ANI

AIR NAVIGATION INSTITUTE

Course Level

IFP Initial

PANS-OPS Basic Classroom

Duration	2 parts of 3 weeks	
Tuition Fee	CHF 8200 per participant	
Instructors	Beat Zimmermann (IFP)	Romano Germann (IFP practical)
Certificate	ANI Certificate	

Questions at a glance	Answer
ICAO recognised?	No, there is no such thing as an ICAO recognition for training. ANI is a State-approved training provider and complies with all ICAO training regulations.
Pre-requisites?	Yes. Please see below for details.
Does ANI provide accommodation?	No. Please check the hotel list provided in the location documentation.
Daily schedule?	9.00 - 16.00
Weekly schedule	Monday Morning to Friday Midday
Venue?	Please check the information in the course calendar.
Mobile Phones?	Absolutely and strictly forbidden in the class!

1. ANI Procedure Design Training Program and Concept

All ANI Procedure Design/PANS-OPS courses cope with ICAO document 9906 "Quality Assurance Manual For Flight Procedure Design", vol. II "Flight Procedure Designer Training".

2. General Concept

According to ICAO doc. 9906, vol. II, Flight Procedure Designer Training must be competency based. This results in a fundamental difference from traditional education. Traditional education is centered on the teacher and the unit of progression is time. In other words, the class will progress to the next topic whenever the teacher says so. It is up to the student to understand the material in the allocated time.

In competency based education however, the teaching is centered on the learner and the unit of progression is the mastery of the skill. That leads to the conclusion that everybody in the class must understand and prove mastery before progressing to the next topic.

This is no problem when the timeframe of the education is not limited. Typical examples of competency based education are the training for the Private Pilot's License or musical instrument education. The progress is tailored to the learner.
In Procedure Design courses we encounter the issue that the course must be delivered in a certain timeframe. Therefore the allocated time for the individual topics must ensure that the learner will master the skill. For that reason, the ICAO doc. 9906 vol. II specifies pre-requisite Skills, Knowledge and Attitudes (SKAs) for initial training. When the student complies with these, reasonable assurance exists that the individual topics and skills will be mastered in a given time.

3. Pre-requisite SKAs

(extract from ICAO do. 9906, vol. II)

3.3.1 Mathematics

3.3.1.1 Algebra
Students should be competent in Algebra to at least the level of resolving equations with 2 unknowns and handling operations of the 3rd level (Exponentiation, Radical, Logarithms, Angular functions). This requirement will assure the understanding of formulas given in the relative criteria documents as well as the ability to follow rationales, on which certain criteria are based.

3.3.1.2 Geometry
Students should be familiar with the classical Euclidian Geometry (Plane Geometry, Solid Geometry) as well as Thales and Pythagoras constructions.

3.3.1.3 Trigonometry
Students should be competent in all Trigonometry Functions such as Sine, Cosine, Tangent, Cotangent, Secant and Cosecant. Furthermore they should be familiar with Trigonometry Theorems such as the Theorem of Sines and the Theorem of Cosines.

3.3.1.4 Probability and Statistics
Students should have basic knowledge of Statistical and Probability Mathematics, particularly an understanding of the Gaussian (Normal) distribution.

3.3.2 Aviation or Aviation-related pre-requisites

The job profile of an Instrument Flight Procedure Designer requires knowledge in various fields of activity in aviation. Training providers are encouraged to offer ab-initio training and that the following prerequisites are met by the student so as to ensure that the length of training can be optimized.

3.3.2.1 Air Traffic Management
Students should demonstrate fundamental knowledge of Air Traffic Management (ATM) as in ICAO doc. 4444 (PANS-ATM), as well as understanding the broad concept of ATM which consists of ATS including ATC (Air Traffic Control), ATFM (Air Traffic Flow Management) and ASM (Airspace Management), other fields related to ATM such as route spacing, ATC separation, aviation weather, etc.

3.3.2.2 Navigation, Navigation Systems and Geography
Students should demonstrate knowledge of Navigation, Navigation Systems and Geography to the level of any pilot's licence with Instrument Rating (IR). It is however not a requirement to hold such a license.

3.3.2.3 Aircraft Operations
Students should demonstrate knowledge of the basics of flying and aerodynamics. It is however not a requirement to hold a pilot's license.

