



Aeropath

Aeronautical information
& flight procedures

Instrument Flight Procedures Training



Get your Procedure Designers ready for PBN Implementation

Aeropath: Experienced procedure designers, effective training solutions

Aeropath is the largest commercial procedure design organisation in Asia Pacific and has decades of design experience throughout the region. We have used our experience to develop a training syllabus that effectively covers the spectrum from fundamental concepts to advanced Performance Based Navigation (PBN). Our courses have been built by designers and training experts, with both new and experienced designers in mind.

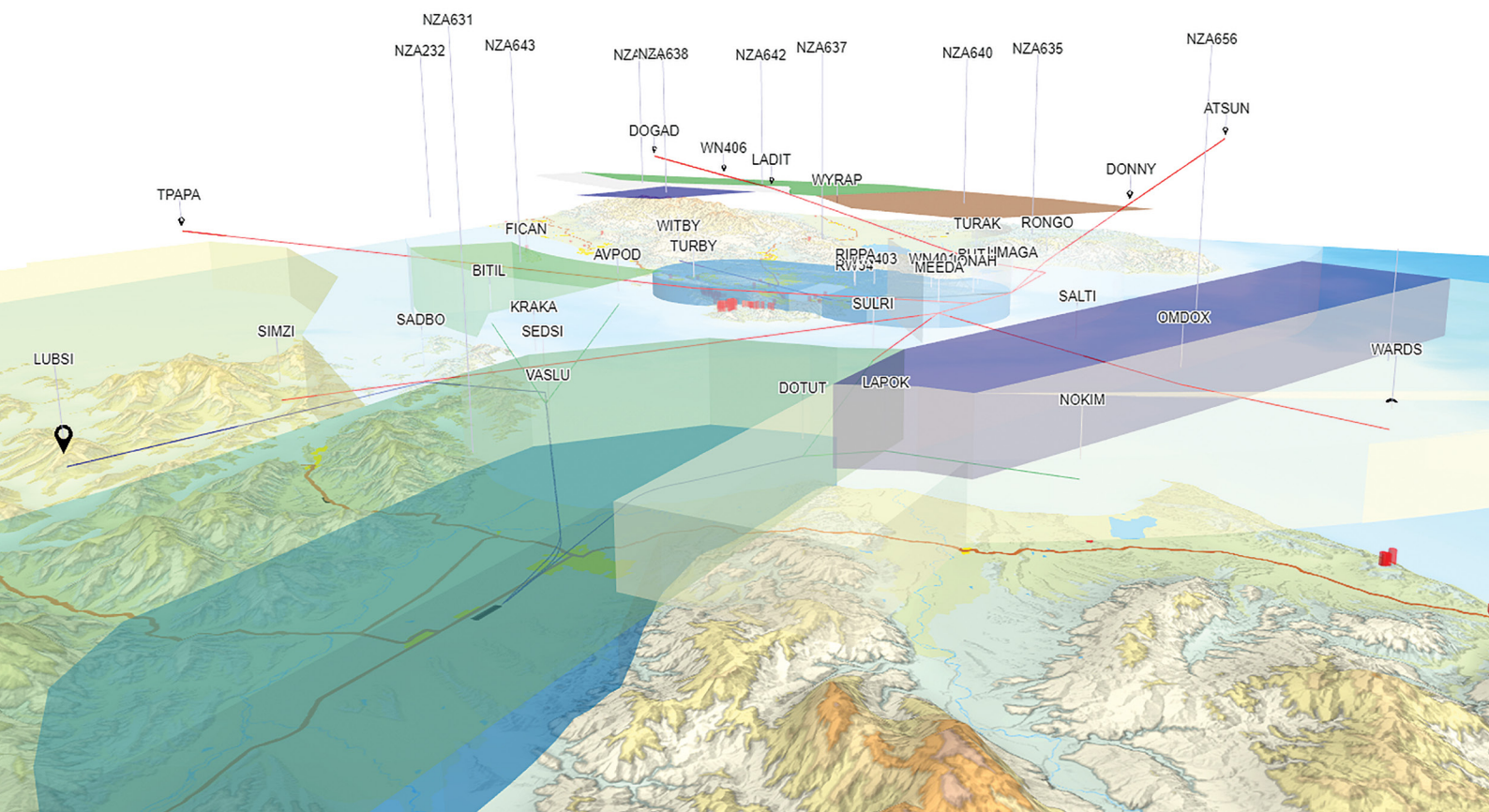
All Aeropath procedure designers are trained to the highest international standards. We operate in a variety of regulatory environments and the terrain we encounter is varied and challenging. Our customers include state regulators, ANSPs, airlines and airport authorities. Our broad experience is reflected in our training, ensuring a great fit with your organisation's needs.

