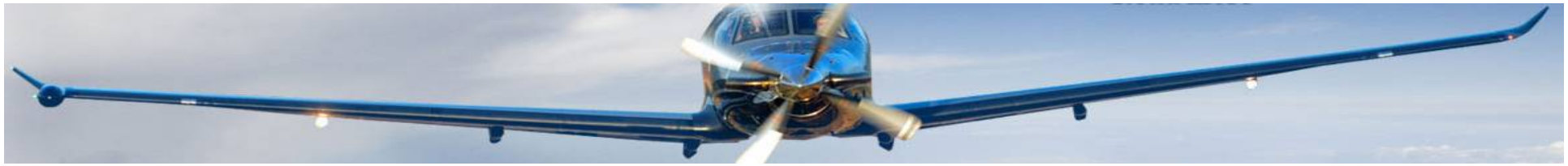
EASA CAT SET-IMC WORK SHOP
Cologne 4.7.2017

”A new industry in Europe, a safe and economical way of transport for our customers”



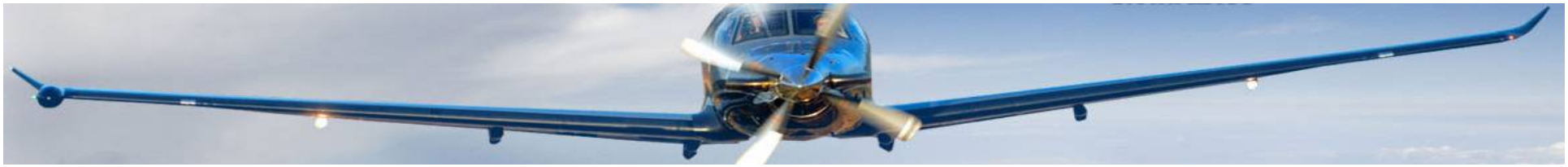
Introduction

Matti Auterinen

- Accountable Manager
- Over 18000 hours with MD80, Boeing 757, Airbus and GA aircrafts
- Captain on A350 and **Pilatus PC-12 NG**

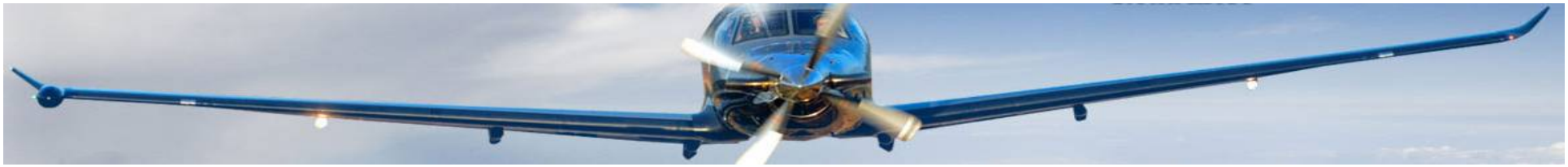
Juuso Aalto

- Head of Flight Operations / Pilatus PC-12 NG Pilot
- ATPL, experience on ATR72 –series
- Former Inspector of Finnish CAA
- Flight Instructor



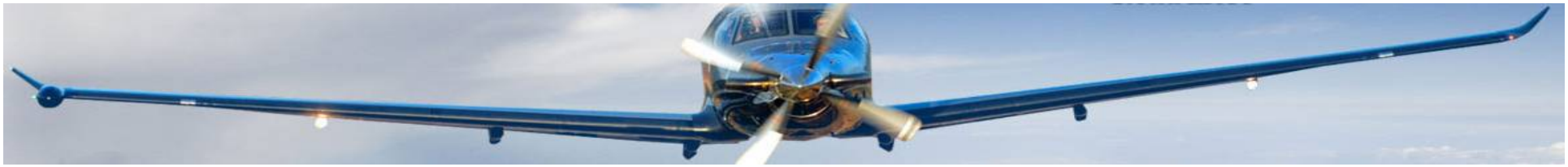
HENDELL AVIATION

- Founded in 2004
- Seaplane operations at the beginning
- EU-OPS operator since 2008
- SET Commercial (CAT pax) since FEB 2013 with the PC-12
- Joint venture with FLY7 (ATO) Lausanne since 2014



