



Integrated Noise Model

Noise Division (AEE-100)
Office of Environment and Energy
Transportation Research Board
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Noise Division (AEE-100)

- Develop Aviation Noise Standards
- Measurement and Prediction of Aviation Noise
 - Develop Tools for Quantifying the Predicted Impact
- Evaluate New Engines and New Procedures
- Formulate R&D Objectives to Reduce Noise
 - Source Noise
 - Operating Procedures
 - Land Use Planning



Quantifying Noise Exposure

Example Policy Studies

- Reduce Noise at the Source
 - NASA R&D Efforts, Engine/Airframe Technology
 - Transition to Stage 3 fleet.
- Operational Mitigation Strategies
 - Noise Abatement Departure Procedures
 - Preferential Flight Tracks and Runways
- Land use Planning
 - Identify Non-Compatible Land Use



Noise Analysis Basics

- Impact Measured in Day/Night Sound Level (DNL)
 - 10 dB Penalty for Night Operations
- Average Annual Day
 - All Airport Configurations Modeled.
 - Capture Noise Intensity & Frequency of Occurrence
- Model Specific Airframe Engine Combinations
 - Stage 2, HushKit Stage 3, Stage 3
- Model Changes in Aircraft Climb Power Setting
 - Aircraft Weight, Procedures



Environmental Noise Analysis

- Disclosure of the Noise Impacts
 - Base Case Versus Alternative for Various Out-Years
- Identify any Significant Impacts
 - Increase Number of People Above 65 DNL
 - 1.5 dB changes above 65
- Identify any Controversial Actions
 - Impacts Outside 65 DNL
 - 3 dB Changes from 60-65, 5 dB Changes 45-60



FAA Noise Modeling Tools

- Integrated Noise Model (INM)
 - Model Specified in FAA Part 150 and FAA Order 1050
 - Lead Technology for Other Models
- Helicopter Noise Model (HNM)
 - Helicopter Specific Propagation Algorithms