We have options for instructor-led and remote learning to suit your style and budget. We also offer stand-alone courses that teach fundamental skills and concepts beneficial to any aviation professional.

All Aeropath training options can be supplemented with a unique mentoring package, where our industry-leading designers come to your site to work with your team in their environment to consolidate their training.

Our courses and mentoring programmes are delivered by active designers, so on-the-spot feedback can be offered and real-world solutions discussed. The working relationships that result from our approach ensure that your team remains part of a global network of design professionals.

Accelerate your PBN implementation with Aeropath training.



Instructor-led training

Our designers, instructors, training material, and software are world-class. Aeropath holds certifications from multiple jurisdictions and is a contributing member to the ICAO Instrument Flight Procedures Panel (IFPP). We have received ICAO recognition for PBN and conventional procedures, and our practices are aligned with the latest ICAO Standards and Recommended Practices (SARPs).

We offer instructor-led training options from basic to advanced. We also offer the ability to customise the in-course content to meet your learning requirements, offering you a practical and cost-effective solution for your specific training needs.

The duration of our training varies, depending on the topic and experience of the participants. For example, a training package for **new procedure designers** can be completed in as little as eight weeks and includes all the necessary subjects to start designing – General Criteria, Conventional Procedures, and Performance Based Navigation.

We also offer a range of advanced courses for **experienced designers** to enhance their skills and maintain their competency according to the latest criteria. Advanced courses include SBAS, RNP-AR, Point in Space, ARINC424 and a module dedicated to PANS-OPS recurrent training.



In Focus: Performance based Navigation (PBN)

Performance Based Navigation (PBN) specifies the system performance requirements for an aircraft operating RNAV or RNP. PBN is defined in terms of accuracy, integrity, continuity and functionality required for the proposed operations in the context of a particular airspace concept, when supported by the appropriate NAVAID infrastructure.

Performance requirements are identified in navigation specifications, which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications provide specific implementation guidance for states and operators in order to facilitate global harmonisation.

The PBN navigation requirements are first defined based on operational requirements. Operators then evaluate options in respect of available technology and navigation services. A chosen solution would be the most cost-effective for the operator, as opposed to a solution being established as part of the operational requirements. Technology can evolve over time without requiring the operation itself to be revisited, as long as the requisite performance is provided by the RNAV or RNP system.

Instructor-led training

Course descriptions

We offer the following selection of courses in an instructor-led, classroom environment (in-person or virtual):

- ▶ **PANS-OPS General Criteria and Conventional Procedure Design**
- ▶ **PANS-OPS Performance-Based Navigation Procedure Design**
- ▶ **ICAO Doc 9905 RNP-AR Procedures**
- ▶ **Helicopter Point in Space Procedures**
- ▶ **PANS-OPS Procedure Design Update**
- ▶ **ICAO Annex 14 Obstacle Assessment and Management**
- ▶ **ARINC 424 Procedure Coding**



In Focus:

Area Navigation (RNAV)

RNAV specifications do not require on board navigation performance monitoring and alerting. RNAV tracks will normally require monitoring by ATC surveillance systems to achieve desired performance and separation safety standards.

This requirement implies near universal surveillance coverage for RNAV specifications. In oceanic airspace this is provided by ADS-C, and in domestic airspace by a network of radar systems (PSR & MSSR). The surveillance of domestic airspace will also include Wide Area Multilateration (WAM) and ADS-B.

The current and legacy aircraft operations are suited for RNAV. However, as a stand-alone specification it is insufficient to support many of the new Air Traffic Management (ATM) applications envisaged in strategic plans (e.g. 3D, 4D ATM concepts).

PANS-OPS General Criteria and Conventional Procedure Design

The course is based on ICAO PANS-OPS Doc 8168 Volume II Construction of Visual and Instrument Flight Procedures; it describes the essential areas and obstacle clearance requirements for the achievement of safe, regular instrument flight operations.

Pre-requisites: Background in aviation or relevant qualifications (e.g. Pilot, Air Traffic Controller, Dispatcher, Aviation studies etc.) and a good understanding of mathematics and trigonometry.