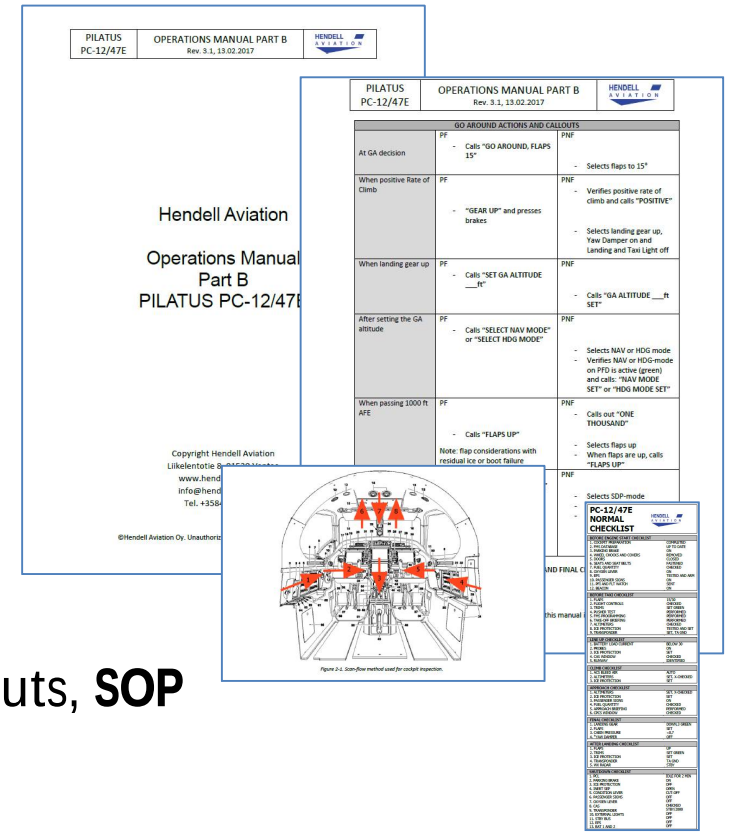
Topics..

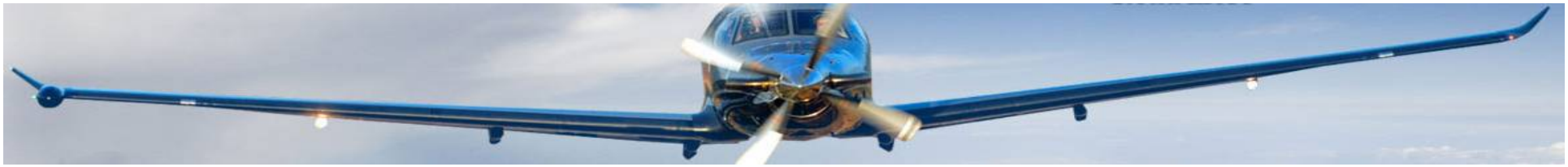
- Training:
  - What are main challenges of training?
- Flight Planning
  - Hendell way to do it..
  - What will change?
- Trend Monitoring
  - Greetings from HA CAM



Two-man-crew SOP creation – OM-B

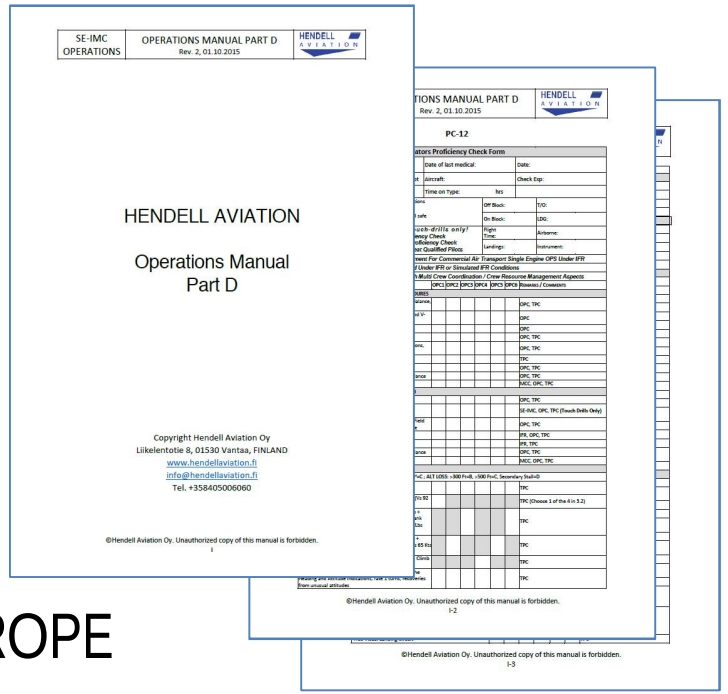
- Heavy transportation view to do it
- Scan-flow technique
- PF and PM task sharing
- Check lists with killer items only
- CRM, clear communication, briefings, call-outs, **SOP**

