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Course Level

IFP Initial

PANS-OPS Basic Classroom

Duration	This is a four month study program with 2 parts of six weeks presence tuition	
Tuition Fee	CHF 8500 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 - ca. 16.00 during the presence modules
Weekly schedule	Monday Morning to Friday Midday
Venue?	ANI Training Center
Mobile Phones?	**Absolutely and strictly forbidden in the class!**

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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. That is simply not always possible as there are people with different backgrounds and people coping with complex material quicker.

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.

In order to evaluate the expected performance during the course, students who wish to participate a PANS-OPS Basic course at the ANI **must perform the pre-requisite test in the ANI Online Test Center.** The test results will show us if there are critical areas to work on before the course starts or if the foundation is all too weak.

3. Pre-requisite SKAs

The below pre-requisites are evaluated with a **mandatory pre-requisite test** that is taken in the ANI Online Faculty Test Center. It gives us and also the student an idea where he might have deficits. Pre-requisite tests can only be taken one within six months. The overall pass mark is 80% with individual pass marks also defined for certain areas like Trigonometry, Algebra etc. Critical topics must not be failed (e.g. Trigonometry). If a potential participant scores below 80% he is not automatically refused to attend but is informed that he might face some extra efforts during the course and he risks that the overall grade of the course might be a fail. See paragraph 9 „testing and grading“ for more info. ANI refuses to take participants who score below 20% in the pre-requisite test.

(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 license 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.

(end of extract)

Note: For ANI courses, an ICAO language proficiency Level 5 is also accepted.

If no English Language Certificate is available this can also be done from the ANI online Test Center with a 50-Minute English Test.

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 is a four-month training program with 2 times three weeks of presence lecturing. Outside the presence modules the student will self-learn and self-prepare through ANI-produced Videos, online keynote-lectures and reading. The students is continuously tested for learning progress. Live Video Q&A sessions are held to ensure that students are working on their tasks and receive the necessary assistance.

Presence tuition Level 1 then consolidates all basic concepts and covers non-precision approach design, departures, holdings in detail, all according the criteria for conventional ground-based navigation. Apart from skill mastery exercises on a fictitious airport the students will also perform a team project to consolidate their skills and knowledge in real scenario with interaction with stakeholders like Airport Authority, Operator, ATC etc.

Between the Level 1 and Level 2 presence tuition there is homework again, tasks to study videos and work through keynotes. Before starting Level 2, all required theory and practical tests for Level 1 must be completed.

Level 2 covers the PBN concept, PBN non-precision approaches, PBN departures and holdings, ILS operations (also in combination with PBN) in detail. After the PBN theory there is again a team project to consolidate the learnt material in a real scenario. ILS practical is performed on the ANI-created fictitious airport because the learning effect is much better like that and important challenges can be addressed.

After the Level 2 presence tuition there is an inventory period of delivered tests and work, evaluation of the observed behaviours in the class and in the project teams as well as evaluation of the project work. This is also the period when students can do homework that was not completed before, retake tests that were not completed at a satisfactory grade etc.

After four months from the starting date the training program is completed and in case of successful completion, an ANI Certificate of successful completion is issued. In case of non-successful completion, a certificate of attendance is issued. In the latter case the full testing can be repeated after 6 months earliest for a fee of CHF 300.

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 presence training at ANI is split into 2 parts of 3 weeks each. As the material is complex and there is a lot of it, ANI decided to expand the training to a four-month program using all modern learning tools and techniques like video self-study, video live tuition and online testing. This allows to focus on more complex issues in the presence tuition as well as discussing specific cases and allowing more time for consolidating the learnt material. The break in between the presence parts is typically around 4-8 weeks and requires the students to do some self-studying in that period. 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. We are convinced that with this four-month program we can gear up future procedure designers with the necessary toolbox to function in their OJT after initial training.

Also before the start of the course we ask students to purchase and read the book „Instrument Flight Procedures“ from Jens Gjerlev https://aurinko.no. This is essential for better understanding of the big picture.

6. OJT

An OJT phase must be provided by the employer after the initial training, 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.