Duration: 4 weeks

Syllabus:

- ▶ Introduction & General Design Criteria
- ▶ ICAO Overview
- ▶ Ground Based Navaids
- ▶ Approach Classifications
- ▶ Fixes
- ▶ Turn Area Construction
- ▶ NPA Introduction
- ▶ NPA Final Segment
- ▶ NPA Intermediate and Initial Segments
- ▶ NPA Reversal and Racetrack Procedures
- ▶ Missed Approach Segment
- ▶ Conventional Holding Procedures
- ▶ Circling Approach
- ▶ Minimum Sector Altitude
- ▶ Instrument Approach Charts
- ▶ PA Introduction and ILS Principles
- ▶ PA Basic ILS and Obstacle Assessment Surfaces (OAS)
- ▶ PA Exercise
- ▶ Collision Risk Model
- ▶ Visual Segment Surface
- ▶ Departures
- ▶ Omnidirectional Departures
- ▶ Straight and Turning Departures
- ▶ En-route Procedures
- ▶ Standard Arrival Procedures
- ▶ Practical Application



PANS-OPS Performance-Based Navigation Procedure Design

This course explains the components required for the construction of RNAV instrument flight procedures based on the Global Navigation Satellite System (GNSS) and BARO-VNAV procedure design criteria.

Pre-requisites: Knowledge of General Criteria and Conventional Procedures

Duration: 4 weeks

Syllabus:

- ▶ PBN Introduction and RNAV/RNP Principles
- ▶ RNAV/RNP – Arrivals
- ▶ RNP – Final Segment
- ▶ RNP – Intermediate and Initial Segments
- ▶ RNAV/RNP – Missed Approach
- ▶ Terminal Arrival Altitude
- ▶ RNAV Departure Within Transition
- ▶ RNAV Holding Pattern
- ▶ Proposed Changes to PANS-OPS Criteria
- ▶ APV (BARO-VNAV)
- ▶ Practical Application

ICAO Doc 9905 RNP-AR Procedures

This course covers approaches with vertical guidance (APV) including the RNP AR and a revisit of the Baro-VNAV procedure design criteria.

Pre-requisites: Knowledge of General Criteria, Conventional Procedures and Performance Based Navigation.

Duration: 1 week (minimum 3 days)

Syllabus:

- ▶ RNP AR General Criteria
- ▶ RNP AR – Arrivals
- ▶ RNP AR – RNP Final Segment
- ▶ RNP AR – Intermediate and Initial Segment
- ▶ RNP AR – Missed Approach
- ▶ Practical Application

Helicopter Point in Space Procedures

A specialised course that covers the general criteria and area navigation (RNAV) approach procedure applicable to helicopters only.

It also covers the Point in Space approach and departure procedures consisting of an instrument segment followed by a visual segment or vice versa.

Pre-requisites: Knowledge of General Criteria, Conventional Procedures and Performance Based Navigation.

Duration: 1 week (minimum 3 days)

Syllabus:

- ▶ Helicopter Criteria and Procedures
- ▶ Point in Space Approaches
- ▶ Point in Space Departures
- ▶ HAS Diagram
- ▶ Practical Application

PANS-OPS Procedure Design Update

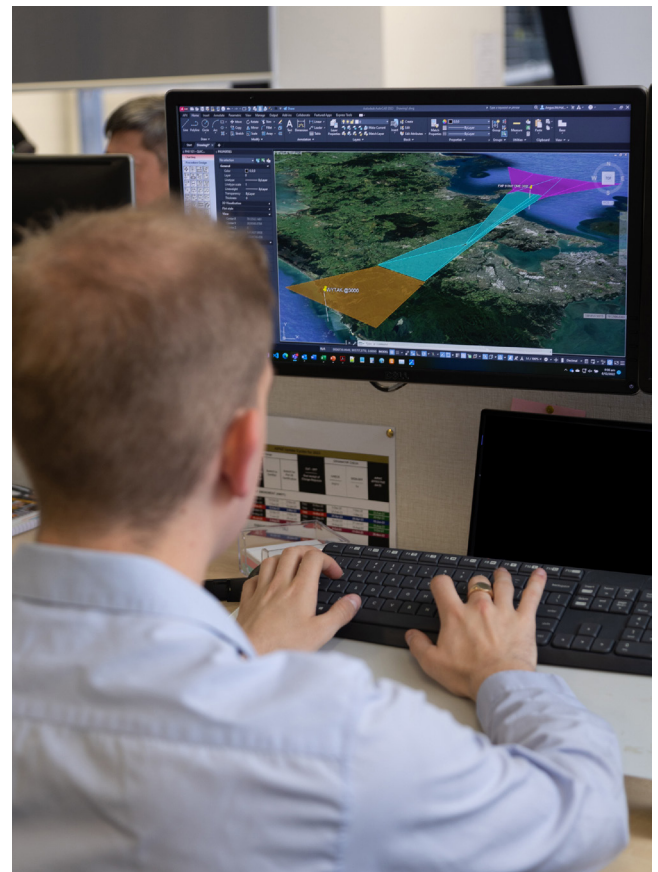
This course will cover new amendments to PANS-OPS and future developments, and assess the impacts and associated risks on existing flight procedures or the implementation of new ones.

