

An improved aircraft noise monitoring system

SOUNDTRACK deals with the development of an improved aircraft noise monitoring system capable of (1) identifying and locate aircraft noise events, (2) reducing the influence of the background noise of the measurement site, and (3) providing an estimate of the aircraft sound power. As a collateral advantage such a system would be independent from non-acoustical data such as RADAR.

1. Aircraft noise identification

A microphone array and time difference of arrival techniques are used to estimate the direction of arrival ($\hat{\theta}$, $\hat{\phi}$) of the potential aircraft noise events. More than one microphone array can be used to also estimate the range of the aircraft (\hat{r}) by triangulation.



Figure 1: Microphone array in situ during a measurement campaign near Oslo airport.

2. Background noise reduction

A cleaner measurement of aircraft sound pressure (\hat{L}_p), less impacted by ground-borne noise, is obtained through the use of 1st-order directional microphones rather than the commonly employed omni-directional variety. The attenuation of the aircraft noise level can be compensated for as the direction of sound arrival at the noise monitoring terminal (NMT) is available.

3. Sound power estimation

An estimate of the aircraft sound power (\hat{L}_W) is obtained using a reverse propagation model, with the clean sound power and aircraft range and direction as inputs. The sound power estimate would be a function of the relative direction between the aircraft and NMT.

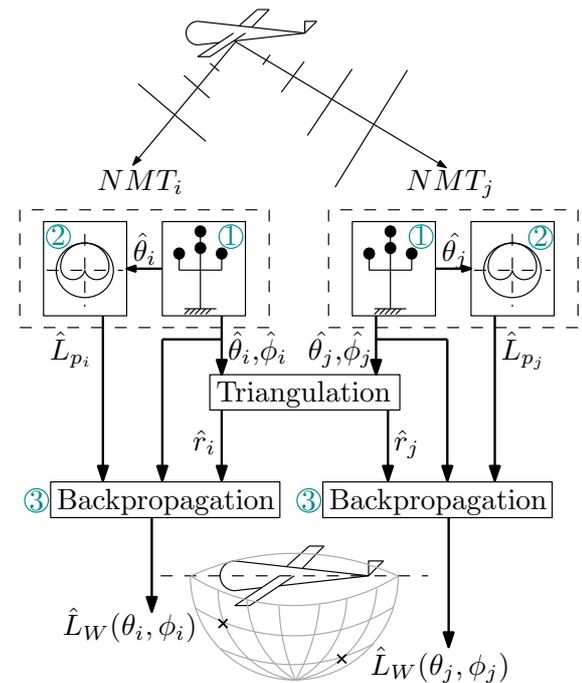


Figure 2: Block diagram showing the interaction of elements of the improved aircraft noise monitoring system.

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Advantages over classical noise monitoring systems

Automatic identification

Aircraft events are automatically identified by estimating the sound direction of arrival, therefore no further analysis of the noise level recording is required for identification purposes.

RADAR independent

Automatic identification allows the application of the system to airports which lack a RADAR system. It could provide an alternative measurement of aircraft position.

Noise limit enforcement

The reliability of the noise monitoring system as a noise limit enforcement tool is improved by reducing the influence of the background noise.

Input to prediction model

Creating more reliable acoustic footprints of individual flights would be possible by using the estimated sound power values to adjust the aircraft source model of individual flights in the noise prediction models.