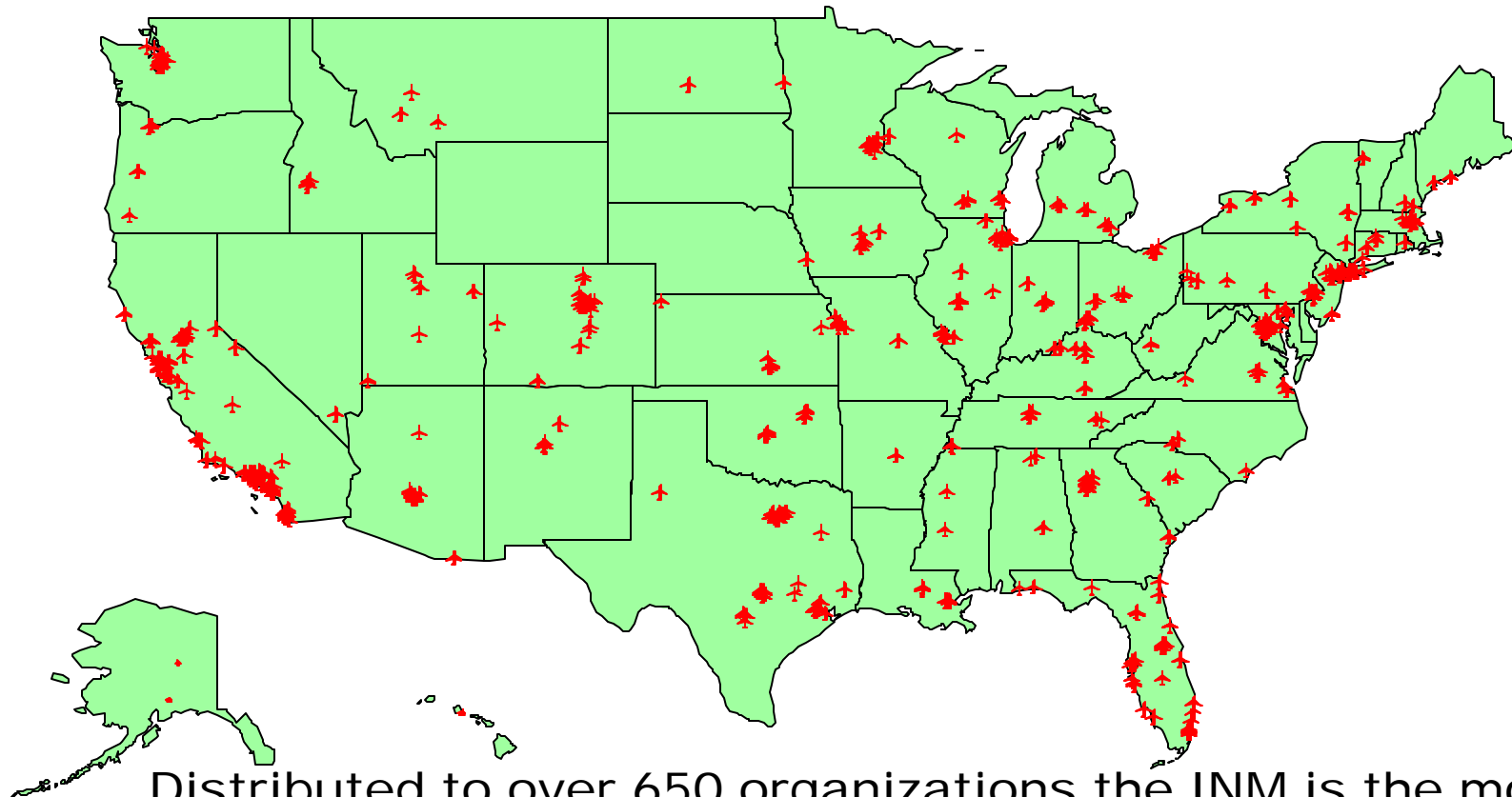


Integrated Noise Model (INM)

- Wide Distribution
- Available in Windows 95, 98, Windows 2000
- User's Guide and Technical Manual
- Web Page for Information and Model Updates
 - <http://www.aee.faa.gov/aee-100/inm>
 - Technical Support Provided
- Commercial Training Courses Available