Pre-requisites: Procedure Design Experience.

Duration: 1 week

Syllabus:

- ▶ PANS-OPS Changes in the Last 24 Months
- ▶ Future Developments
- ▶ Customer-Specific Requirements
- ▶ PANS-OPS Proposed Changes
- ▶ Forum Discussion



ICAO Annex 14 Obstacle Assessment and Management

This course provides airport operators or obstacle control personnel the necessary skills to evaluate aerodrome obstacles from a practical perspective.

It describes different methods to efficiently evaluate obstacles within the vicinity of the airport, including the straight segments of published flight procedures.

Pre-requisites: Background in Annex 14 / PANS-OPS.

Duration: 1 week

Syllabus:

- ▶ Fundamentals
- ▶ Frame of Reference
- ▶ Phases of Flight
- ▶ Aircraft Performance
- ▶ Aerodrome Infrastructure
- ▶ ICAO Annex 14 OLS for Aerodromes
- ▶ Annex 14 new OFS and OES concepts
- ▶ Obstacle Restriction and Removal

- ▶ Obstacle Free Zone
- ▶ State-Modified OLS
- ▶ Understanding PANS-OPS Procedures
- ▶ Communication, Navigation and Surveillance (CNS) Facilities
- ▶ Application of Shielding Principles
- ▶ Protection of Visual Slope Indicator Systems
- ▶ Marking and Lighting of Obstacles
- ▶ Aeronautical Studies Overview

ARINC 424 Procedure Coding

Pre-requisites: Familiar with instrument flying.

Duration: 3 days

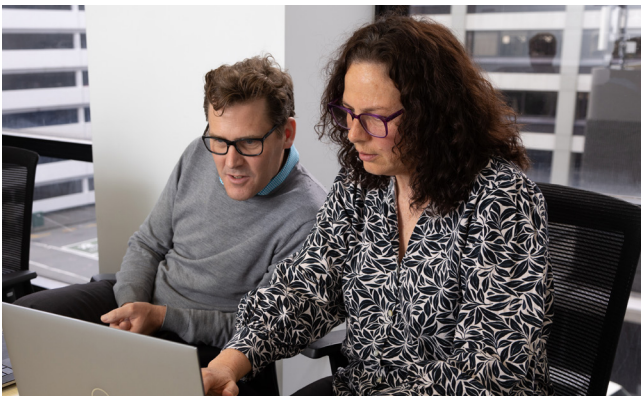
Syllabus:

- ▶ History and Introduction ARINC 424
- ▶ Data Chain
- ▶ Path Terminators
- ▶ ARINC 424 Format
- ▶ Coding For Designers and AIM
- ▶ Coding Limitations and Problems
- ▶ Practical Application



Customised training, mentoring and OJT

As you look through our training syllabus, you may find that you would like selected elements of one course combined with elements from others. You may also want to mix online training with in-person, instructor-led learning.



Please talk to our knowledgeable training experts and we will work with you to develop a training solution that meets your specific needs.

As an extension of our customised training, Aeropath can further support your designers by working with you to develop a tailored mentorship programme.

Our procedure design instructors and technical leads can work with your recently trained designers to provide online support, peer review and feedback, and can even visit your site to work with them in their own environment as they work on real-life tasks. Any of these mentoring activities will help consolidate learning with the experience of working on projects that matter to your organisation, all while under the guidance of our experienced designers.

Also see our On-the-Job Training (OJT) description on the following page for more information.

In Focus:

Required Navigation Performance (RNP)

RNP specifications require on-board navigation performance monitoring and alerting. This ensures that aircraft performance allows lower separation standards to be applied, and therefore ATC surveillance is not required. The on-board navigation performance monitoring and alerting is a necessary enabler for many new ATM applications:

▶ RNP approach:

represents the application of RNP APCH navigation specification. This application can include APV where required and operationally feasible.

