.

Information required for flight validation

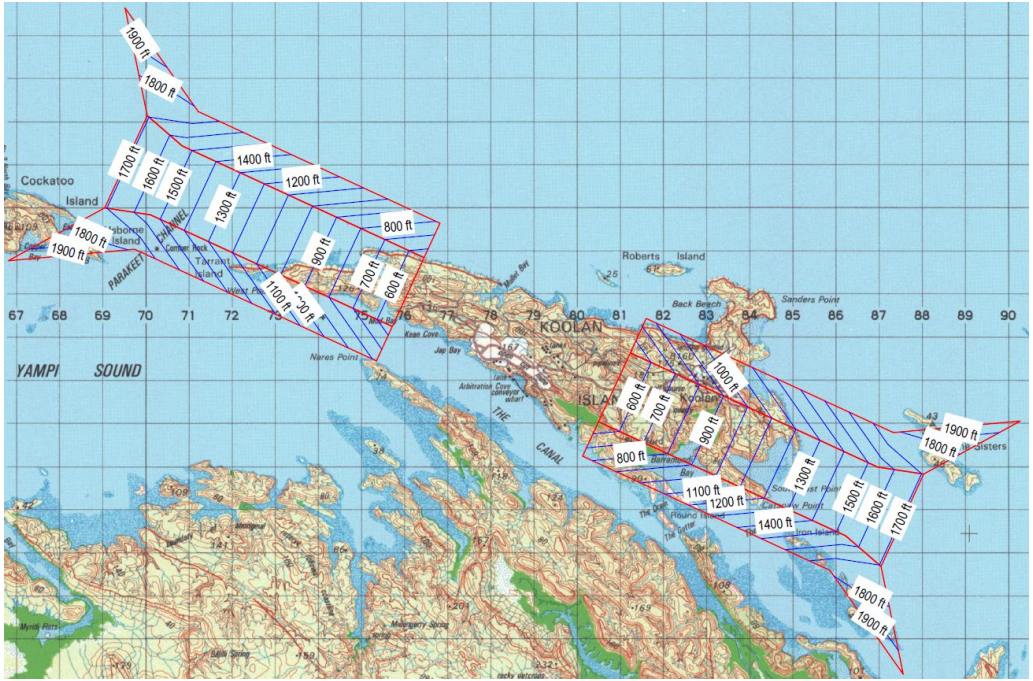


» KML files for EFB

All data loaded in EFB using KML files. This allows accurate navigation for protection areas and sloped surfaces.

Information required for flight validation

» Contoured FAS and VSS



Contours are used to validate the controlling surfaces, and check controlling obstacles.

These surfaces are flown.