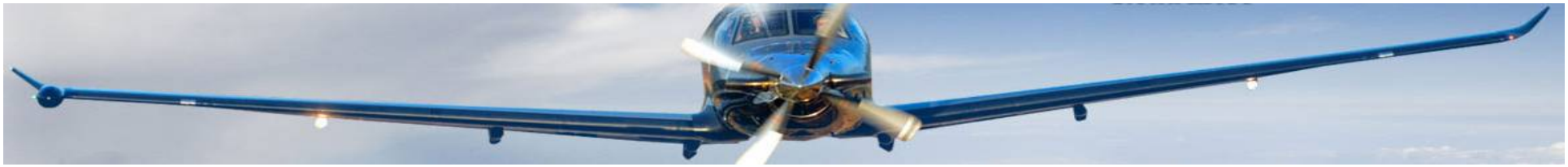




Training

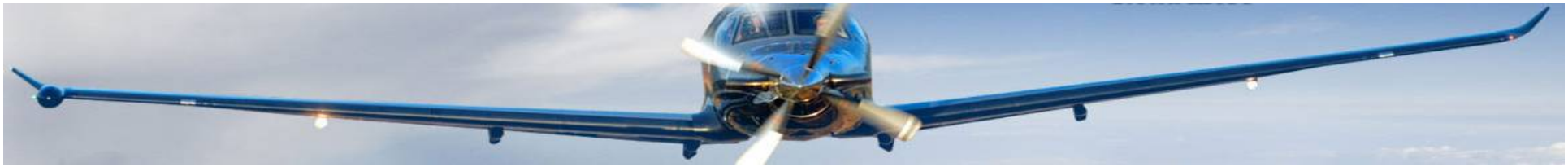
- Class rating
- Company conversion course
- TPC/OPC
- LIFUS
- LFC
- Recurrent training
- NO SIMULATOR AVAILABLE IN EUROPE





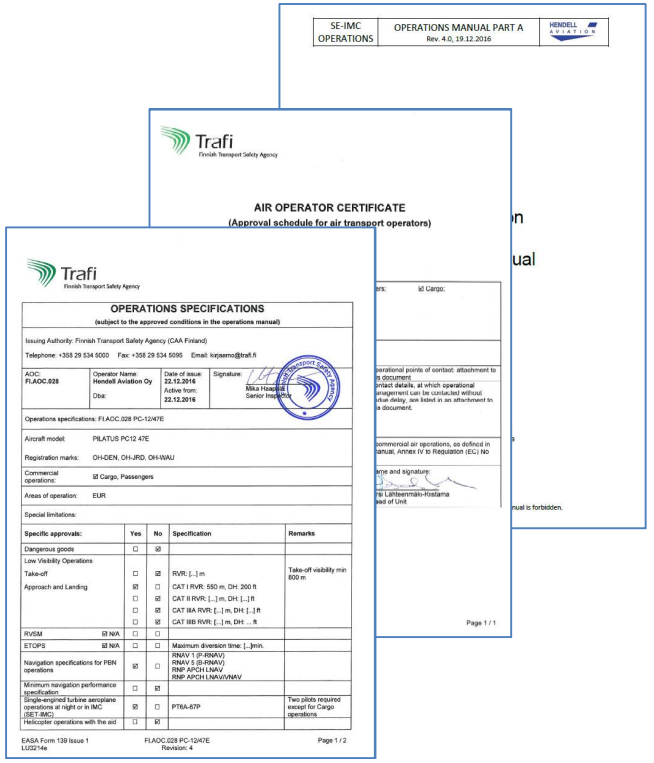
Simulation

- Static FSTD or FFS?
- Modern FSTD with high resolution visual is sufficient?
- FFS 8-9 Million € vs. FSTD with a price tag of 2 Million €
- Training cost 350 €/hour vs. 875 €/hour
- Should or Must?

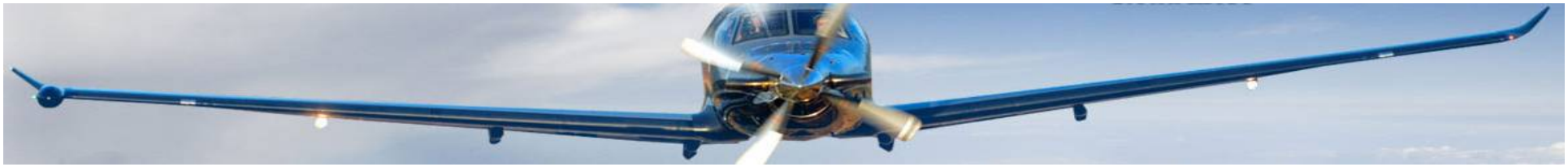


Flight Planning

- How we've been doing it so far?
  - Operations Manual and Approval
    - ICAO Annex 6, Part I
      - Chapter 5.4
      - Appendix 3
      - Attachment H

