US Army Corps
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Construction Engineering
Research Laboratory

Fact Sheet

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ROTARY WING AIRCRAFT NOISE PROPAGATION

The Problem

Noise prediction programs developed for conventional aircraft do not necessarily work well for rotary wing aircraft. The helicopter is a source of low- to mid-frequency noise, often of an impulsive nature, whereas aircraft produce fairly steady, higher frequency noises. In addition, Army rotary wing aircraft are operated much lower to the ground. Studies have demonstrated that the sound exposure from low-level flights is more sensitive to both the ground characteristics and meteorological conditions than flights far above the ground.

The Technology

The U.S. Army Construction Engineering Research Laboratory (CERL) has developed prediction methods which encompass ground conditions and near ground meteorology. Environmental conditions cannot be controlled, but they can be measured and their effects on recieved noise level accounted for. CERL uses two important noise propagation modeling methods which are the parabolic equation method and fast-field program. Both models have been validated in previous experiments by using loudspeakers as sound sources and by measuring temperature and wind speed as independent variables. CERL has applied these analytic methods in developing noise decay prediction capability in ground-to-ground propagation.

Benefits/Savings

Accurate noise predictions and noise contours, which predict where loud noises will be received, can be used in the Environmental Noise Management Program to identify potential incompatible land uses around Army aircraft operation facilities. Once these actual or potential impacts are identified, the installation can better plan helicopter operations to avoid complaints or legal action resulting from high sound exposure levels.

Status

For a homogeneous atmosphere, comparisons with measured data are very accurate for helicopter slant ranges below 500 meters, but the model predictions exceed measured levels beyond 500 meters. The best available explanations for the discrepancy at long ranges are the effects of meteorology and turbulence. During recent field experiments, sound propagation was measured at distances of up to two kilometers from the noise source. Current research is exploring the effects of refraction and turbulence on sound propagation.

Points of Contact

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