Information required for flight validation

» Complete Obstacle list

AERODROME: YKLC OBSTACLES

	Serial	Segment	Description	BRG °T	Dist (KM)	Dist (NM)	Elev (ft)	MOC	Nominal Alt (ft)	OIS / Flt Alt (ft)	Approximate Position	
MSA	KLC001	10NM	TERRAIN	178°	6.91	3.73	901	1000	2000	**1000**	16 11.28	123 44.22
MSA	KLC002	25NM	TERRAIN	138°	54.60	29.48	1235	1000	2300	**1300**	16 29.51	124 4.570
RNAV (GNSS) RWY11	KLC004	HOLDING	TERRAIN	286°	21.64	11.69	645	984	2300	**1316**	16 4.402	123 32.39
RNAV (GNSS) RWY11	KLC004	RIGHT INITIAL	TERRAIN	286°	21.64	11.69	645	984	1700	**716**	16 4.402	123 32.39
RNAV (GNSS) RWY11	KLC005	CENTRE INITIAL	TERRAIN	294°	24.56	13.26	474	984	1700	**716**	16 2.259	123 31.45
RNAV (GNSS) RWY11	KLC006	LEFT INITIAL	TERRAIN	294°	22.10	11.93	317	984	1700	**716**	16 2.611	123 32.80
RNAV (GNSS) RWY11	KLC007	INTERMEDIATE	TERRAIN	286°	20.92	11.30	573	492	1100	**608**	16 4.53	123 32.78
RNAV (GNSS) RWY11	KLC008	FINAL	RW11 THR+100FT	300°	1.09	0.59	637	246	890	**644**	16 7.263	123 43.57
RNAV (GNSS) RWY11	KLC008	INITIAL MISSED LNAV	RW11 THR+100FT	300°	1.09	0.59	637	246	890	**644**	16 7.263	123 43.57
RNAV (GNSS) RWY11 LNAV/VNAV	KLC008	FINAL LNAV/VNAV	RW11 THR+100FT	300°	1.09	0.59	637	161	820	**659**	16 7.263	123 43.57
RNAV (GNSS) RWY11 LNAV/VNAV	KLC009	INITIAL MISSED LNAV/VNAV	TERRAIN	131°	0.55	0.30	638			**638**	16 7.752	123 44.33
RNAV (GNSS) RWY11	KLC010	COMMON MISSED	TERRAIN	100°	5.07	2.74	625	164		**931**	16 8.049	123 46.90
RNAV (GNSS) RWY29	KLC011	LEFT INITIAL	TERRAIN	130°	23.44	12.66	681	984	1700	**716**	16 15.74	123 54.14
RNAV (GNSS) RWY29	KLC012	CENTRE INITIAL	TERRAIN	119°	27.03	14.59	635	984	1700	**716**	16 14.66	123 57.36
RNAV (GNSS) RWY29	KLC013	RIGHT INITIAL	TERRAIN	112°	17.94	9.69	287	984	1700	**716**	16 11.20	123 53.44
RNAV (GNSS) RWY29	KLC014	INTERMEDIATE	TERRAIN	124°	13.48	7.28	438	443	1100	**657**	16 11.66	123 50.35
RNAV (GNSS) RWY29	KLC003	FINAL	TERRAIN	102°	3.41	1.84	710	246	960	**714**	16 7.956	123 45.96
RNAV (GNSS) RWY29	KLC015	INITIAL MISSED	TERRAIN	129°	0.57	0.31	638	246	960	**714**	16 7.752	123 44.35
RNAV (GNSS) RWY29 LNAV/VNAV	KLC003	FINAL LNAV/VNAV	TERRAIN	102°	3.41	1.84	710	161	880	**See FAS contours**	16 7.956	123 45.96
RNAV (GNSS) RWY29 LNAV/VNAV	KLC016	INITIAL MISSED LNAV/VNAV	TERRAIN	295°	0.56	0.30	602			**602**	16 7.431	123 43.81
RNAV (GNSS) RWY29	KLC017	COMMON MISSED	TERRAIN	290°	5.17	2.79	510	164		**1045**	16 6.585	123 41.37
RNAV (GNSS) RWY29	KLC018	HOLDING	TERRAIN	119°	40.26	21.74	1091	984	2300	**1316**	16 17.98	124 3.919
CIRCLING	KLC003	CAT A/B	TERRAIN	102°	3.41	1.84	710	295	1040	**745**	16 7.956	123 45.96
CIRCLING	KLC003	CAT C	TERRAIN	102°	3.41	1.84	710	394	1140	**746**	16 7.956	123 45.96
CIRCLING	KLC003	CAT D	TERRAIN	102°	3.41	1.84	710	394	1230	**836**	16 7.956	123 45.96