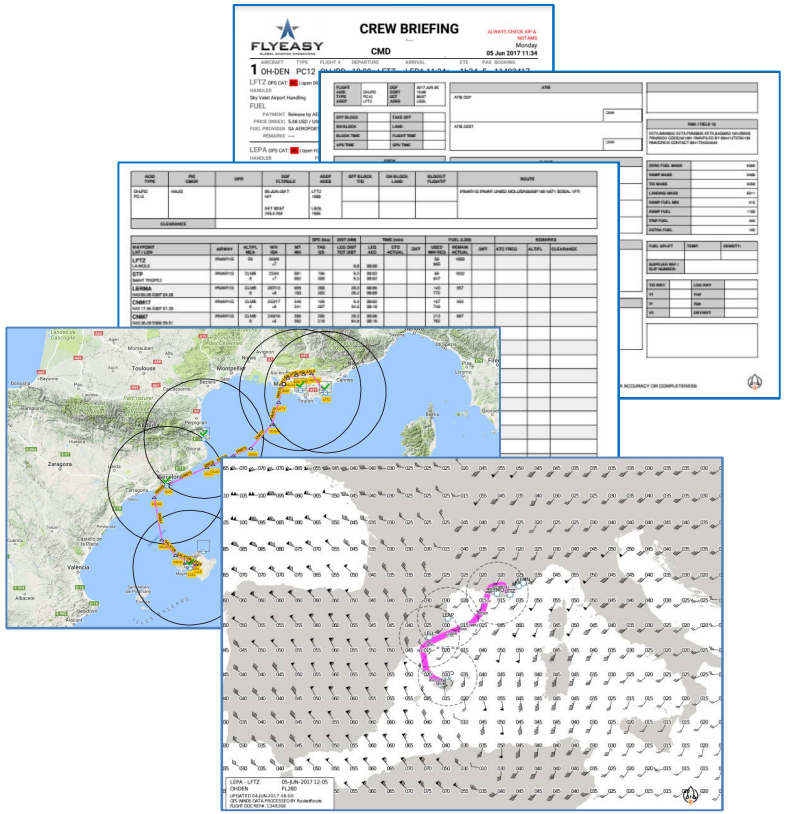


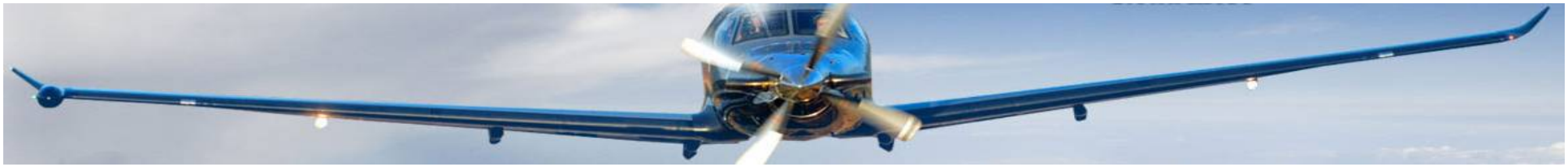
- ...in practice?



Current process

- Stages
  - Flight request
  - Feasibility study
  - Quote
  - Confirmation
  - Preparation
  - Briefing Pack
  - Flight release
- Audited through CSMS

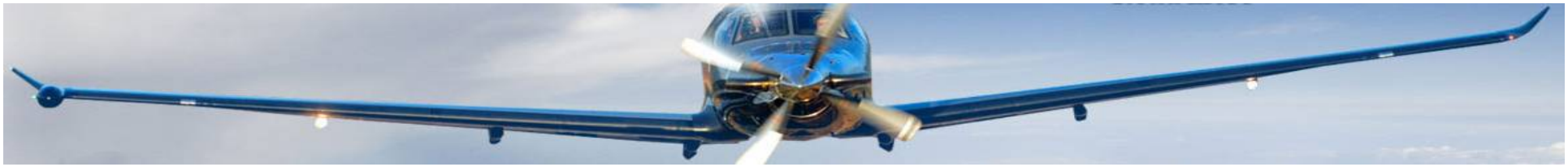




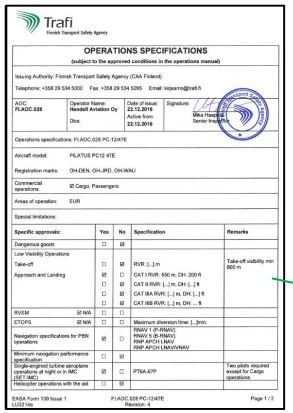
What will change?

- Gap-analyse in process..

