

How ANR Cancels Noise

Active Noise Reduction, or ANR, reduces noise exposure by introducing sound waves 180 degrees out of phase with the noise, resulting in destructive interference, causing a net reduction of noise at the ear. ANR headsets identify and reduce unwanted noise, allowing improved intelligibility of speech received through the radio and intercom audio and provides better hearing protection.

Aircraft noise has been a longtime problem for pilots when it comes to communicating with one another and protecting themselves from hearing loss. Experts say that persistent noise actually induces added fatigue on pilots. Noise canceling performance is far superior to passive noise protection alone, especially in the lower frequency ranges.

The principle of destructive interference of waves is to generate an inverse pressure wave or "anti-noise" to attenuate unwanted noise. The anti-noise is a sound pressure wave which is the exact opposite of the offending noise: it is the mirror image signal, exact in frequency and amplitude but 180 degrees out of phase or "anti-phase" with the unwanted noise. In order to maximize active noise cancellation, the canceling source always produces with great precision an equal but inverted replica of the signal to be canceled.

The graph below shows the noise and mirror image (Anti-Noise) which is 180 degrees out of phase. The result is noise cancellation.

