INNOVATIVE SOLUTIONS FOR SAFER FLIGHT OPERATIONS

How the use of a computer tool can increase the safety of instrument flight procedures

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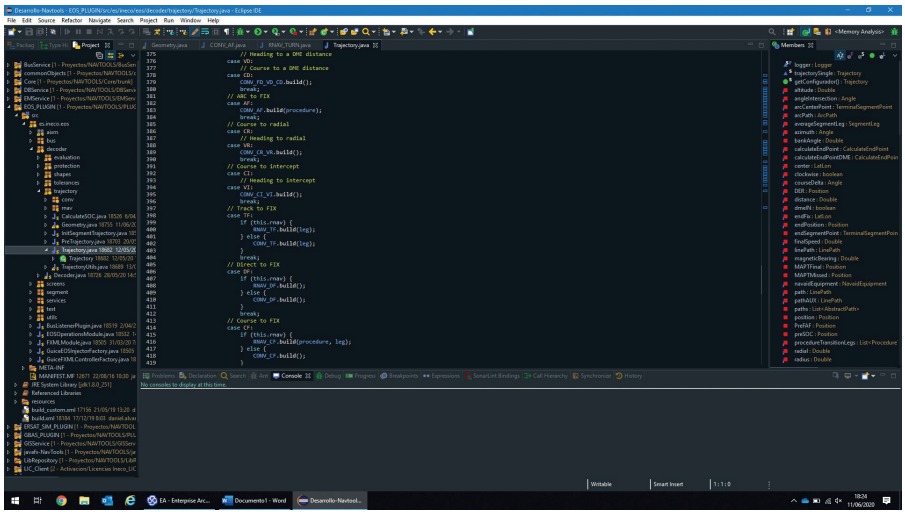


Left & below: Examples of the Enterprise Architect development environment

The Instrument Flight Procedure Design aims to ensure that flight operations are carried out in a safe manner, defining a set of areas and surfaces associated with the nominal trajectory of an aircraft in which the obstacles and existing orography with an adequate obstacle clearance margin are evaluated.

ICAO considers Instrument Flight Procedures (IFP) an essential component of the aviation system and publishes a series of volumes such as quality guide in its Doc 9906 “Quality assurance manual for the design of flight procedures”.

This need for quality assurance has led the European Commission, within the framework of the Single European Sky, to publish regulations that complement and reinforce the quality requirements of aeronautical data / information as is defined in ICAO Annex 15 (Regulation EC-73 / 2010 of January 26, 2010), with entry into force on July 1, 2013 and known as ADQ (Aeronautical Data Quality).

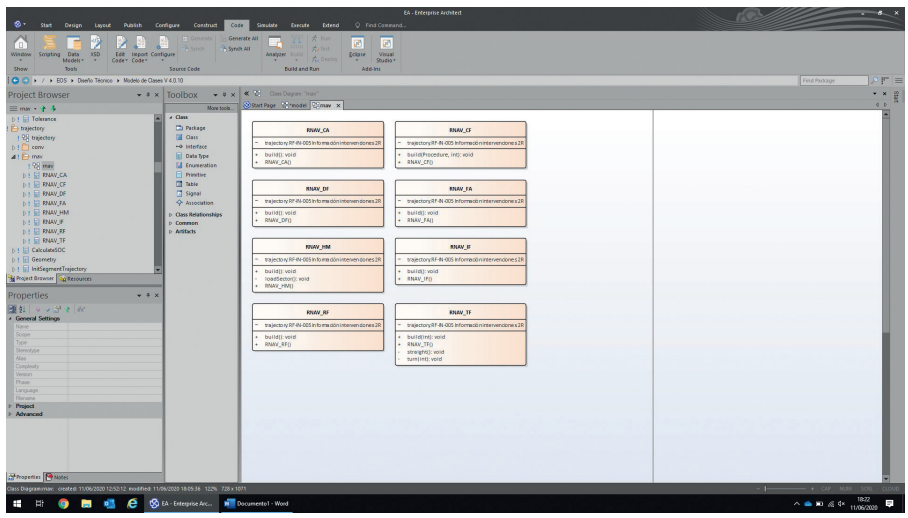
To meet all these requirements, it becomes almost necessary to have software tools to support, among others, the Instrument Flight Procedure Design (IFPD) in order to automate the design process and ensure accuracy, resolution and integrity.

