Federal Interagency Committee on Aviation Noise

FICAN Findings and Recommendations on Tools for Modeling Aircraft Noise in National Parks

February 2005

In a letter dated September 2, 2003, the Federal Aviation Administration (FAA) and the U.S. Department of Interior (DOI) jointly requested that FICAN "provide advice on some matters related to the measurement and assessment of the effects of aircraft noise due to overflights of units of the National Park System." FICAN enlisted the assistance of the U.S. Department of Transportation's Volpe Center (Volpe) and Wyle Laboratories (Wyle) to assist with the study. Volpe is responsible for the development of the core acoustics module within the FAA's Integrated Noise Model (INM) and Wyle is responsible for the development of the Department of Defense's (DOD) NoiseMap SIMulation model (NMSim). Volpe and Wyle jointly produced the report, "Assessment of Tools for Modeling Aircraft Noise in the National Parks" (the report). The FICAN recommendations are based upon the analyses and findings presented in the report.

The assessment contained in the report evaluated two models that embrace distinct aircraft noise modeling approaches. INM, like DOD's NoiseMap, is a segmentation model in which the time integrated sound level of the aircraft event is calculated by summing the noise received from a sufficient number of contiguous straight line segments representing the flight trajectory and associated performance. NMSim is a simulation model in which the flight path of an aircraft is represented by a series of closely spaced discrete points. The level-time-history at any specific observer location is then constructed by calculating the sound radiated towards it from each flight path point. The segmentation approach is widely used around the world to model aircraft noise in the vicinity of airports. The simulation approach is considered to have greater potential and it is only a shortage of the comprehensive aircraft acoustic data required, and the higher demands on computing capacity, that presently limit this approach to special applications or augmentation of the more traditional integrated modeling approach.

In complying with the FAA and DOI joint terms of reference, FICAN agreed to assess the two models on the basis of accuracy, reliability, practicality, and usability, all of which are covered in-depth in the report. One section of the report is devoted to the comparison of the output of the two models to the measured time audible data collected in the Grand Canyon National Park Model Validation Study (GCNP MVS)[1] – the so-called "gold standard" dataset for assessing model performance. Assessing accuracy was extremely difficult due to the complexity of the audibility metric. FICAN agreed that no model will ever be able to predict with absolute certainty the audibility of any particular aircraft event at any specific location. The problem lies in predicting with certainty all three key elements of audibility: ambient sound environment, source noise level, and detectability threshold of the observer (human or animal). Extensive long-term

[1] Miller, N.P., et. al., Aircraft Noise Model Validation Study, HMMH Report No. 295860.29, Harris Miller Miller and Hanson, Burlington, MA, January 2003.

monitoring could substantially reduce uncertainty in the ambient sound levels. Even more extensive long-term measurement programs with detailed aircraft performance and position information may be able to substantially reduce uncertainty in predicted received aircraft sound levels. However, sound propagation over long distances through a complex atmosphere (wind, temperature, turbulence) will always be subject to considerable variability. Furthermore, observer reaction can never be predicted with absolute certainty. Uncertainty often exists to some degree in any type of modeling. Despite this uncertainty and given that the primary use of the noise assessment tool is for planning and decision-making purposes, FICAN concluded that the accuracy of the two models could be assessed. FICAN agreed with the conclusion of the authors of the report that INM Version 6.2 and NMSim perform equally well, on average, when compared with the "gold standard" audibility data measured in the GCNP MVS.

FICAN concluded that NMSim is a valuable tool and its continued evolution should be widely supported. FICAN noted that the ability to generate color animations of moving sources, as demonstrated by NMSIM, could be useful in explaining complex technical issues and building public confidence in aviation acoustic modeling. However, FICAN agreed that NMSim is not yet a mature technology as it currently lacks fundamental processes and extensive aircraft source databases that are necessary to make it a viable tool for general use in environmental impact analysis under the National Environmental Policy Act (NEPA). FICAN concluded that INM, with its long history of development and enhancements, extensive aircraft source database, and widely available user support, is currently a superior tool for general usage. Given that the authors of the report jointly found that both models perform equally well compared with the gold standard (GCNP MVS), and considering the many factors listed above in this document and the report, FICAN recommends INM 6.2 as the best practice modeling methodology currently available to evaluate aircraft noise in national parks.