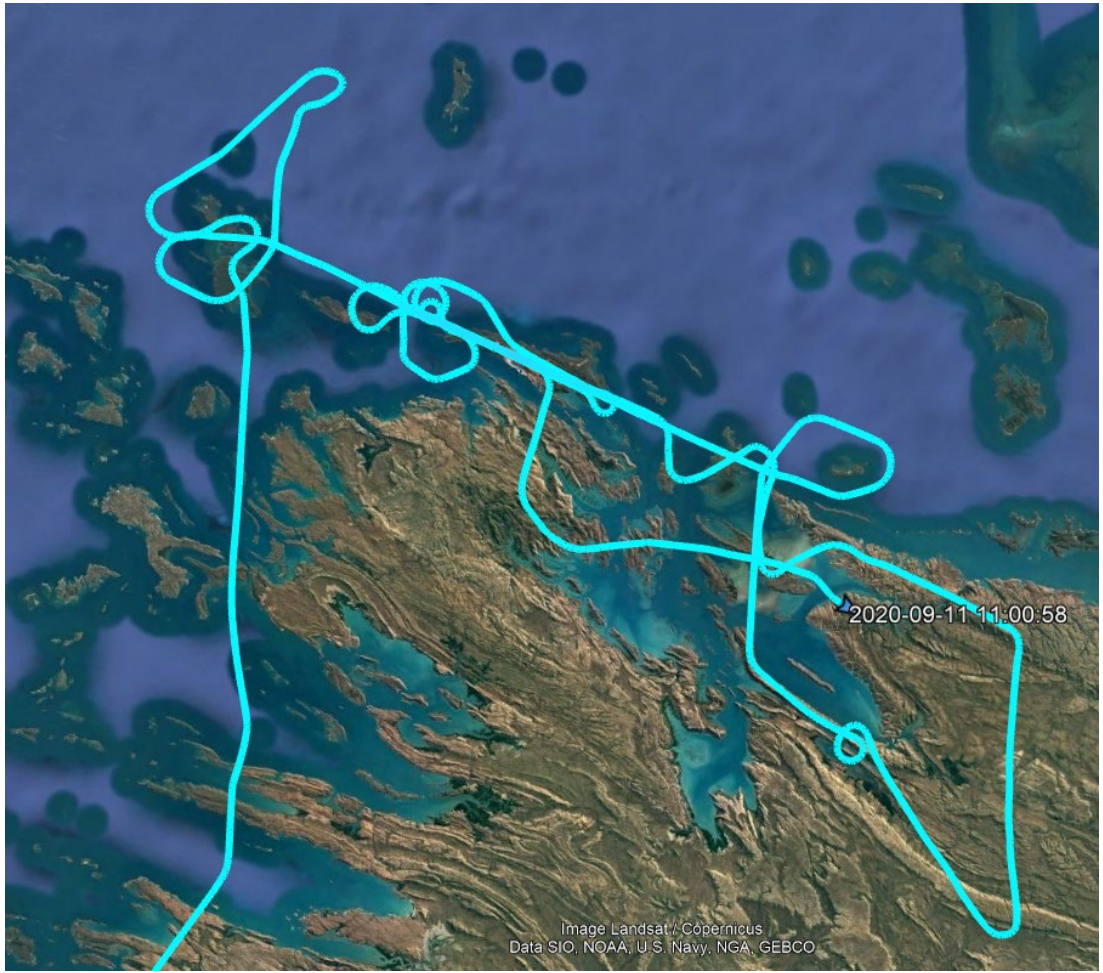
Time to go and fly!

Remember this?