Reference	Change/Amendment	Comments	Status
	(EU) 2017/363		
(EU) 2017/363 (3)	The International Civil Aviation Organisation (ICAO) standards and recommended practices, set out in Part I of Annex 6 to the Convention on International Civil Aviation, signed in Chicago on 7 December 1944, include provisions for the operation of single-engined turbine aeroplanes at night or in instrument meteorological conditions. Those provisions contain, inter alia, a requirement that, in approving such operations, the State of the operator needs to ensure that certain conditions are complied with, including those relating to installed equipment, engine reliability, engine monitoring, operator procedures and flight crew training. Union law should	Refer to prior AOC approval and to this document. **Action(s):** Not required.	Completed
(EU) 2017/363 Article 1 (2)	'5. Until 2 September 2017, exemptions granted before 22 March 2017 in accordance with Article 8(2) of Regulation (EEC) No 3922/91, as provided for in Article 6(5) of Regulation (EU) No 965/2012 as applicable before 22 March 2017, shall be considered to constitute approvals referred to in point (a) of CAT.POL.A.300 of Annex IV (Part-CAT). After 2 September 2017, those exemptions shall no longer be valid for the operation of single-engined aeroplanes. If any change to the operation of those aeroplanes that affects the	Derogations will expire 2.9.2017 and compliance must be verified before that. Refer to this document for compliance. **Action(s):** Not required.	
(EU) 20 (4)			Completed
AMC1 ORO.GEN.200(b)	SIZE, NATURE AND COMPLEXITY OF THE ACTIVITY [...] (b) Operators with up to 20 FTEs involved in the activity subject to Regulation (EC) No 216/20087 and its Implementing Rules may also be considered complex based on an assessment of the following factors: (1) in terms of complexity, the extent and scope of contracted activities subject to the approval; (2) in terms of risk criteria, the extent of the following: (i) operations requiring a specific approval; (ii) high-risk commercial specialised operations; (iii) operations with different types of aircraft used; and (iv) operations in challenging environment (offshore, mountainous area, etc.).	Hendell Aviation is already considered and approved as a complex organization. **Action(s):** Not required.	Completed
			Completed
			Completed
AMC3 ORO.MLR.100	CONTENTS — CAT OPERATIONS [...] A GENERAL/BASIC 0 ADMINISTRATION AND CONTROL OF OPERATIONS MANUAL [...] 8 OPERATING PROCEDURES 8.1 Flight preparation instructions. As applicable to the operation: [...] 8.1.13 For commercial air transport operations with single-engined turbine aeroplanes in instrument meteorological conditions or at night (CAT SETIMC) approved in accordance with Subpart L (SET-IMC) of Annex V (Part-SPA) to Regulation (EU) No 965/2012: (a) the procedure for route selection with respect to the availability of surfaces, which permits a safe forced landing; (b) the instructions for the assessment of landing sites (elevation, landing direction, and obstacles in the area); and (c) the instructions for the assessment of the weather conditions at those landing sites.	(a) OM-A 8.5.3.1 (b) OM-A 8.5.3.3 (c) OM-A 8.5.3.5 **Action(s):** Not required.	Completed
	C ROUTE/ROLE/AREA AND AERODROME/OPERATING SITE INSTRUCTIONS AND INFORMATION [...]		Completed
			SPEC
			In progress
			Completed



Take Off minima



Trafi
Finnish Transport Safety Agency

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the operations manual)

Issuing Authority: Finnish Transport Safety Agency (CAA Finland)
Telephone: +358 29 534 5000 Fax: +358 29 534 5095 Email: kirjaamo@trafi.fi

AOC: FI.AOC.028	Operator Name: Hendell Aviation Oy Oba	Date of issue: 22.12.2016 Active from: 22.12.2016	Signature: Mika Hendell Owner Inspector

Operations specifications: FI.AOC.028 PC-12/47E

Aircraft model: PILATUS PC12 47E

Registration marks: OH-DEN, OH-JRD, OH-WAU

Commercial operations: ☒ Cargo, Passengers

Areas of operation: EUR

Special limitations:

Specific approvals:	Yes	No	Specification	Remarks
Dangerous goods	☐	☒		
Low Visibility Operations				
Take-off	☐	☒	RVR: [...] m	Take-off visibility min 800 m
Approach and Landing	☒	☐	CAT I RVR: 550 m, DH: 200 ft	
	☐	☒	CAT II RVR: [...] m, DH: [...] ft	
	☐	☒	CAT IIIA RVR: [...] m, DH: [...] ft	
	☐	☒	CAT IIIB RVR: [...] m, DH: ...ft	
RVSM ☒ N/A	☐	☐		
ETOPS ☒ N/A	☐	☐	Maximum diversion time: [...]min.	
Navigation specifications for PBN operations	☒	☐	RNAV 1 (P-RNAV) RNAV 5 (B-RNAV) RNP APCH LNAV RNP APCH LNAV/VNAV	
Minimum navigation performance specification	☐	☒		
Single-engined turbine aeroplane operations at night or in IMC (SET-IMC)	☒	☐	PT6A-67P	Two pilots required except for Cargo operations
Helicopter operations with the aid	☐	☒		

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LU22 hki Revision: 4

Remarks
Take-off visibility min 800 m

AMC1 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS — AEROPLANES

(c) Required RVR/VIS — aeroplanes

(3) For single-engined turbine aeroplane operations approved in accordance with Subpart L (SET-IMC) of Annex V (Part-SPA) to Regulation (EU) No 965/2012, the take-off minima specified by the operator should be expressed as RVR/CMV values not lower than those specified in Table 1.A below.

Unless the operator is making use of a risk period, whenever the surface in front of the runway does not allow for a safe forced landing, the RVR/CMV values should not be lower than 800 m. In this case, the proportion of the flight to be considered starts at the lift-off position and ends when the aeroplane is able to turn back and land on the runway in the opposite direction or glide to the next landing site in case of power loss.