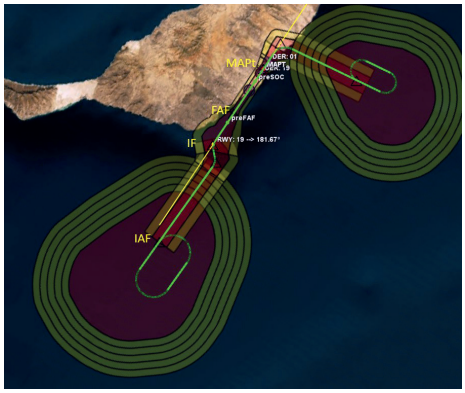
Designing Instrumental Flight Procedures

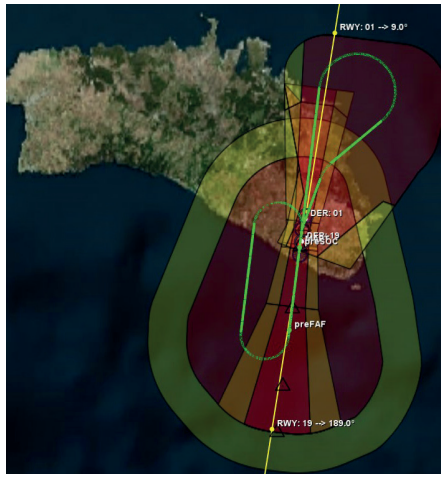
The design and validation of the IFP increasingly relies on specific computer tools that, used by expert designers, guarantee the quality of the aeronautical data and the quality processes according to the relevant international regulations.

INECO has the largest and most experienced team in Spain of IFP designers, with an average group experience of more than 10 years. Since 2000, the tool used by INECO designers has been a commercial tool subject to license and maintenance by an external company. As specifications for the design of flight procedures were advancing with the (performance-based navigation) PBN concept, deficiencies were noted in this tool that needed to be resolved in order to quickly respond to the needs of customers in compliance with the European commitments to implement the PBN.

INECO began the development, within the framework of an internal R&D project of a tool called EOS for the IFPD that, in addition to fulfilling the functionalities that the other commercial tool did not cover would allow tackling works subject to current regulations with the advantage of having its own maintenance and development team to incorporate changes in an agile way.







Left: Protection areas associated with RNAV Approach Procedure
Right: Protection areas associated with conventional Approach Procedure

The project was implemented and managed with the software development methodology implemented in INECO, CMMI level 3. It complies with the ADQ specification that ensures the integrity and quality of the information generated as it is based on the recently created AIXM 5.1.1 standard (model for the exchange of aeronautical information) required at the international level.

EOS has been developed by INECO's own multidisciplinary team made up of engineers from various fields: aeronautical, telecommunications and computer science. It is a desktop application, developed in Java within the framework of Core NavTools.

NavTools is a suite created by INECO for the management and use of digital terrain models that allows collaborative work with other proprietary tools for the study of easements, radio conditions and CNS systems in an airport environment. It is supported by the GIS (geographic information system) developed by NASA called "WorldWind".

The EOS tool, which has recently completed its development and internal validation phase, now allows it to be put into production for the design of both based on Area Navigation (RNAV) and based on Conventional Navigation flight procedures.

Using spatial geometric calculations, integrated with a GIS and a 3D visual interface, EOS is able to calculate the areas and protection surfaces associated with the nominal trajectory of the aircraft based on what is specified in Doc 8168 AN / 611 of ICAO "Aircraft Operations. Construction of Visual and Instrument Flight Procedures. Volume II " in its latest edition. It is also capable of evaluating whether the obstacles and terrain elevations contained in the limits of those areas and protection surfaces could affect the flight safety of the aircraft flying that associated nominal trajectory. These trajectories can be those corresponding to departure (SID), arrival (STAR), approach (APP), route and waiting manoeuvres. ❖