INM Distribution

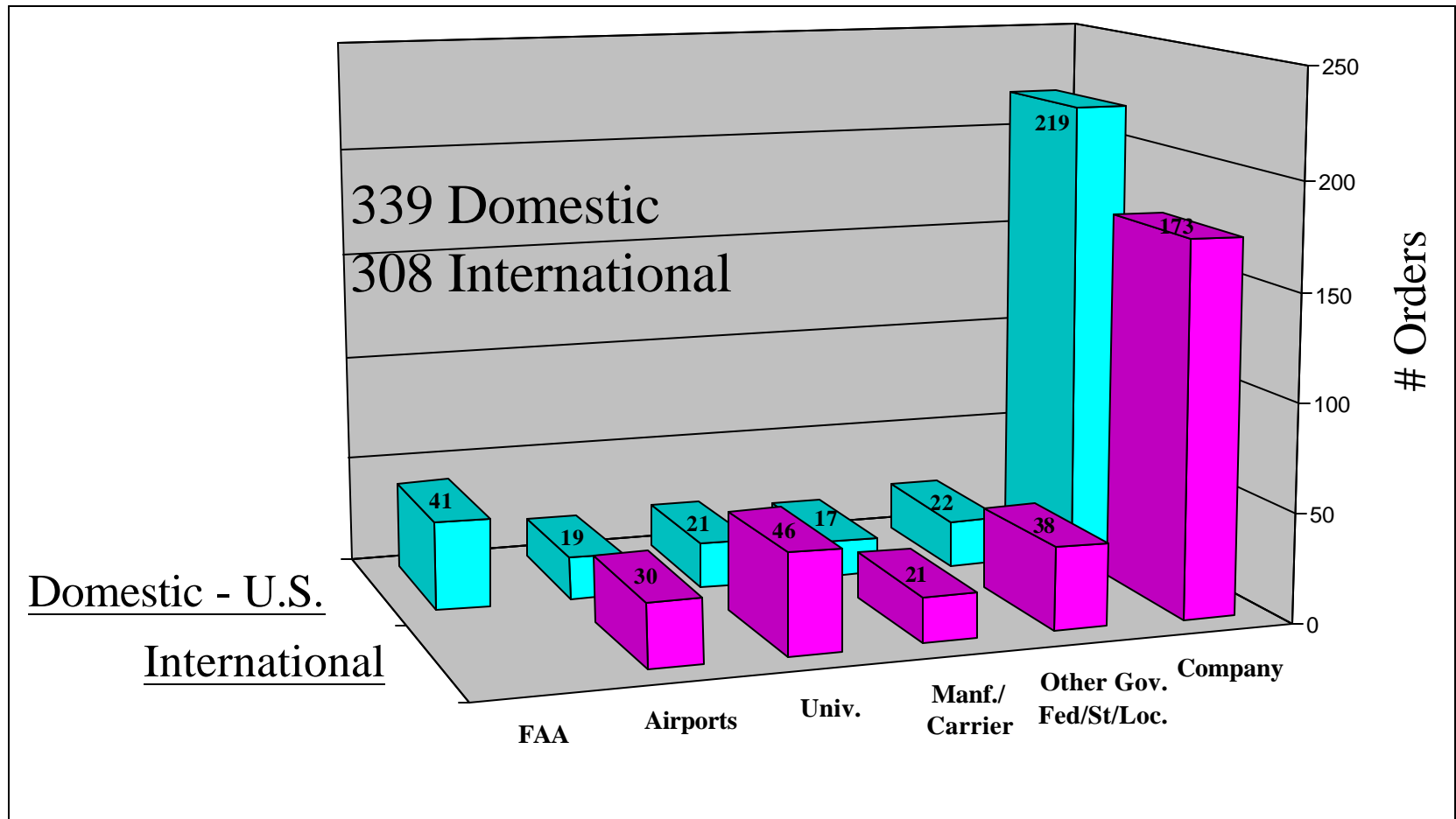


Distributed to over 650 organizations, the INM is the most popular model of its kind in the world