▶ RNP AR approach:

represents the application of RNP AR navigation specification. Barometric VNAV is an integral part of this application.

Some of the RNP navigation specifications enable the application of more sophisticated functions available in RNP capable aircraft to further improve safety, reduce environmental impact and increase operating efficiency (e.g. RNP AR APCH).

Operational benefits:

- ▶ Reduced track distance, noise and fuel consumption
- ▶ Reduced separation standards for air traffic routes
- ▶ Greater flexibility of airspace design in terminal areas
- ▶ Reduced environmental impact
- ▶ Increased airspace capability
- ▶ Increased airport accessibility
- ▶ Reduced infrastructure costs

Procedure Design OJT

The final goal of training is to ensure flight procedure designers perform to the requirements specified in the company framework. This cannot be achieved solely through initial training; on-the-job training (OJT) is critical.

While OJT cannot be considered a specific training course in the formal sense, it is an essential phase in a training programme. Its purpose is to reinforce formal training and support the achievement of competency standards. Similar to initial training, the OJT curriculum will be derived from the competency framework and driven by training objectives. If appropriate, OJT phases can also follow advanced or refresher training.

We have developed an OJT programme for each of our training modules — these can be tailored to meet customer requirements.

Location: Wellington, New Zealand or on-site.

Duration: 1-6 months

Goal: Consolidate the knowledge and skills acquired during previous training. Training objectives are established from the competency framework and can be demonstrated through developing instrument

flight procedures of all types. The OJT objectives are close or equivalent to the expected job performance and help to reduce the number and type of error.

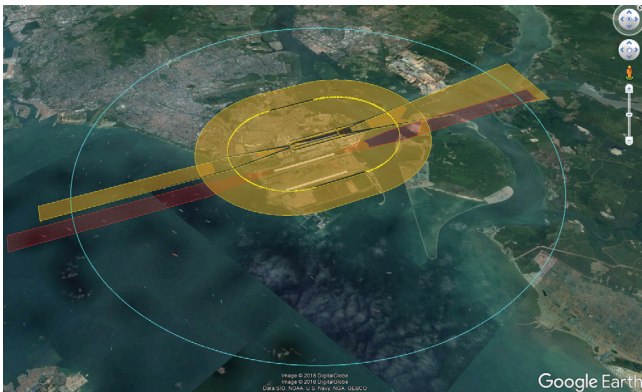
Description: Under the guidance of a qualified procedure designer, the trainee will go through the training objectives by designing the instrument flight procedures while considering constraints such as terrain, noise abatement, airspace management and user request. The trainee should collect data, design the selected procedures with the tools available at their procedure design unit, and acquire the employing organisation's method to integrate his/her work in the quality, validation and archiving processes specific to the organisation.

Additional: Use of specific tools such as Excel, QA, AutoCad, PHX; Description of specific tools such as Excel, QA, AutoCad, PHX; Use of regulations, aeronautical studies, and noise abatement; Pilot point of view: Flight simulation of the designed procedure.

Assessment: Ongoing assessment against performance criteria for each competency element as work is stated in ICAO Doc 9906 vol 2.



PHX | software and training



PHX, the procedure design software package developed by **Aeronautical Services and Procedures (ASAP)**, was released in February 2003 and is being successfully used by over 27 organisations worldwide, including multiple ANSPs and regulatory organisations. Unlike other procedure design applications, PHX is not an automated application but is instead a tool based software package, intended to assist professional procedure designers in the development, design, and validation of instrument flight procedures.

Aeropath's procedure design team has been a primary user of PHX since adopting it in 2005. Based on the extensive experience we have gained in using the PHX tool set, Aeropath has been recognised by ASAP as an authorised reseller of PHX throughout the Asia Pacific region, and is a recommended provider of PHX training courses. Please refer to our "PHX Procedure Design Application Training" module on this page for details of our PHX training syllabus.

Both new and experienced procedure designers will agree that a tool based procedure design software package has many advantages over an automatic system.

For more information on PHX please visit www.asap.sk or www.aeropath.aero



PHX Procedure Design Software Training

This training course covers a PHX fundamentals programme which can include the tools required by your organisation from the syllabus below; this syllabus is proven to establish the necessary familiarity with the functionality of the PHX procedure design software, leading to proficiency with ongoing use of the application in day-to-day design tasks. It is combined with selected modules covering ground validation processes, which ensure the PHX reporting tools can be used to their full advantage in your design and review processes.