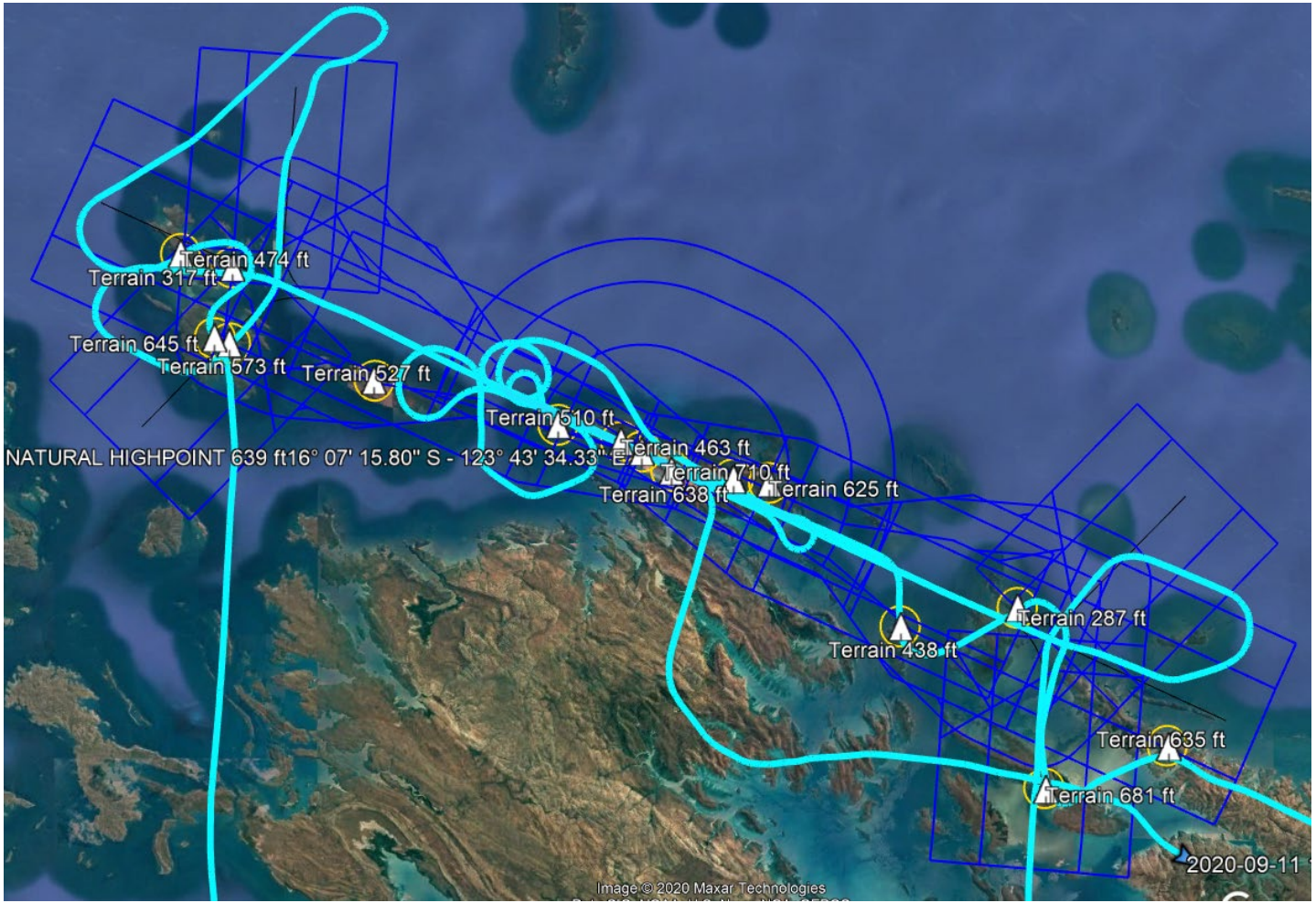
Now this

View from other end

What was flown?



