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Proposal Sample 03/17:

Training Flight Validation Pilots FVPs plus associated Staff

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The following proposal describes the Flight Validation Pilot Training provided by TransPolar GmbH (TPL). The proposal is based on ICAO Doc 9906 Vol 5 & 6, and falls into the 3 parts

1. General / Introduction
2. Training Syllabus (Academic and Flight Training)
3. Commercial part

1. General / Introduction

Flight Validation is a complex and demanding task. Proper training of suitably qualified personnel is a must for a safe, efficient and professional execution of this task.

Transpolar's comprehensive training does reflect this fact. It is based on our almost 15 years of experience in this field, providing Flight Validation and Training services to customers in Germany, UK, The Middle East, Australia, Singapore, Vietnam, East Timor, and elsewhere. The training comprises a ground course, (80 hrs classroom training) with an ensuing training on the job / in the aircraft at the customer's premises, where actual flight validation missions will be executed under supervision of TransPolar's certified instructor for Flight Validation. The training will be completed by a final exam, comprising both a written test as well as an actual Flight Validation under supervision, again at the customer's facilities.

After completion of the ground based training, the candidates will move on to the practical on-the-job training, learning how to set up a Flight Validation, communicate with all relevant

stakeholders involved in the project, to assemble all required data and documents, analyse the data, provide initial feedback, execute the Flight Validation itself, post processing all data, supply feedback to all stakeholders, write the final report and archive all relevant data. This training will be conducted on actual Flight Validation mission under contract by the customer, under supervision of an instructor supplied by TransPolar. Having completed the Flight Validation of the required 12 procedures, a final exam has to be passed.

This part of the training again takes place at the customer's premises, with an instructor of TransPolar being seconded to the mission for the duration of that training.

Start and duration of the practical training is subject to aircraft, crew and projects being available on the customer's side. A suitable number of projects provided, this part of the training could be completed in approximately 15 days / 3 weeks for 2 pilots (due to a high workload for the Instructor FVP to supervise the work of the trainees, the practical training is based on training up to 2 pilots at a time). Ideally, the practical training should be split into 2 blocks at roughly 10 days, and 5 days respectively, with the first block of practical training being conducted under close guidance by the Training FVP, the second block being executed by the candidate FVP on a more independent basis, serving as a lead-in to the final test as well. Please note, however, that the practical training can easily be split into more than 2 blocks, to cater for availability issues of projects, aircraft and crew to be trained on the side of the customer.

1.1. Prerequisites, general

Please note that TPLs proposal is based on the availability of the following prerequisites:

- a. the customer does have a policy in place, and manuals, forms etc. that go with that policy, in the field of Flight Validation
- b. the customer's aircraft to be used on Flight Validation missions are equipped with a suitably qualified Flight Management System (FMS), with this system to be capable of dealing with all procedures under consideration for Flight Validation work, and being able to drive the aircraft's autopilot accordingly
- c. A computer / desktop-based training tool for the FMS intended to be used
- d. An agreement is in place with the provider of the FMS database to provide a PreProduction database for any upcoming Flight Validation mission.
- e. For the practical on-the-job training, the Flight Validation Instructor is either allowed to sit in one of the cockpit seats or a have a seat behind the two cockpit seats that allows an unrestricted outside view as well as a clear view of all relevant instruments required for the Flight Validation, plus has uncompromised access to all communications required to perform the task (all crew members on board, ATC).

In case some of these prerequisites are not met, TPL is more than glad to provide guidance on these requirements, like supplying appropriate manuals as per a. above, establish contacts with the relevant FMS manufacturer as per d. above, etc., under a separate contract. Please feel free to contact us on this matter any time.

1.2. Prerequisites, Flight Inspectors in Flight Validation

Flight Validation, as per ICAO Doc 9906, Vol 5 and 6, is primarily a task to be accomplished by Flight Validation Pilots. There are interfaces, though, connecting this task with the legacy role of flight inspection, performed by a Flight Inspector.

These interfaces being:

- Analysing and recording of signal-in-space of nav aids supporting the procedure under validation (i.e. VOR, DME, DME/DME)
- Analysing and recording of the space segment that supports an GNSS-based RNAV / PBN procedure under validation
- Assistance in writing, filing, distributing and storing any reports resulting from a validation task

Please note that for a successful participation of flight inspectors in the flight validation work, the prerequisites as per 1.1, para a. of above have to be met.