Pre-requisites: Prior working knowledge of AutoCAD.

Duration: 3 weeks

Syllabus:

▶ PHX User Interface and Set-up

- ▶ Settings Dialog Box
- ▶ Construction Layer
- ▶ Common User Interface Elements
- ▶ Status Bar
- ▶ Input Units

▶ PHX Quality Assurance System and Position Tools

- ▶ Quality Assurance Assistant (QA)
- ▶ Symbol Insertion
- ▶ Basic Calculation and Conversions
- ▶ Layer Copy
- ▶ Theoretical Magnetic Variation
- ▶ Determination
- ▶ Multi Scale
- ▶ Determine Bearing and Distance
- ▶ Multi Width
- ▶ Determine Position
- ▶ Multi Rotate

▶ **Import and Export of Data, Insert Maps and Digitise Map Data**

- ▶ Data Import
- ▶ Polyline to 3D Circles
- ▶ Data Search and Change
- ▶ Polyline Weeding
- ▶ Scanned Maps
- ▶ External Reference Manager
- ▶ 3D Obstacles Digitising from Map
- ▶ Database Export
- ▶ Contours Altitude Adjustment
- ▶ Mountainous Terrain Analyser

▶ **Calculation of Obstacles/Terrain and Construction of Protection Areas**

- ▶ Nominal Turn Construction
- ▶ Turn Protection Area Construction
- ▶ Radial Tolerance Construction
- ▶ Profile Manager
- ▶ Secondary MOC Calculation
- ▶ Visual Surfaces
- ▶ True Airspeed Calculation
- ▶ 15% Area Analyser
- ▶ DME Tolerance Slant Range

▶ **Departure and Missed Approach**

- ▶ Departure Average Flight Path Construction
- ▶ Standard Departure
- ▶ Omnidirectional Departure Obstacle Analyser
- ▶ Initial Missed Approach Obstacle Analyser
- ▶ Turn Area Obstacle Analyser
- ▶ Enroute, Circling, Holding and MSA
- ▶ Overhead Tolerance Construction

▶ **Enroute Turn Overhead a Facility**

- ▶ Holding Pattern Templates
- ▶ Approach Alignment
- ▶ VOR/DME Holding
- ▶ Visual Circling
- ▶ Overhead Holding
- ▶ Minimum Sector Altitudes (MSA)

▶ **ILS category tools**

- ▶ ILS Basic Surface Construction
- ▶ ILS CRM
- ▶ ILS Obstacle Assessment Surface Construction
- ▶ Nominal Approach Altitudes

▶ **GNSS and Procedure Coding**

- ▶ Basic GNSS Approach Obstacle Analyser
- ▶ Procedure Summary
- ▶ Temperature Correction Calculation
- ▶ Database Coding (Path Terminators)
- ▶ APV/VNAV Surface-Procedure
- ▶ Procedure Export
- ▶ Terminal Arrival Altitude (TAA)

▶ **RNAV Tools**

- ▶ Minimum Stabilisation Distance Construction
- ▶ RNAV Departure
- ▶ RNAV Protection Area VOR/DME
- ▶ RNAV Holding
- ▶ RNAV Protection Area VOR/DME
- ▶ RNP Holding
- ▶ DME/DME
- ▶ RNP AR Obstacle Analyser
- ▶ DME Update Area
- ▶ Visual Segment for PinS Approaches
- ▶ Lateral RNP Separation Area Construction
- ▶ RNAV (GNSS En-route/STAR) Straight Segment Analyser
- ▶ RNAV (GNSS En-route/STAR) Turn Segment Analyser

▶ **Annex 14 Surfaces and Shielding determination**

- ▶ Aerodrome Surface Analyser



Aeropath Procedure Design services

Aeropath has broad experience and expertise in flight procedure design — working with State regulators, ANSPs, airlines and airport authorities to design, verify and maintain flight procedures.

Our work includes Performance Based Navigation (PBN) procedures development and maintenance, PANS-OPS training, digital aeronautical data management and charting, and development of cloud hosted solutions to support the AIS to AIM transition.

Notes on Procedure Design course content and duration

The syllabus and the topics described for each module may change for reasons such as updates to criteria, changes to software features, specific customisation requests, new regulatory requirements, shifts in operational practices, advances in technology, or feedback from previous course participants. The durations outlined for each module are indicative.

Talk to us today

international@airways.co.nz
www.airwaysinternational.com