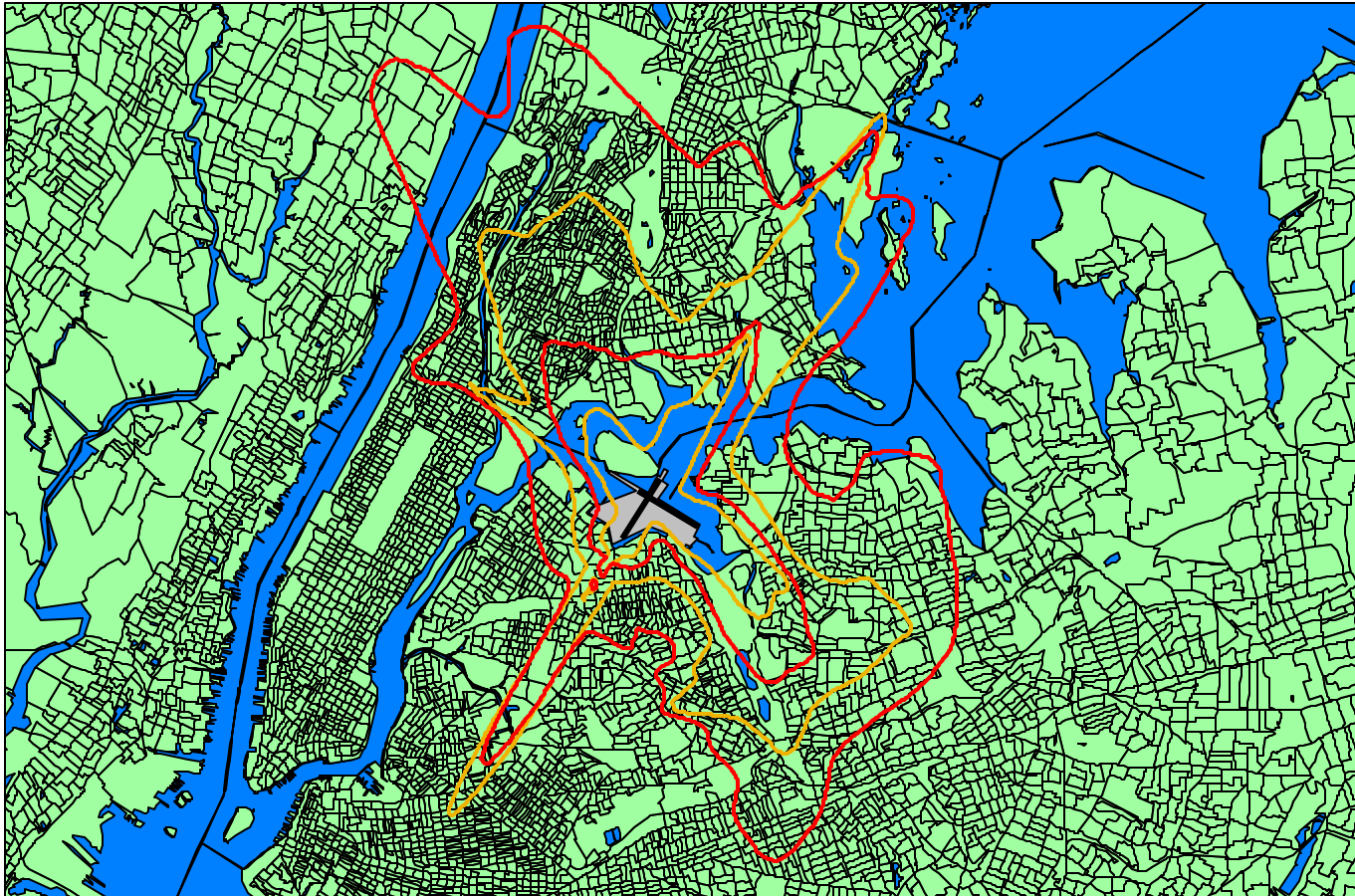
USER GROUP PROFILE

April 1999





INM Output



Integrated Noise Model (INM) produces the noise exposure maps used for land use planning.



New Aircraft

- **Aerospatiale, Embraer, Gulfstream – Full Program**
 - A320, A330, A340 in INM 6.0b.
 - Fully developed Gulfstream fleet
- **Cessna**
 - Citation Bravo, CNA172 and CNA206 Models in INM 6.0b
- **Boeing**
 - 737-700 included in INM 6.0b
- **NASA/FAA Research Project**
 - Bombardier, Cessna Business Jets, and SAAB