Table 1.A

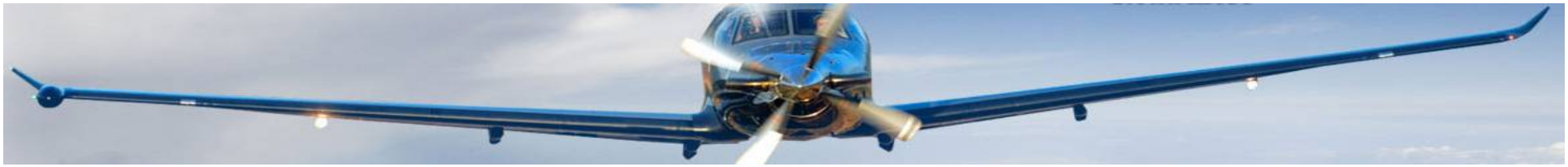
Take-off — aeroplanes (without an approval for low visibility take-off (LVTO))
RVR/VIS

Facilities	RVR/VIS (m) *
Day only: Nil**	500
Day: at least runway edge lights or runway centreline markings Night: at least runway edge lights and runway end lights or runway centreline lights and runway end lights	400

*: The reported RVR/VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

**: The pilot is able to continuously identify the take-off surface and maintain directional control.

- Commanders discretion…?



Crew composition

Trafi
Finnish Transport Safety Agency

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the operations manual)

Issuing Authority: Finnish Transport Safety Agency (CAA Finland)

Telephone: +358 29 534 5000 Fax: +358 29 534 5095 Email: kirjaamo@trafi.fi

AOC: FI.AOC.028	Operator Name: Hendell Aviation Oy	Date of issue: 22.12.2016	Signature: Mika Haapala, Senior Inspector
	Dba:	Active from: 22.12.2016	

Operations specifications: FI.AOC.028 PC-12/47E

Aircraft model: PILATUS PC12 47E

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Special limitations:

Specific approvals:	Yes	No	Specification	Remarks
Dangerous goods	☐	☒		
Low Visibility Operations				
Take-off	☐	☒	RVR: [...] m	Take-off visibility min 800 m
Approach and Landing	☒	☐	CAT I RVR: 550 m, DH: 200 ft	
	☐	☒	CAT II RVR: [...] m, DH: [...] ft	
	☐	☒	CAT IIIA RVR: [...] m, DH: [...] ft	
	☐	☒	CAT IIIB RVR: [...] m, DH: ...ft	
RVSM	☒ N/A	☐	☐	
ETOPS	☒ N/A	☐	☐ Maximum diversion time: [...]min.	
Navigation specifications for PBN operations	☒	☐	RNAV 1 (R-RNAV) RNAV 5 (R-RNAV) RNP APCH LNAV RNP APCH LNAV/VNAV	
Minimum navigation performance specification	☐	☒	☐	
Single-engined turbine aeroplane operations at night or in IMC (SET-IMC)	☒	☐	PT6A-67P	Two pilots required except for Cargo operations
Helicopter operations with the aid	☐	☒	☐	

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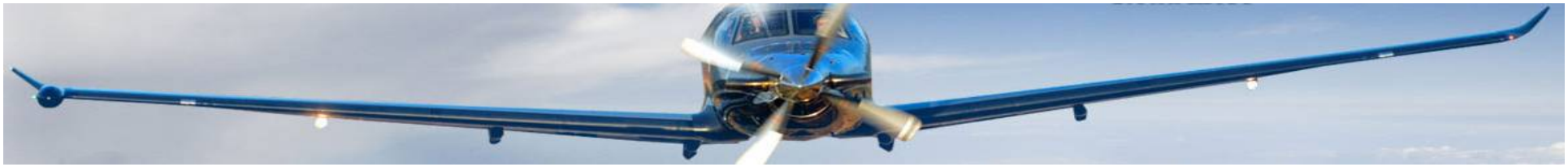
AMC2 SPA.SET-IMC.105(c) SET-IMC operations approval

CREW COMPOSITION

(a) Unless the pilot-in-command has a minimum experience of 100 flight hours under instrument flight rules (IFR) with the relevant type or class of aeroplane including line flying under supervision (LIFUS), the minimum crew should be composed of two pilots.

(b) A lesser number of flight hours under IFR on the relevant type or class of aeroplane may be acceptable to the competent authority when the flight crew member has significant previous IFR experience.

Single-engined turbine aeroplane operations at night or in IMC (SET-IMC)	☑	☐	PT6A-67P	Two pilots required except for Cargo operations



Risk period

AMC1 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

FLIGHT PLANNING

(a) The operator should establish flight planning procedures to ensure that the routes and cruising altitudes are selected so as to have a landing site within gliding range.

(b) Notwithstanding (a) above, whenever a landing site is not within gliding range, one or more risk periods may be used for the following operations:

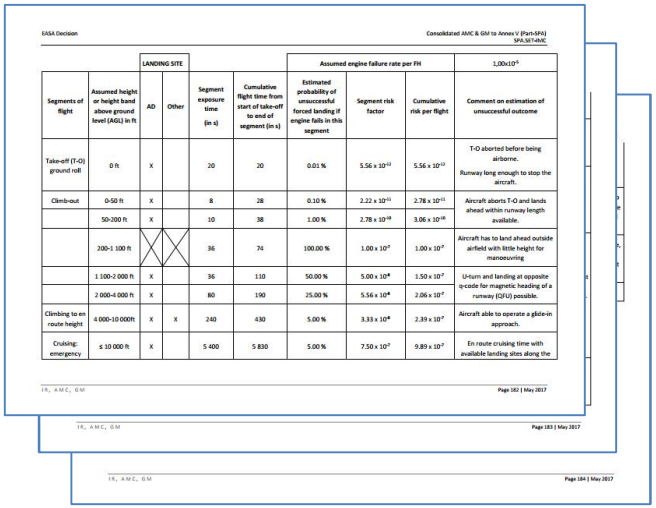
(1) over water;