Compared to procedure design splays



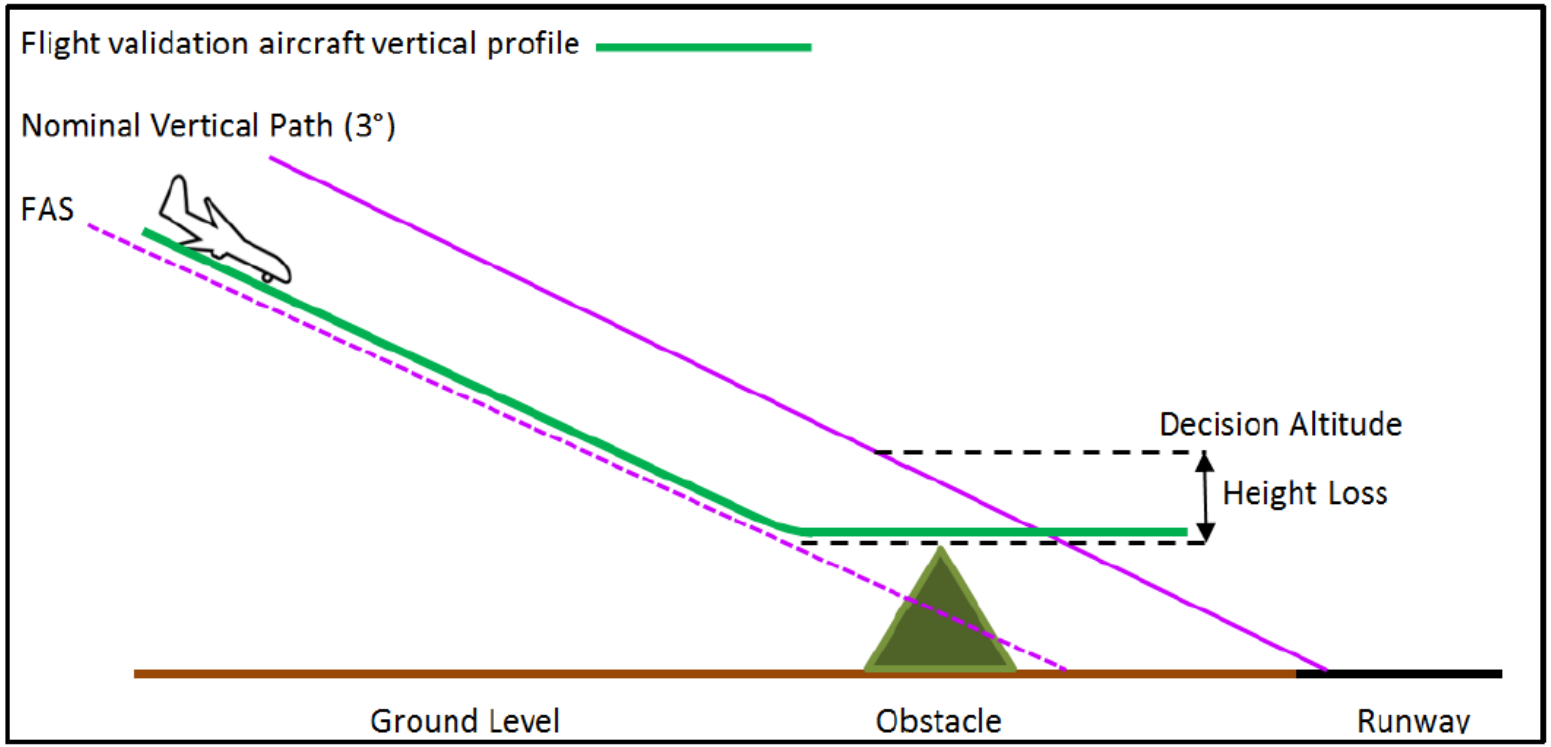
VSS check

VSS intercept distance(NM) from MAPT at Final Segment Check Altitude				
VSS intercepts final segment check altitude of	644	FT at	0.57	NM from MAPT
VSS intercepts final segment check altitude of	714	FT at	1.04	NM from MAPT

FAS check

On site flight validation: Example profile – Baro-VNAV FAS Check

- Descent managed using EFB overlayed altitude contours (hand flown) with aircraft position reference



Threshold check

YKLC	KOOLAN CENTRAL		
Runway 11	16° 07.26' S	123° 43.57' E	537FT
Runway 29	16° 07.74' S	123° 44 .64 E	513FT

Time to fly back to the office

Post flight validation

FLIGHT VALIDATION REPORT

KOOLAN CENTRAL (YKLC)

Date:	11-Sep-20	Aircraft Registration:	VH-VEY
Validation Pilot:	Alf Jonas	A.P. Jonas, MFO, 17 Sep 2020	
Validation Observer:	Simon Ozanne		
dure Designer:	Tim Thorn	Tim Thorn Digitally signed by Tim Thorn Date: 2020.09.18 13:58:06 +10'00'	

CERTIFICATION

e aerodrome is currently UNCERTIFIED.
e specified altitudes of the mentioned instrument approach/arrival procedures have been checked and the
ocedures are acceptable subject to the mentioned changes (if any) being incorporated.
e mentioned instrument procedures are suitable for straight-in minima.
rodrome lighting systems were not able to be assessed. (See comments)
e WDIs are suitable for straight-in minimas to all RWYs.
e suitable WDIs are illuminated.
e (re)validation was conducted between 110131Z and 110257Z SEP 20.
e minimum number of satellites available and average HFOM during that period was 8 and 22 feet
spectively. RAIM was continuously available.
imeters were checked/reset on the threshold of RWY 11 : elevation 537' AMSL.

FRASTRUCTURE VERIFICATION

WY	Threshold Coordinates	APP Lighting	Suitability - APP Lighting
Y 11	S16 07.26 E123 43.57	PAPI	Not able to be assessed (See Comments)
Y 29	S16 07.74 E123 44.64	PAPI	Not able to be assessed (See Comments)

COMMENTS

1. Aerodrome lighting (at 60m spacing), PAPI and illuminated WDI are all located as depicted on the Aerodrome Facilities Plan and the draft ERSA entry. Lighting not operational at time of validation and therefore not assessed.
2. AWIS not operational at time of validation.
3. Designer provided Baro VNAV FAS contours assessed. FAS penetrations are consistent with the location of the controlling terrain points KLC008 (RWY 11) and KLC003 (RWY 29). Baro VNAV procedure sim validation (flyability and coding) required prior to publication.
4. The Telstra comms tower (reported elevation of 701') in the final segment and at 1.34nm SE of RWY29 THR is not erected. Buffered terrain assessment, which is 9' high than the comms tower, remains controlling.
5. Recommend including a Local Traffic Regulation in the ERSA FAC entry regarding high-density VFR operations within 5nm of Talbot Bay / Horizontal Falls and that special procedures apply (as per ERSA GEN - SP) in this area.