Recent Updates

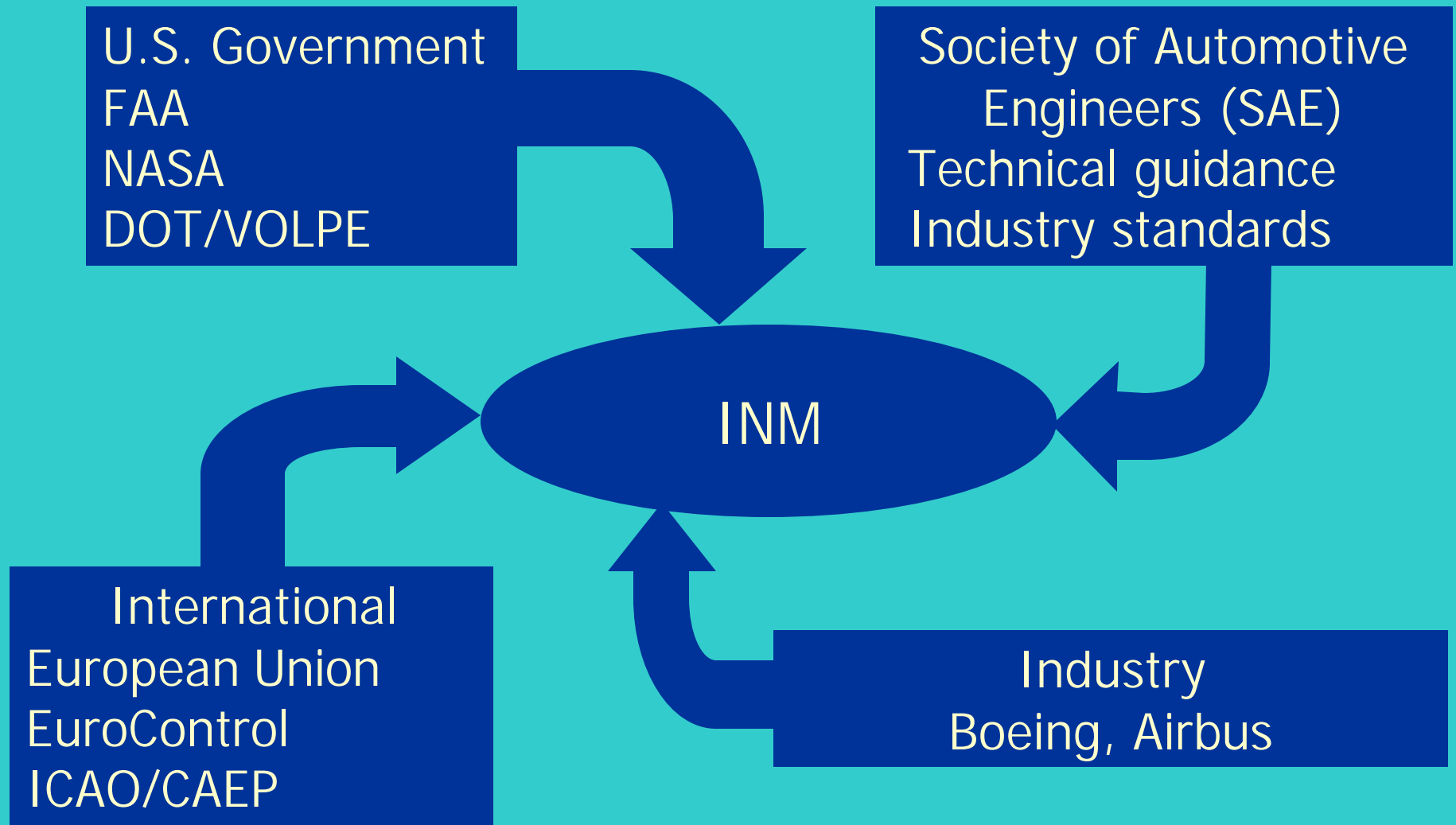
- Associate NPD data with a Spectral Class
 - Separate NPD Takeoff and Approach Curves
 - Atmospheric Absorption Based on SAE-ARP-866A
- Expanded Sets of Performance Coefficients
 - Performance after the engine breakpoint temperature
- Expanded Set of Procedures
 - A320, A330 and A340 Provided ICAO A and ICAO B for same weight