3.3.2.4 Aircraft Performance
Students should demonstrate knowledge of Aircraft Performance to the level of any pilot’s license with Instrument Rating (IR). It is however not a requirement to hold such a license.

3.3.2.5 Aeronautical Information Services
Students should demonstrate fundamental knowledge of Annex 15 (Aeronautical Information Services).

3.3.2.6 Aerodrome safeguarding
Students must be familiar with the basic requirements for aerodrome safeguarding (Annex 14 Obstacle limitation surfaces, Aerodrome reference codes).

3.3.2.7 Geodesy
Geodesy, also called geodetics, is the scientific discipline that deals with the measurement and representation of the earth, its gravitational field and geodynamic phenomena (polar motion, earth tides, and crustal motion) in three-dimensional time varying space. Geodesy is primarily concerned with positioning and the gravity field and geometrical aspects of their temporal variations, although it can also include the study of the Earth's magnetic field.

Students should demonstrate fundamental knowledge in the following areas of Geodesy:

• Geoid and reference ellipsoid
• Coordinate systems in space
• Coordinate systems in the plane
• Heights
• Geodetic Datums and Datum conversion • Point positioning
• Units and measures on the ellipsoid
• Geodetic Principal Problem
• Geodetic Inverse Problem

3.3.3 Language

In order to progress through the competency-based training outlined above, trainees need to demonstrate their ability to achieve terminal objective related to the competency elements. As training will be delivered within a certain timeframe, it is important that trainees learn the material within the time allocated. For this reason, proficiency in the language in which training will be delivered (instruction and training materials) is essential.

For courses in English, it is suggested that training providers require a score of 550 in the written TOEFL (Test of English as a Foreign Language), 213 in the TOEFL Computer Based Test, 79 in the TOEFL Internet Based Test and 750 in TOEIC (Test of English for International Communication) for students whose native language is not English. Alternatively, a score of 6.5 in the IELTS Academic Module (International English Language Testing System) can be accepted. Students having studied at an English speaking institution for one year or longer can be exempted from providing a TOEFL or IELTS score. Note: For ANI courses, an ICAO language proficiency Level 5 is also accepted.

(end of extract)

4. Training Phases

The above pre-requisite SKAs refer to entry into "initial training", which according to doc. 9906 is the first time that a Flight Procedure Design Student gets in touch with actual Flight Procedure Design criteria. Any required training to get to that level is called "ab-initio". Initial Training **MUST** be followed by an On-the-Job (OJT) training phase. The length of such a phase can be specified be the PDSP (Procedure Design Service Provider). Typically an OJT phase will not be shorter than 15 weeks.

5. Initial Training Program

The ANI initial training program consists of 2 levels.

Level 1: All basic concepts, non-precision approach design, departures, holdings, en-route, all according conventional ground-based navigation

Level 2: PBN concept, PBN non-precision approaches, PBN departures and holdings, ILS (also in combination with PBN).

Due to the complexity and the quantity of the material in PANS-OPS, APV-Baro VNAV, SBAS-APV and GBAS criteria as well as RNP and RNP AR (Authorisation Required) criteria are classified „advanced“ and are NOT part of the initial training but are part of the advanced training concept.

For educational reasons (cognitive load, sensory overload) the initial training at ANI is split into 2 parts of 3 weeks each. The break in between the parts is typically around 4-8 weeks. The break allows the students to consolidate the fundamentals and to relax their brain a bit before learning the more demanding and more complex material in part 2. We are fully aware that this requires 2 trips to the training location, but the fact that the student will absorb the learnt material much better will make up for this. Furthermore it limits the time out of the office and away from families to 3 weeks.

6. OJT

An OJT phase must be provided by the employer, allowing the student to apply his skills in a practical environment. This must be under the supervision of a trained and experienced Flight procedure Designer.

