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Of the 21 Helicopters represented in INM 7.0b, only five include the tone-corrected metrics. The calculation of these metrics involves the analysis of 1/3 octave-band data obtained during the source data measurement process, and requires sound-pressure levels at all measured frequency bands (50-10,000 Hz) for the duration of the aircraft event. A census of data availability was undertaken for helicopters currently in the INM, to determine whether available source data were sufficient to reprocess and calculate the tone-corrected metrics.

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*USDOT Research & Innovative Technology Administration*
*Environmental Measurement and Modeling Division*
*Volpe Center Acoustics Facility*

Subject: Tone-Corrected Metrics for Pre-2005 INM Helicopters
Volpe Report # DOT-VNTSC-FAA-14-03

Date: July 30, 2012

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Reply to
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## Introduction

Of the 21 Helicopters represented in INM 7.0b, only five include the tone-corrected metrics Effective Tone-Corrected Perceived Noise Level ($L_{EPN}$) and Maximum Tone-Corrected Perceived Noise Level ($L_{PNTSmx}$). The calculation of these metrics involves the analysis of 1/3 octave-band data obtained during the source data measurement process, and requires sound-pressure levels at all measured frequency bands (50-10,000 Hz) for the duration of the aircraft event.[1]

## Census results

A census of data availability (Appendix A) was undertaken for helicopters currently in the INM. For aircraft without $L_{EPN}$ and $L_{PNTSmx}$, the census attempted to determine whether available source data were sufficient to reprocess and calculate the tone-corrected metrics.

One-third octave band data, captured at the half-second intervals necessary to allow for calculation of the Tone-Corrected metrics, was identified for the following four helicopters currently in the INM without $L_{EPN}$ or $L_{PNTSmx}$:

1. Hughes 500D
2. Aerospatiale SA-350D Astar (AS-350)
3. Aerospatiale SA-355F Twin Star (AS-355)
4. Aerospatiale SA-365N Dauphin (SA-365N)

## Recommendations

The number of helicopters with the necessary data available to produce the tone-corrected metrics is quite limited; new field measurement efforts would be needed to expand the coverage of tone-corrected metrics across the INM fleet. Reprocessing the existing 1/3 octave band data for the four

[11] Code of Federal Regulations, 14 CFR FAR 36 A36.4.1.2

aircraft listed above is possible as well. A combination of field measurement and data reprocessing targeted to commonly modeled aircraft might be the most effective course of action to improve the availability of useful Tone-Corrected metric data in the INM.

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# Appendix A: Data availability

**Table 1. Data availability for helicopters represented in the INM**

| INM code | Aircraft Name | 1/3 Octave data | audio recording | $L_{EPN}$ | $L_{PNTSmx}$ |
|---|---|---|---|---|---|
| A109 | Agusta A-109 | | | Yes | |
| B-206L | Bell Long Ranger | | | | |
| B212 | Bell Huey | | | | |
| B222 | Bell 222 | | | | |
| B407 | Bell 407 | | Yes | Yes | Yes |
| BO105 | Boelkow BO-105 | | | | |
| CH47D | Boeing Vertol 234 (CH-47D) | | | | |
| EC130 | Eurocopter EC-130 w/Arriel 2B1 | | Yes | Yes | Yes |
| H500D | Hughes 500D | Yes | | No* | No* |
| MD600N | McDonnell Douglas MD-600N w/RR 250-C47M | | | Yes | Yes |
| R22 | Robinson R22 Beta w/Lycoming O320 | | Yes | Yes | Yes |
| R44 | Robinson R44 Raven w/Lycoming O-540-F1B5 | | Yes | Yes | Yes |
| S61 | Sikorsky S-61 (CH-3A) | | | | |
| S65 | Sikorsky S-65 (CH-53) | | | | |
| S70 | Sikorsky S-70 Blackhawk (UH-60A) | | | | |
| S76 | Sikorsky S-76 Spirit | | | Yes | |
| SA330J | Aerospatiale SA-330J Puma | | | | |
| SA341G | Aerospatiale SA-341G/342 Gazelle | | | | |
| SA350D | Aerospatiale SA-350D Astar (AS-350) | Yes | | No* | No* |
| SA355F | Aerospatiale SA-355F Twin Star (AS-355) | Yes | | No* | No* |
| SA365N | Aerospatiale SA-365N Dauphin (SA-365N) | Yes | | No* | No* |
| SC300C | Schweizer 300C w/Lycoming HIO-360-D1A | | Yes | Yes | Yes |

**Tone-Corrected metrics have not been calculated from existing 1/3 octave band data*