Noise Model Standards

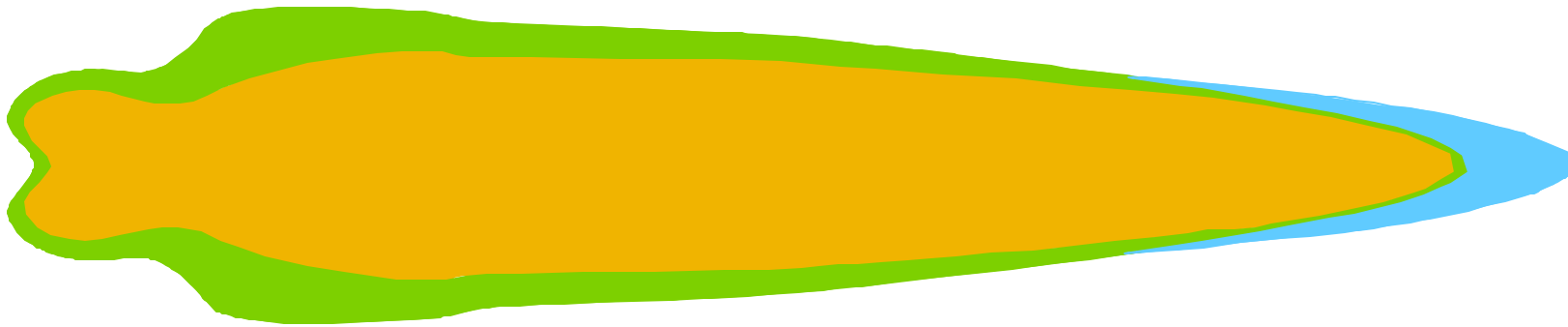
- SAE-AIR-1845 Noise Model Calculation
 - Aircraft Profiles, Noise Power Distance Curves
- SAE-AIR-1751 Lateral Attenuation
 - Ground & Engine Installation Effects, Other Things
- SAE-ARP-866A Atmospheric Absorption
- SAE-ARP-4721 Monitoring Aircraft Noise
 - Focus on Acoustic Considerations