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7. Course Rundown

Topic	Description	Part
Introduction	What is the task „Flight Procedure Design“ about? Issues and Challenges.	1
Situational Awareness	Knowing the environment for which a procedure is developed. Obstacle situation, databases, vegetation.	1
The PANS-OPS	Who writes the criteria, how do they make their way into PANS-OPS. ICAO history and document levels.	1
IFP basics	Principles used in Flight Procedure Design. Tolerances of Navigation Signals and Flight Technical Errors.	1
Annex 14 OLS	Obstacle Limitation process around airports. Effect on procedures.	1
Unit Conversions	Conversions between typical aviation units and SI-Units.	1
General Principles	Some principles used in the design of procedures. Normal operations, rounding etc.	1
IAS to TAS	Conversions from IAS to True Air Speed	1
Segments on an NPA	Segments possibly existing in Non-Precision Approaches.	1
Terminal Area Fixes	Types of Fixes used in the Terminal Area. Explanation of some Legacy type fixes (Markers, Radar).	1
Turn Calculations	Newton’s Law of Circular Motion. Calculations of turn radii, Rate of turn.	1
Turn Protection	Protection of turns with wind influence. Omnidirectional wind, wind spirals and bounding circles.	1
Aircraft Categories	Categorization of Aircraft based on Threshold Speed.	1
Arrival Segment	Navigation and restriction for implementing an Arrival Segment. Protection Areas and Obstacle Clearance	1
Initial Approach Segment	Initial Approach concepts. Straight, DME Arcs and Reversal Procedures. Construction of Protection for Procedure Turns, Base Turns and Racetrack/Holding Patterns.	1
Intermediate Segment	Intermediate Segment protection and Obstacle Clearance.	1

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Topic	Description	Part
Final Approach Segment	Possibilities to apply Final Approaches. Criteria to define straight-in minima. Protection and Obstacle Clearance.	1
Missed Approach Segment	Calculation of Start of Climb. Obstacle assessment in straight missed approaches. Construction methods for turning missed approaches. Turn at a point, turn at an altitude.	1
Circling	Constuction and obstacle assessment for circle-to land minima.	1
Minimum Sector Altitudes	Definition of sectors, Obstacle assessment and publication.	1
Charting/AIP	Chart titles, published information for approaches. Some examples.	1
Departures	Principles for establishing departure routes. Obstacle assessment, climb gradients and clean-up altitudes.	1
Holding	Application of Holding Templates on a VOR/DME Fix. Inbound to and outbound from the station.	1
Area Navigation Introduction	History of Area Navigation Methods and Systems.	2
Are Navigation Basics	Basic Concepts in Area Navigation.	2
ARINC 424 Path/Terminators	ARNINC 424 Database concepts.	2
PBN Concept	The ICAO PBN Concept. History and available Navigation Specifications and their purpose.	2
Navigation Sensors in PBN	Theory and System behaviour of VOR/DME, DME/DME and Basic GNSS Navigation.	2
Protection Concept	Protection Areas for PBN.	2
T/Y Bar Layout Concept	Layout concept for approaches that reduces track miles for operators.	2
Terminal Arrival Altitude	Flexible Arrival Concept if no STARS are used.	2
PBN Turn Protections	Protection technique for PBN turns based on the path/Terminator concept.	2
PBN Departures	PBN specifics when developing departure procedures.	2
PBN Holdings	Holding technique in PBN, protection and obstacle clearance.	2
ILS General Principles	Introduction to ILS Systems, Precision approach operations.	2
Linear Surface Equation	Calculating height on linear surfaces with reference to a specific point.	2

Topic	Description	Part
Precision Segment Basic ILS	Obstacle assessment with Basic ILS Method	2
OAS Cat I	Obstacle Assessment with OAS Method for Cat. I	2
OAS Cat II	Obstacle Assessment with OAS Method for Cat. II	2
Collision Risk Model	CRM Theory and sample scenario.	2
Legacy Missed Approach	Constructing missed approach with legacy navigation after ILS.	2
LOC only	Criteria for GP inop procedures.	2
PBN in combination with ILS	Initial/Intermediate and Missed Approach in combination with ILS Final Approach.	2

8. Practical Project

Last week of Part 1 is a Team Project on a real airport with a task to design a VOR Approach, a Departure Route and a Holding.

The last 7 working days of part 2 are a Team Project on a real airport with a task to design an approach to an LNAV minimum, a PBN departure and an ILS approach to Cat. I and Cat. II minima with PBN Initial/Intermediate and Missed Approaches.

9. General expectations

ANI Classroom courses have a **strict** mobile phone and social platform ban during the classes. There are frequent breaks (1 break per hour) that will allow students to make calls if necessary.

Furthermore, please be on time for the lectures. We lose precious time if we have to wait for individuals.

Show an effort achieve a good level of expertise. This is especially important when you come back for part 2 of the course. Make sure all basic competencies are still 100% present.