PREVIOUSLY UNIDENTIFIED OBSTACLES

Description	Approx. Elevation	Location	Owner (If Known)
None			

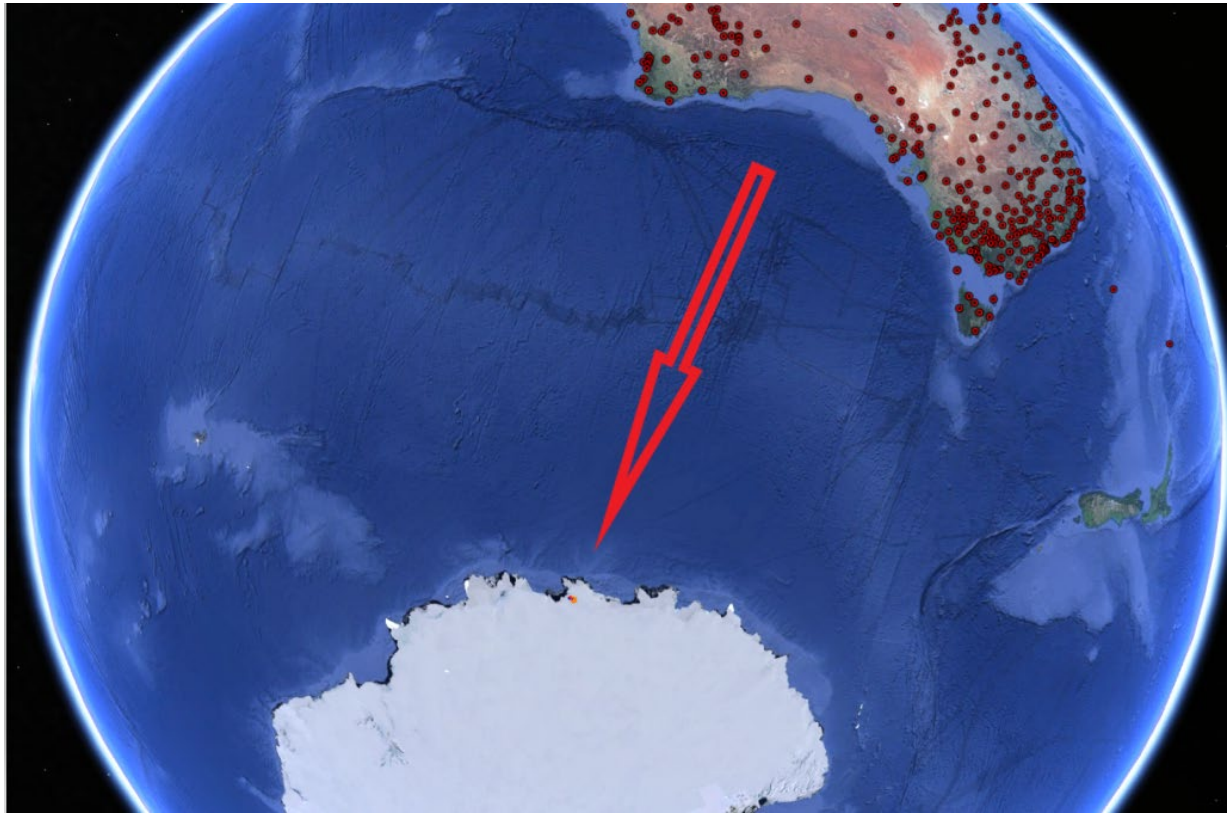
COMMON SEGMENTS

SEGMENT	COMMENTS	NEED for CHANGE
25 MSA	SATISFACTORY	
10 MSA	SATISFACTORY	
Circling	SATISFACTORY	
VSS / VAA	SATISFACTORY	

INSTRUMENT APPROACH PROCEDURES

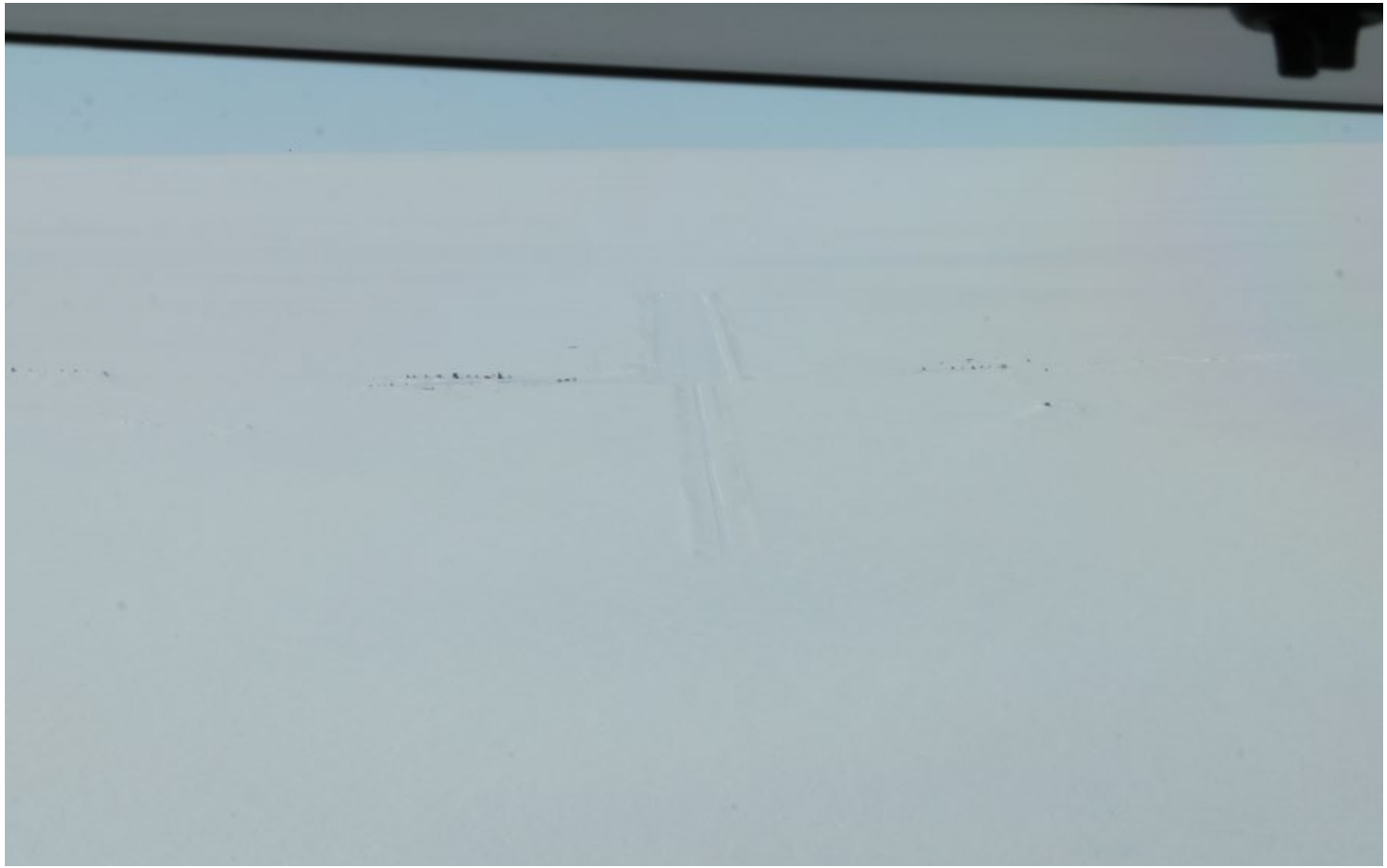
PROCEDURE	SEGMENT	COMMENTS	NEED for CHANGE
RNAV (GNSS) RWY 11 (DRAFT)	Holding	SATISFACTORY	
	Left Initial	SATISFACTORY	
	Centre Initial	SATISFACTORY	
	Right Initial	SATISFACTORY	
	Intermediate	SATISFACTORY	
	Final	SATISFACTORY	
	Missed Approach	SATISFACTORY	
RNAV (GNSS) RWY 29 (DRAFT)	Holding	SATISFACTORY	
	Left Initial	SATISFACTORY	
	Centre Initial	SATISFACTORY	
	Right Initial	SATISFACTORY	
	Intermediate	SATISFACTORY	
	Final	SATISFACTORY	
	Missed Approach	SATISFACTORY	

Extreme Flight Validation
Wilkins Aerodrome Antarctica



Extreme Flight Validation
Wilkins Aerodrome Antarctica

Extreme Flight Validation
Wilkins Aerodrome Antarctica



Thank You