INM Development and Validation



Model 1 A320 95% MTOW Profile

75 SEL Contour



INM 6.0



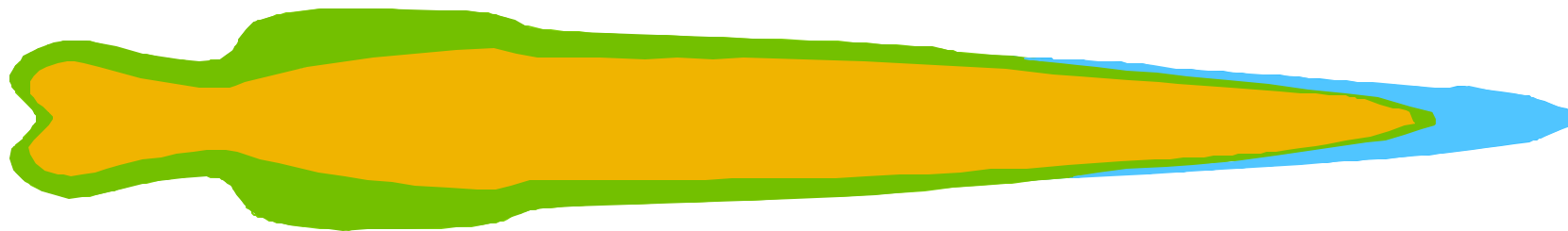
Proposed Update to SAE-AIR-1751



INM 6.0 with SAE-ARP-866A

Model 1 747 95% MTOW Profile

85 SEL Contour



INM 6.0



Proposed Update to SAE-AIR-1751



INM 6.0 with SAE-ARP-866A

2002 Fleet Mix 65 Contour



INM 6.0

Proposed Update to SAE-AIR-1751

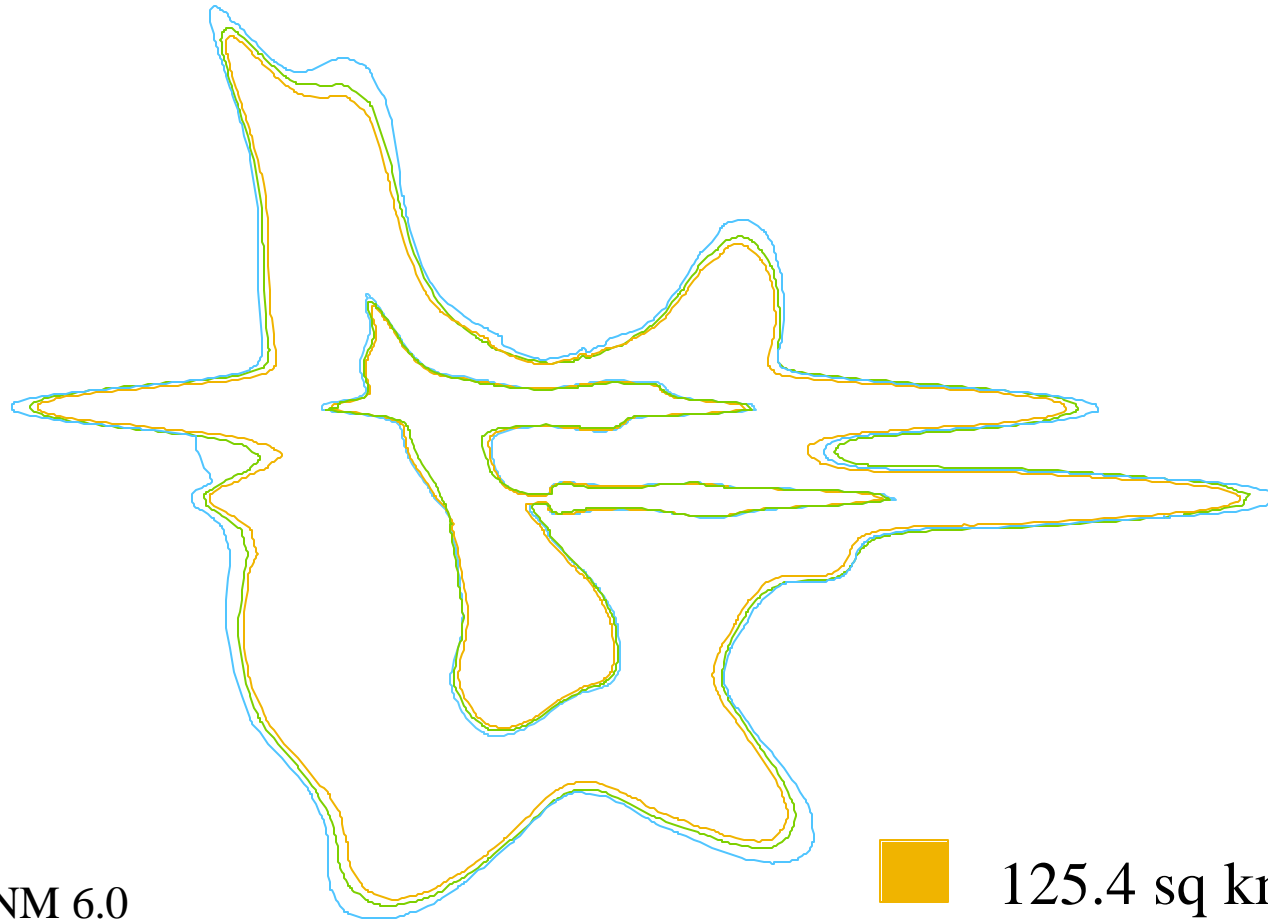
INM 6.0 with SAE-ARP-866A

21.1 sq km.

21.6 sq km

23.2 sq km

2002 Fleet Mix 55 Contour



INM 6.0



Proposed Update to SAE-AIR-1751



INM 6.0 with SAE-ARP-866A



125.4 sq km.



134.9 sq km



143.6 sq km



INM Noise Model Goals

- Reaffirm and update the SAE documents
- Expand INM Database - Projects with industry
- Begin assessing noise monitor data
- Continued research in modeling helicopter operations