



3D-AUDIO AND ACTIVE NOISE REDUCTION – FIGHTER



Natural audio in noisy environments

Terma's 3D-Audio and Active Noise Reduction Systems for military aircraft improve situational awareness, reaction time, speech intelligibility, and flight safety by reducing the noise – acoustically and electrically – while enhancing the signal through digital 3D-audio and spatial communication channel separation.

Terma's 3D-Audio digital intercom system is designed for the harsh acoustic environment found in most military aircraft. The system, which is already operational and fielded in F-16s, including US, is designed as a form-fit replacement of the existing intercom system, including the amplifier and the headset – part of the pilot's helmet.



Reduced stress and fatigue

Noise in the cockpit is a serious stress factor. Therefore, the reduced noise level means less stress and fatigue for pilots and other crew members, especially during prolonged missions, thereby enhancing flight safety and mission effectiveness. The reduced noise level also allows pilots to reduce the volume of the intercom system, and thereby reduce the acoustic noise pressure and avoid the foam earplugs, which many pilots use to prevent hearing damage.

Terma has achieved this reduced pilot noise exposure through developing a digital headset with built-in Active Noise Reduction (ANR) circuitry and Electrical Noise Reduction (ENR), which is powered through a standard intercom interface. The system offers considerable noise attenuation and is at the same time capable of reproducing 3D-Audio in stereo sound quality.

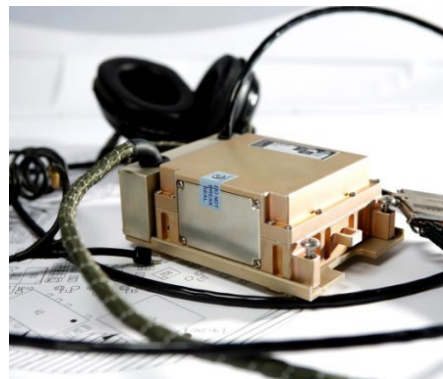
Operational benefits

3D-Audio, or spatial audio, is used in two ways to improve the quality of the acoustic messages presented to the pilot. First, it means spatial separation of messages (e.g. cues, VHF and UHF radio communication, warnings, and intercom). Because the messages are directional in the pilot's earphones, it allows the pilot to focus on one message, the most relevant one, while he is still being kept aware of other messages.

Reduced reaction time

Not only does the pilot receive the warning from the exact direction of the threat, he will also be able to initiate evasive maneuvers a full second earlier compared to a traditional voice message system, because he can act instinctively without the need to process any information mentally.

The 3D-Audio system makes the pilot aware of activities 360 degrees spherical. To a certain extent, it can be regarded as the audio equivalent of a helmet mounted display, where the visual information moves with head movements. In a similar manner, audio from a given direction will give real time information of direction changes, which is extremely important, especially in a missile attack situation.





Product specifications

3D-Audio	Generic database of Head Related Transfer-Function (HRTF). Full-sphere 1.5 degrees coverage
Angular Resolution	Better than 3 deg azimuth and 10 deg elevation (application dependent)
3D-Audio Channels	8
Audio Management	Play, stop, pause, priority, play list, etc.
Audio Storage (audio cues)	512 MB
Audio Sample rate	22 kHz - 48 kHz (Internal Sample Rate 48 kHz)
Analog Inputs	9 channels
Analog Outputs	3 (Record -, intercom - and command mic. out)
Headset Output	4-wire standard to U-92 A/U connector Analog Mode: Output for standard intercom headset / Digital Mode: Powered Digital Audio (auto detection)
Discrete Inputs	4 (Hot-Mic, Radios Keys and Analog/Digital Mode)
Microphone Input	Low Impedance M-87 dynamic microphone and M-169 Oxygen Mask Microphone
Interface Control	Serial Communication RS-485
Max Sound Pressure Level	115 dB (@THD < 3%, ANR ON)
Frequency Response	20 Hz – 16 kHz
Distortion	0.5% (@ 85 dB, 1000 Hz)
HRTF Reproduction	+/- 1 dB (63 Hz - 16 kHz)
Noise Attenuation (active+passive)	20 - 30 dB
ANR	9 dB (A), 20 dB (peak)
Compatibility	Audio kit is Form/Fit/Function replacement with existing F-16 Interphone Amplifier
Helmet Compatibility	HGU-55/P and JHMCS
Helmet Kit Nominal Impedance	9.5 Ohms (Analog Mode)
Helmet Kit Weight	320 g
Operational Temperature	EIA: -40°C - +71°C: Helmet kit: -40°C - +55°C
Storage Temperature	EIA: -54°C - +95°C: Helmet kit: -40°C - +70°C
Vibration	EIA: Gun fire: 15 g peak sinusoidal, 0.06 g2/Hz background random. Method 519.5 of MIL-STD-850F
Electro-Magnetic	MIL-STD-461 rev. E
Humidity	MIL-E-5400T
Low Pressure (Altitude)	Sea Level – 50,000 ft.