(2) over hostile environment; or

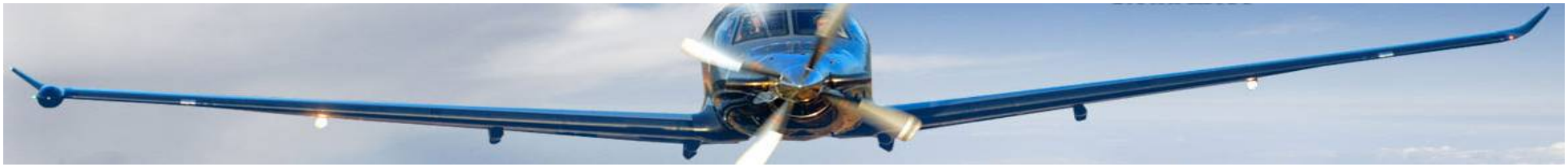
(3) over congested areas.

Except for the take-off and landing phase, the operator should ensure that when a risk period is planned, there is a possibility to glide to a non-congested area.

The total duration of the risk period per flight should not exceed 15 min unless the operator has established, based on a risk assessment carried out for the route concerned, that the cumulative risk of fatal accident due to an engine failure for this flight remains at an acceptable level (see GM2 SPA.SET-IMC.105(d)(2)).



- Total risk < 1.3×10E-06



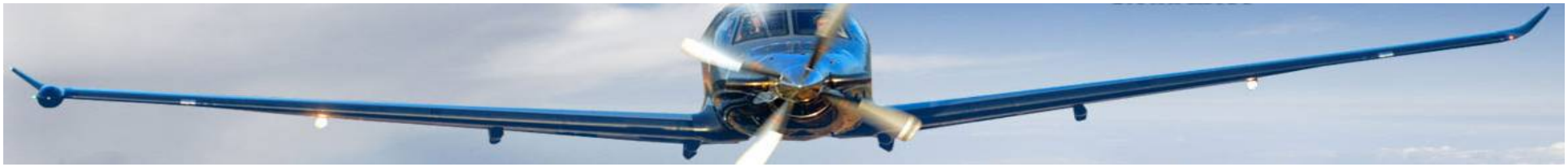
Safety Risk Assessment

HA Route Risk Assesment - Excel

GM2 SPA.SET-IMC.105(d)(2) SAFETY RISK ASSESMENT — DEP: LEPA — DEST: LFTZ

Assumed engine failure rate per flight hour: 1,00E-05

Segment of flight	Assumed height or height band above ground level (AGL) in ft	Landing site: AD	Landing site: Other	Segment exposure time (in s)	Cumulative flight time from start of take-off to end of segment (in s)	Estimated probability of unsuccessful forced landing if engine fails in this segment	Segment risk factor	Cumulative risk per flight	Comment on estimation of unsuccessful outcome	Segment time in minutes	Cumulative time in minutes
Take-off (T-O) ground roll	0	x		15	15	0,01 %	4,17E-12	4,17E-12	T-O aborted before being airborne. Runway long enough to stop the aircraft.	0,25	0,25
Climb out	0-1000			60	75	25,00 %	4,17E-08	4,17E-08	Aircraft has to land ahead outside airfield with little height for manoeuvring	1	1,25
Take off procedure	1000-4000	x		120	195	25,00 %	8,33E-08	1,25E-07	Aircraft is able to glide back to departure AD.	2	3,25
Climb to cruise altitude	4000-25000	x		900	1095	5,00 %	1,25E-07	2,50E-07	Aircraft able to operate a glide-in approach or return to to departure AD.	15	18,25
Cruising: emergency area available	25000	x		1800	2895	5,00 %	2,50E-07	5,00E-07	En route cruising time with available landing sites along the route within gliding range.	30	48,25
Cruising: emergency area NOT available	25000			2040	4935	25,00 %	1,42E-06	1,92E-06	Ditching near coast line. All POB's with life vests.	34	82,25
Descent according planned profile	25000-4000	x		720	5655	5,00 %	1,00E-07	2,02E-06	Descent with available landing sites or destination AD within gliding range.	12	94,25
Aircraft has to descend below the glide approach									Aircraft descends below the height		



Safety Risk Assessment

GM2 SPA.SET-IMC.105(d)(2) SAFETY RISK ASSESMENT DEP: DEST:

