

FSL Tool Set Overview

The evolution of the U.S. National Airspace System (NAS) from conventional ground-based navigation to Area Navigation (RNAV) point-to-point navigation created the need for a tool to be used for prescreening procedures to determine DME/DME coverage. The Flight Systems Laboratory (FSL) subsequently developed RNAV-Pro in 2002 as a flight assessment software program to support the aviation community in RNAV route development and implementation. RNAV-Pro assesses route viability for aircraft with DME/DME capability and forwards information to flight inspection aircraft for monitoring during the flight check. Upon flight check completion, RNAV-Pro analyzes flight inspection findings to confirm or disaffirm adequate DME/DME coverage.

The FSL Tool Set has continued to expand as new software products have been developed to support the FAA in its mission to meet increased demand through improved efficiency and increased safety. These tools include:

RNAV-Pro - Screening tool to support the development of RNAV routes and procedures. It assesses aircraft and navigation system flyability, determines Radar, Communication, DME/DME/(Inertial), Ground Based Augmentation System (GBAS), Wide Area Multilateration (WAM), and Automatic Dependent Surveillance - Broadcast (ADS-B) coverage, and conducts Pre-TERPS and other surface obstacle evaluations. RNAV-Pro evaluates the validity routes and procedures, thus reducing the rate of Flight Inspection rejections. It checks the effects of terrain and co-frequency interference, and identifies DMEs to be examined during Flight Inspection. After Flight Inspection, RNAV-Pro analyzes data obtained during the flight to affirm adequate DME/DME coverage.

RDVA-Pro - Radar Vector Departure Procedure Design Tool that uses FAA databases/criteria to identify RNAV Departure Vector Areas, which allow radar vectoring to join RNAV routes. When a Standard Instrument Departure (SID) begins with radar vectors, it may serve one or more runways at single or multiple airports. Radar vectoring affords flexibility of routing and allows an aircraft to attain sufficient altitude/distance to achieve a satisfactory navigation solution prior to using RNAV.

RPAT-Pro - Required Navigation Performance (RNP) Parallel Approach Transition (RPAT) Design Tool. Given a geographic location, environmental conditions, and piloting definitions, the tool calculates waypoints needed to define the procedure as well as additional operational information of interest to the designer. This includes the determination of acceptable locations for RPAT Start-of-Turn Point, Stabilized Approach Point, and the acceptability (from a safety perspective) of parallel approach procedures in Instrument Meteorological Conditions (IMC) when one aircraft is on an ILS approach and the other is on the proposed RNP approach. Once the procedure has been defined by the tool, the program performs a flyability check in order to confirm the design.

EOSE - The Engine-Out Surface Evaluator is an Engine-Out obstacle evaluation tool. EOSE identifies terrain and man-made obstacle penetrations of various surfaces, including the Obstacle Accountability Area (OAA) surface identified in AC 120-91, the One-Engine Inoperative (OEI) Obstacle Identification surface referenced in AC 150/5300-13, the Federal Aviation Regulation (FAR) 121.189 Engine-Out surfaces, and the ICAO Instrument Meteorological Condition (IMC)

Engine-Out surface. A generic surface option allows for the creation of additional departure trapezoids for user defined Engine-Out (62.45:1) and TERPS (40:1) surfaces.

FOPE - The Final-Approach Obstacle Penetration Evaluator is a final approach obstacle evaluation tool. FOPE identifies terrain and man-made obstacle penetrations on final approach. Individual airports or entire airport groupings (e.g., Core 30 airports, Primary airports) may be selected for 20:1, 34:1, GQS, and Glidepath surface evaluations.

The FSL Tool Set software applications reside on the FSL Tools Server Farm at the Mike Monroney Aeronautical Center and are made available to FAA, military, general aviation and commercial aviation community users via the Internet at <https://RNAVPro.faa.gov>.

Audio/video presentations on the operation of the software products are located at http://www.atsi.aero/rnavpro_briefing/index.html for RNAV-Pro and http://www.atsi.aero/eose_briefing/ for EOSE.

The FSL Tools Server Farm also provides FSL personnel access to the Monte Carlo System for the performance of simulations during the conduct of Risk Assessment Studies. Monte Carlo simulations provide an analytical method to imitate real-life scenarios by randomly generating values for uncertain variables over and over to simulate a model. The simulations calculate multiple scenarios of a model by repeatedly sampling values from probability distributions for the uncertain variables and then automatically analyzing the effects of the varying inputs on outputs of the modeled system.