INM 6 News

The Integrated Noise Model

A publication of HARRIS MILLER MILLER & HANSON INC. for users of the Integrated Noise Model.
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FAA Releases INM Version 6.0b

The FAA has just released INM 6.0b. The upgrade is available on the FAA web site at: www.aee.hq.faa.gov. It is a free upgrade for users of INM 6.0 or 6.0a. The Version 6.0 User Guide and Version 5.1 Technical Manual are the current manuals for INM Version 6.0b.

The new version contains:

- New noise and performance data for the Airbus 330 (INM Code A330), Boeing 737-700 (737700), Cessna 550 Citation Bravo (CNA55B), Cessna 172R (CNA172), Cessna 206H (CNA206), and Cessna T206H (CNA20T).
- Changes in substitution for the Boeing 717 and 717ER – these should now use the F10062.
- Program modifications include automatic updates for the new aircraft database types (provided you have specified the substitution name) and modifications to the File/Export as DXF function.
- Several bug fixes, including problems with EMB120 from previous cases (confusion over whether the aircraft was a database or substitution code), Windows 2000 color palette issues.

Database Modifications

Version 6.0b contains several new aircraft types:

- **A330**: Airbus A330-301 with CF6-80 E1A2 engines. New noise curve identifier is CF680E. The single fixed-point approach profile is a standard 3-degree descent with a 3000-foot level segment. There are three sets of procedural departure profiles: ICAO_A, ICAO_B, and STANDARD, all of which have stage lengths 1 through 6 (note: the STANDARD departure profiles are identical to ICAO_B profiles).
- **737300:** Boeing 737-700 with CFM56-7B engines. New noise curve noise identifier is CF567B. The procedural approach profile is a standard 3-degree descent. There are two sets of procedural departure profiles: ICAO_B has stage lengths 1 through 5, and STANDARD has stage lengths 1 through 5 (note: the STANDARD departure profiles are identical to the ICAO_B profiles).
- **CNA55B:** Cessna 550 Citation Bravo with PW530A engines; the noise identifier is PW530A. Standard procedural profiles for one approach and one departure are included. There are two additional procedural departure profiles: FLAPS_0 is a departure with aircraft flaps set at zero, and FLAPS_15 is a departure with aircraft flaps set at 15. The STANDARD departure is equivalent to the FLAPS_15 profile.
- **CNA172R**: the Cessna 172R with a Lycoming IO-360-L2A; the noise identifier is IO360L. Standard procedural profiles for one approach, one departure, one touch and go, and one circuit profile are in the database.
- **CNA206:** the Cessna 206H with a Lycoming IO-540-AC engine; the noise identifier is IO540. Fixed-point profiles for one approach, four departures (3000LB, 3300LB, 3600LB, and STANDARD), one touch and go, and one circuit profile are included. The STANDARD departure profile is equivalent to the 3600LB profile. NPD curves for the IO540 use engine RPM as a surrogate for corrected net thrust. RPM is input as the thrust setting for all approach and departure profiles. The approach, touch and go, and circuit profiles use 3-degree descents.
- **CNA20T:** the Cessna T206H with a Lycoming TIO-540-AJ1A engine; the noise identifier is TIO540. Fixed-point profiles for one approach, four departure (3000LB, 3300LB, 3600LB, and STANDARD), one touch and go, and one circuit profile are included. The STANDARD departure profile is equivalent to the 3600LB profile. NPD curves for the TIO540 use engine RPM as a surrogate for corrected net thrust. RPM is input as the thrust setting for all approach and departure profiles. The approach, touch and go, and circuit profiles use 3-degree descents.

SAE A-21 Meeting

The Society of Automotive Engineers (SAE) A-21 Committee is responsible for overseeing the technical algorithms that are implemented through the INM. These include SAE 1845 and 1751, as well as ARP 4721. The A-21 Committee met November 14-16, 2000 in Boston.

INM users should be interested in the following reports from SAE Committees and Project Working Teams (PWTS) made at the meeting:

- *Lateral Attenuation of Aircraft Sound (Gregg Fleming, USDOT Volpe Center):* As further investigation of the new methodology for computing lateral attenuation, controlled measurement of aircraft flyovers at NASA's Wallops Island Flight Facility were concluded in September 2000. Four aircraft types (B767, DC9, F2000, and Beechcraft King Air) were flown through and over a 20-microphone array at various altitudes and power settings. The purpose of the test was to quantify the engine/installation effects (i.e., source directivity) associated with the four test aircraft. Results of the measurement program should be available mid-year 2001.
- *Use of Radar Data to Determine Aircraft Flight Paths (Vince Mestre, Mestre Greve Associates):* The PWT has developed ARP 4721 entitled "Acquisition and Use of Aircraft Position Information" for comment. The ARP includes sections related to: methods for acquiring position data, processing of aircraft position data into continuous flight tracks, correlation of flight track data with noise event data, and accuracy associated with aircraft position data.
- *Development of INM Data for Airbus Aircraft (Michel van Boven, Aerospatiale):* Airbus presented their methodology for the development of AIR 1845 performance coefficients. Airbus also compared INM output to that produced by their own performance and acoustic modeling tools to validate the INM process. Aerospatiale concluded the following: 1. the Airbus methodology is reliable with respect to AIR 1845 requirements. 2. Airbus aircraft representation in the INM will be satisfactory. 3. INM accuracy is directly dependent on the quality of the aircraft database. 4. The INM methodology is robust and generates acceptable results for airport noise impact assessment. 5. The INM should not be used for single event noise analysis. 6. Approach performance and noise modeling in the INM needs additional sophistication. Mr. Van Boven also made several recommendations for future work: 1. Development of an industry standard for INM aircraft data development. 2. Improvement of both the performance and aerodynamic noise associated with approach noise modeling. 3. Capability for modeling Flex (i.e., de-rate) Thrust departures by means of a modeling algorithm. 4. A sensitivity study to assess the impact of large source to receiver distances.
- *Additional Analysis of NPD Data for Approach Noise (Dr. Darren Rhodes, CAA U.K.):* This report was an extension to a previous report which suggested deficiencies existed in the way AIR 1845 estimated approach thrust levels based on altitude and speed information. This current report used a larger sample database containing additional aircraft types, and actual performance data downloaded from each aircraft's flight data recorder. The report concludes that, for a number of cases where the correct NPD data are available, the analysis does not produce noise estimates consistent with the measured data particularly at distant points from touchdown.

Useful references from SAE include:

- *Procedure for the Computation of Airplane Noise in the Vicinity of Airports*, AIR 1845, March, 1986.
- *Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity*, ARP 866A, March, 1975.
- *Prediction Method for Lateral Attenuation of Airplane Noise During Takeoff and Landing*, AIR No. 1751, March, 1981.

These documents are available through SAE. Please see: http://www.sae.org/about/index.htm.

INM Training Course Schedule

HMMH's next INM training course will be offered on **May 16-18, 2001,** at our Burlington, Massachusetts office. We also are offering a course on Noise Office Management, May 14th and 15th. For more information, please see our web site: www.hmmh.com/inm.html.

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