		Landing site				Assumed engine failure rate per flight hour			1,00E-05
Segment of flight	Assumed height or height band above ground level (AGL) in ft	AD	Other	Segment exposure time (in s)	Cumulative flight time from start of take-off to end of segment (in s)	Estimated probability of unsuccessful forced landing if engine fails in this segment	Segment risk factor	Cumulative risk per flight	Comment on estimation of unsuccessful outcome
Take-off (T-O) ground roll	0	x		15	15	0,50 %	2,08E-10	2,08E-10	T-O aborted before being airborne. Runway long enough to stop the aircraft.
Climb out	0-1000			60	75	35,00 %	5,83E-08	5,85E-08	Aircraft has to land ahead outside airfield with little height for manoeuvring
Take off procedure	1000-4000	x		120	195	10,00 %	3,33E-08	9,19E-08	Aircraft is able to glide back to departure AD.
Climb to cruise altitude	4000-25000	x		900	1095	5,00 %	1,25E-07	2,17E-07	Aircraft able to operate a glide-in approach or return to to departure AD.
Cruising: emergency area available	25000	x		1800	2895	5,00 %	2,50E-07	4,67E-07	En route cruising time with available landing sites along the route within gliding range.
Cruising: emergency area NOT available	25000			1140	4035	35,00 %	1,11E-06	1,58E-06	Ditching near coast line. All POB's with life vests.
Descent according planned profile	25000-4000	x		840	4875	5,00 %	1,17E-07	1,69E-06	Descent with available landing sites or destination AD within gliding range.
Aircraft has to descend below the glide approach capability to set up for a normal powered landing from 1 000 ft on a 3° approach path	4 000 - 1 000 ft on the approach	x		150	5025	10,00 %	4,17E-08	1,73E-06	Aircraft descends below the height needed to maintain a glide approach for reaching the airfield. Therefore, it may land short of airfield if engine fails.
Aircraft descends on a 3° approach path	1 000 -50 ft on approach at 120 kt (600 ft/min)			95	5120	35,00 %	9,24E-08	1,83E-06	Aircraft assumes 3° glideslope, reg lned to ensure normal landing. Therefore, it may undershoot the landing field if engine fails at this late stage.
Landing	50 ft above threshold until touchdown	x		10	5130	1,00 %	2,78E-10	1,83E-06	Aircraft over runway. Engine is to be idled anyway, but failure, while airborne, may surprise pilot and result in hard landing.
Landing ground roll	Touchdown to stop	x		15	5145	0,50 %	2,08E-10	1,83E-06	Aircraft on ground. Risk negligible, if engine stops on the example runway (very long) providing that all services are retained.
TOTAL RISK/FLIGHT								1,27794E-06	Risk per flight

DATE:

PERFORMED BY:

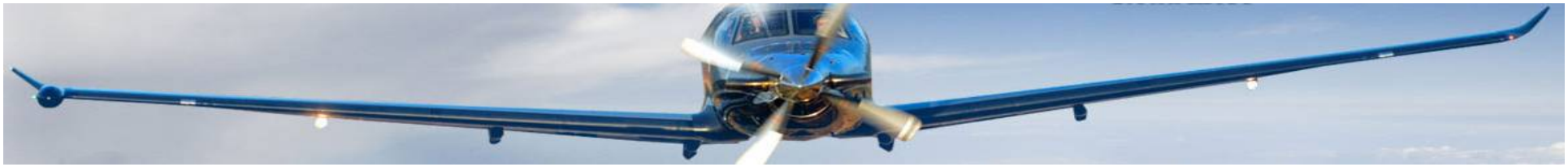
GM2 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

SAFETY RISK ASSESSMENT FOR A SPECIFIC ROUTE

The following likelihood scale may be used to determine the estimated probability of an unsuccessful forced landing:

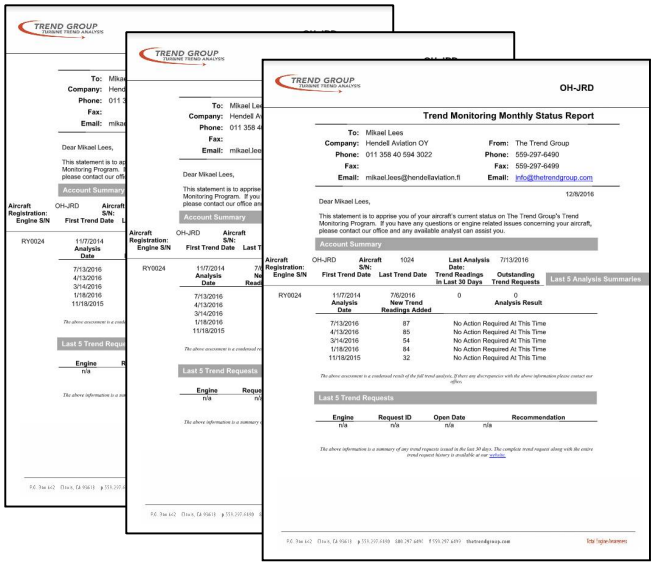
Probability in %	Description
0	Impossible
0-1	Negligible likelihood/remote possibility
1-10	Possible but not likely
10-35	Moderately likely
35-65	Possible
65-90	Likely
90-99	Almost certain
99-100	Certain

- Assessment standards?



Trend Monitoring

- Greetings from Hendell Aviation CAM…



Thank you!