7. Course Rundown

Topic	Description	Part
Icebreaker session, getting to know each other	Introduction of everybody, professional background, personal info, etc.	Initiation Webinar
The rundown of the training, access to the online learning and online testing platforms.	Where to find the material, where to find the tests, self-check of the progress etc.	Initiation Webinar
What is Flight Procedure Design?	What is the task „Flight Procedure Design“ about? Obstacles and tolerances.	Video lecture
ICAO Documents	What is the status of ICAO documents and what „power“ do they have. How does the writing and maintenance process work?	Video lecture
The IFP Process	All steps in the Quality Assurance Process of a Procedure	Video lecture
IFP basics	Principles used in Flight Procedure Design. Tolerances of Navigation Signals and Flight Technical Errors.	Video lecture
Annex 14 OLS	Obstacle Limitation process around airports. Effect on procedures.	Video lecture
Unit Conversions	Conversions between typical aviation units and SI-Units.	Video lecture
Situational awareness	Knowing the place we design for, national or local regulations to comply with, co-operations required	Video lecture
General Principles	Some principles used in the design of procedures. Normal operations, rounding etc.	Video lecture
IAS to TAS	Conversions from IAS to True Air Speed	Video Lecture
Aircraft Categories	Categorization of Aircraft based on Threshold Speed	Video lecture
Live Video session	Q&A, discussion, assistance	before part 1 presence tuition
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

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Topic	Description	Part
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
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
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
Team project	Team project for conventional NPA, SID and holding in real environment with stakeholder interaction.	1
Area Navigation Introduction	History of Area Navigation Methods and Systems.	Video lecture
Area Navigation Basics	Basic Concepts in Area Navigation.	Video lecture
ARINC 424 Path/Terminators	ARNINC 424 Database concepts.	Video lecture
Navigation Sensors in PBN	Theory and System behaviour of VOR/DME, DME/DME and Basic GNSS Navigation.	Video lecture

Topic	Description	Part
PBN Concept	The ICAO PBN Concept. History and available Navigation Specifications and their purpose.	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
PBN team project	Team project for PBN NPA, SID and holding in a real environment with stakeholder interaction	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
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 second week of part 2 is a Team Project on a real airport with a task to design an approach to an LNAV minimum, a PBN departure and a Holding. Furthermore, the procedures will be converted to a proposed coding table and a sample chart has to be made.

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9. General expectations and Student Attitude

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. Note that we also rate the student's attitude in the grading.

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. **If you have weaknesses in the mathematical foundations try to get rid of them as quickly as possible.**

For the practical design ANI requires that a computer aided design tool without procedure design automation is used. If a professional CAD software like AutoCAD or Bentley Microstation is available that is great. If not, a free open source tool like Librecad can be used www.librecad.org.

Important is that the student is familiar with the basic drawing functions of such tool, draw lines, circles, construct side and angle bisectors, offset lines, trim and extend lines, rotate, copy.

Alternatively we allow design with pencil and paper.

9. Testing and Grading

We at the ANI were always of the view that it is not our task to pass or fail people but that it is our responsibility to help the student to achieve the best possible level and to provide a feedback on what to focus in the OJT. Every now and then we saw students struggle in the course and then develop nicely in the OJT.

Nevertheless we had to introduce a testing and grading system in order to provide the student a continuous feedback on his learning progress. All the theory tests can be taken in the ANI Online Test Center. Some tests are purely for the purpose of monitoring progress, some will be part of the final grading along with the subjective rating of the performance during the lectures as well as the practical projects.

The following grades exist for the individual tests as well as for the final certification:

Grade	Required Result
Summa Cum Laude	100% correct in theory questions. Save, correct and flyable result in practical exercises at the first attempt.
Magna Cum Laude	95-99% correct in theory questions. Save, correct and flyable result in practical exercises at the first attempt.

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Grade	Required Result
Cum Laude	90-94% correct in theory questions. Save, correct and flyable result in practical exercises at the second attempt.
Pass	80-89% correct in theory questions. Save, correct and flyable result in practical exercises at the third attempt.
Fail	20-79% correct in theory questions. Still incorrect results in practical exercises at the third attempt.
Wrong job	0-19% correct in theory questions. Still incorrect results in practical exercises at the third attempt.

Important:

ANI offers any student with a fail grade to re-take all mastery tests after their OJT but not before a year after the end of the course taken to receive a pass grade. The fee for this re-taken exam is CHF 300.

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10. Registration

Participants can register for the course by sending the online registration. Please be aware that the registration must not be sent before the participation and the budget for it is approved. Sending the form means that the course fee is owed and the cancellation policy is accepted.