Again, in case these prerequisites are not met, TPL is more than glad to provide guidance on these requirements, like what is supposed to be analysed and recorded when and for how long, by what means, etc., supplying appropriate manuals, etc., under a separate contract. Please feel free to contact us on this matter any time.

2. Training Syllabus

2.1 Pre-requisite Pilot Qualification

As a technical prerequisite, a potential **Flight Validation Pilot FVP**, as per ICAO Doc 9906, Vol 6, should have the following qualification:

- CPL or ATPL with IR
- Current type rating for the type to be flown on mission
- Total flight time > 1.500 hrs
- Command time > 400 hrs
- Flight Inspection Pilot for more than 2 years

On top of the technical requirements, some Skills, Knowledge and Attitude (SKAs) are particularly useful in that role, such as

- Three-dimensional visualization (skill)
- Multi-tasking (skill)
- Mathematical understanding (skill / knowledge)
- Ability to work as part of a team, CRM-minded (attitude)
- Attention to detail (attitude)

The pre-requisites for **flight inspectors** to take part in a flight validation task are not specifically defined by ICAO Doc 9906. It is suggested, though, that any candidate should be a qualified flight inspector, with some experience background in that field.

Based on these skill sets, the customer will select candidates for training from the company's workforce.

2.2 Flight Validation Training

The training falls into 4 segments:

- Ground training Initial
- Ground-based Flight Training
- On-the Job-Training (OJT) in Flight
- Final Exam

2.2.1 Ground Training Initial

The ground training course is based on ICAO Doc 9906 Vol 6, comprising different modules as follows:

Module 1: General Introduction to Quality Assurance and Validation of Instrument Flight Procedures

with subjects to be covered:

- Overview of the Flight Procedure Design Process
- Demonstration of critical points where a quality assurance process is safety critical
- Introduce online resources and source material and documents

Module 2: General Criteria for Flight Procedure Design

with subjects to be covered:

- Introduction to structure of Doc 8168 PANS OPS
- SARPs and PANS
- Outline of the procedure Design Process
- Procedure Design-to Database-Path Integrity philosophy
- Explanation of the Amendment Process / AIRAC cycles

Module 3: Conventional Navigation Criteria (PANS OPS expanded)

with subjects to be covered:

- Aircraft Categories
- Speeds to be used and derived (IAS to TAS)
- Terminal Area Fixes
- Turn Calculations
- Protection of Turns
- Arrival Segment
- Initial Segment (Straight / DME arc/ DR track/Reversal/Racetrack)
- Intermediate Segment
- Final Segment
- Missed Approach
- Circling
- MSA
- Charting
- Departure Procedures SIDs
- Holdings

Note: all items primarily covered under obstacle clearance aspects

Module 4: Airport Design and Obstacle Limitations

with subjects to be covered:

- Demonstration of the Obstacle Limitation Surfaces
- Possible actions to mitigate penetrations

Module 5: Precision Approach Criteria

with subjects to be covered:

- General introduction to Precision Approach
- Basic ILS surfaces
- Obstacle Assessment Surfaces (OAS)
- Collision Risk Model (CRM)
- Missed Approach
- Low Visibility operations criteria
- Non-standard approach angle

Module 6: Performance-based Navigation (PBN)

with subjects to be covered:

- Overview of the PBN concept
- Long Range and RNAV Navigation History
- Function Principles of the various Navigation Methods and their limitations
- GNSS: overview (GPS, EGNOS, GLONASS, GALILEIO)
- GNSS: limitations
- APV Baro VNAV (RNAV GNSS)
- APV SBAS
- RNP AR: underlying principles
- RNP AR: Design criteria and obstacle assessment
- FAS Data Block requirements
- Design criteria and obstacle protection for PBN approach, departure, holding and en-route

Module 7: ARINC 424 Database Coding

with subjects to be covered:

- Database coding history
- The data chain
- Database integrity and regulations (Do28 and ED076)
- ARINC 424 Path terminators
- Translating analogue procedures to ARINC 424
- ARINC limitations
- SID & STAR coding
- Approach coding incl. approach transitions and missed approach
- Coding of conditional requirements (at-but not below; at-but not before)
- Behaviour of different FMS models, limitations
- Validation tools

Module 8: Geodesy and Earth Modelling

with subjects to be covered:

- Vector Geometry
- Spherical Trigonometry
- Reference Systems (WGS84 et al)
- Map Projections
- Datum Conversions (coordinate formats)

Module 9: Aeronautical Charting

with subjects to be covered:

- Introduction to ICAO Annex 4, Doc 8697
- Charting guidelines and standards
- Charting workflow
- SIAP charts
- Flight charts
- Electronic Flight Bags

Module 10: Safety Assessment Process

with subjects to be covered:

- Safety Assessment Process
- Case studies

Module 11: Differences in aircraft operations and performance

with subjects to be covered:

- Overview of different aircraft operations (i.e aerial work vs airline operations, low-performance twin engine aircraft vs. Airliner, etc)
- Aircraft performance factors (limitations, equipment, etc.)

