Photo by Rick Thompson, Northrop Grumman Newport News

OE-538/BRC Multifunction Communication Mast Antenna System

If the communication antennas in use aboard your submarine do not satisfy your current or future requirements, you need to consider replacing those antennas with a modern, highly capable Multifunction Mast Antenna (MFM) system. Lockheed Martin offers standard MFM antennas and custom variations to meet your specific communications requirements

The OE-538/BRC Antenna was designed and is manufactured for the U.S. Navy by Lockheed Martin. It is a high performance, mastmounted, communication and navigation antenna intended for new construction or as a replacement upgrade for antennas on existing submarines. The standard OE-538/BRC system supports communications in several operating bands including VLF/LF receive *(10 kHz to 170k Hz),* MF/HF Transceive *(2 MHz to 30 MHz),* VHF LOS Transceive *(30 MHz to 174 MHz),* VHF/UHF LOS Transceive *(225 MHz to 400 MHz),* VHF/UHF SATCOM Transceive *(240 MHz to 400MHz),* IFF Transpond and GPS receive. The MF/HF capabilities include both conventional narrowband and broadband tuning modes and requires no adjunct external tuning equipment. When used for satellite communications, the antenna is capable of full duplex UHF Demand Assigned Multiple Access (DAMA) communications with UFO and MILSTAR (LDR) satellites.

Photo by Chris Oxley, Northrop Grumman Newport News

OE-538 system units.

Variants of the OE-538/BRC have been developed which also support Iridium transceive and Link-16 transceive communications and improved MF/HF and VHF/UHF STACOM communications performance. These features can be added to the antenna without sacrifice to the submarine's other communications capabilities.

The individual antennas of the OE-538/BRC system are housed in a hydrodynamically faired, nonpenetrating mast assembly. The system is capable of simultaneous transmission and reception for all functions. The spatial coverage is excellent, allowing communication from low angle, line of sight assets to high and low angle satellite assets. The external mast is an extremely rugged hydrodynamically optimized assembly, allowing use from a submerged submarine operating at high speeds and in severe weather and sea-state conditions. With its compact and modular design, the OE-538 antenna offers all of these capabilities in a smaller volume than any competitive solution.

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The OE-538/BRC Antenna System comprises five units. Unit 1, the Antenna/Radome Assembly, is a pressure-proof radome that houses all required antenna elements and associated outboard electronics. Unit 5, the Antenna Control Unit (ACU), provides control of the Antenna/Radome Assembly and the RF input/output ports for external receivers and transceivers. Units 2, 3 and 4 provide connectivity between the antenna/radome and the ACU.

The antenna/radome contains four higher frequency antenna elements *(HF/VHF, UHF, IFF and GPS)* utilized for the capture and transmit of RF signals. Signals are routed to and from these antenna elements via appropriate matching networks, bandpass filters, and amplifiers. All RF signals are multiplexed onto a single, coaxial RF line by diplex filter units. VLF/LF reception is accommodated via a VLF/LF crossed loop antenna with integral preamplifiers. The VLF/LF signals appear on a dedicated set of signal lines at the base of the antenna. Operating power, control and status information to and from the antenna radome is routed to and within the radome via separate, dedicated conductors. The RF, VLF/LF and power/control/status signals are routed through a single connector at the base of the antenna/radome to the external cable assembly *(Unit 2)* and then to the hull penetrator *(Unit 3)*. The Junction Box *(Unit 4)* may be mounted either directly at the hull penetrator or within seven feet of the penetration point. The Junction Box provides for distribution of the VLF/LF and other antenna/radome signals.

Antenna RF signals and control/status signals are routed from the Junction Box to the ACU. The ACU separates the single, RF signal into four separate signals: HF/VHF, UHF, IFF and GPS. It also provides for both local and remote control of the Antenna/Radome Assembly and for presentation of the system status on front panel system status displays or at a remote location via a control/monitoring port. The remote control presently utilized is an RS-422 port. Alternately, a different bus controller port, such as an RS-232 port, can be implemented if requested.

Lockheed Martin has over 35 years of dedicated experience in the field of submarine communications. Our background and experience in the development of antennas and associated couplers in the ELF through UHF range has led to our being recognized as the world leader in submarine antenna systems. This background and experience assures you that Lockheed Martin can provide custom variations of their standard MFM systems to meet your specific communication needs and the physical requirements of your submarine and its environment.

The OE538/BRC system is capable of simultaneous transmission and reception for all functions.

Antenna System Performance

Power Handling Function	Band of Operation	Radiation Pattern			
		Polarization	Azimuth	Elevation	Capacity
VLF/LF Receive	10 kHz - 170 kHz	Vertical Linear	Crossed Figure-8	Similar to Monopole	Receive Only
HF Transceive	2 MHz - 30 MHz	Vertical Linear	Omni	Similar to Monopole	1 KW
VHF Transceive	30 MHz - 174 MHz	Vertical Linear	Omni	Similar to Monopole	100 W
UHF LOS Transceive	225 MHz - 400 MHz	Vertical Linear	Omni	Similar to Monopole	200 W
UHF SATCOM Transceive	240 MHz - 400 MHz	Circular	Omni	Hemispherical *(See Note 1)*	200 W
IFF Transpond	980 MHz - 1120 MHz	Vertical Linear	Omni	Similar to Monopole	1 KW Peak
GPS Receive	1227.6 MHz $\pm$ 10 MHz 1575.42 MHz $\pm$ 10 MHz	Circular	Omni	Hemispherical	Receive Only

Note 1: *System provides both high angle and low angle modes for SATCOM operation. Elevation pattern is hemispherical in either mode, but gain is optimized at high (30° to 90° elevation) or low (horizon to 30° elevation) angles.*

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