Module 11 concludes the Ground Training Initial. The next phase of training, the Ground-based Flight Training, starts to touch on the actual Flight Validation Mission and comprises the following modules:

2.2.2 Ground-based Flight Training

Module 12: Introduction to Company Procedures and Equipment

with subjects to be covered:

- Introduction to Company Documents and Procedures
- Planning Process and responsibilities
- Company SOPs on mission
- Aircraft equipment (avionics, FMS, FIS)
- Database procurement
- Flight Validation Reports and Records

Module 13: Pre-Flight Validation

with subjects to be covered:

- Procedure package analysis and review
- Resolving procedure design ambiguities and conflicts
- Flight Validation Requirements of an IFP package
- Flight Validation and Flight Inspection Reports
- Identification of procedure elements that require Flight Inspection (i.e. new fixes that require ground-based nav aids, new nav aids on procedure, etc.)
- Operational aspects like speed, temperature, bank angles, wind limitations, etc., as specified in an IFP package
- ARINC 424 leg and path terminator coding verification

2.2.3 On-the-Job-Training in Flight

Module 13 concludes the Ground-based Flight Training. The candidate having successfully passed that stage of the training is deemed to be fit to start, under supervision and guidance by the Instructor FVP, the OJT-phase of the Flight Training.

Module 14 is effectively an actual Flight Validation task for which the Instructor FVP and the FVP candidate are paired together as crew. Guided and supervised by the Instructor FVP, the candidate will go through all steps necessary for a Flight Validation task, as described in this document, including Pre-Flight Validation, Flight planning and actual flight execution.

After 12 Flight Validation Missions, and when seen fit by the Instructor FVP, the candidate will then undergo the final exam.

The 12 Missions under supervision should comprise at least 2 Approach (both Precision as well as Non-Precision) and 2 SID / STAR procedure plus 2 RNAV / PBN procedures.

2.2.4 Final Exam

The final exam is a two-stage exercise, comprising a written test and an actual Flight Validation

Part A: Written Test

This test of 50 questions will touch on all aspects of Flight Validation as per this training document, relating both to the initial training element as well as to company procedures.

Note: this Written Test may be taken right after completing the Ground based Training as per Module 1-13

Part B. Actual Flight Validation

Here, the candidate must prove that he/she is capable of performing a flight validation according to the standards and procedures described by ICAO and the company.

When seen as being appropriate by the Instructor FVP, that flight test may take place on an actual Flight Validation of the company. In case no suitable project is available at the time, the Instructor FVP will prepare a dummy-project for the candidate to flight validate.

The terms of the flight test go very much along the terms of a regular line check that every pilot in the company has to undergo once a year. It is not so much that single, specific items of the itinerary are subject of this test (e.g. like holding speed and altitude on a steep turn), but the complete package of procedure validation has to be shown to be mastered by the candidate.

2.2.5 Training of Flight Inspectors in the Flight Validation Domain

As per 1.2 and 2.1 of this proposal, a formal training for flight inspectors in flight validation is not defined as per ICAO. In an ideal world, any flight inspector intending to operate in the arena of flight validation would go through the complete syllabus of this proposal. However, strictly speaking, this is not a requirement. In case a full participation cannot be assured due to operational reason, availability, etc., the minimum recommended amount of Modules to be attended as per this syllabus are as follows:

▶ **Module 1: General Introduction to Quality Assurance and Validation of Instrument Flight Procedures**

Module 2: General Criteria for Flight Procedure Design

Module 6: Performance-based Navigation (PBN)

Module 7: ARINC 424 Database Coding

▶ **Module 12: Introduction to Company Procedures and Equipment**

Module 13: Pre-Flight Validation

Module 14

In Module 14 the Flight Inspector joins up with the Flight Validation Pilot candidate to perform flight validation tasks under supervision.

Braunschweig, 03 Mar 2017

TransPolar GmbH



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