Application Brief

# Upgrading vital HF radio systems to meet the demands of remote naval operations

This end-user's landing ship dock (LSD) is a crucial asset for defence and disaster relief efforts in Oceania. In a changing climate, it was paramount that the naval customer's forces were equipped to manage such threats, as well as any other military situations that might arise. The primary mission is to maintain readiness to support home and overseas operations, including humanitarian aid support.

Communications systems are vital tools for managing conflict situations and relief efforts. When it came to upgrading this ship, a robust solution was required. However, several key operational, technological, and environmental challenges had to be overcome to ensure consistent transmission quality.


### End-user

Naval force, Oceania region.

### Mission/area of operation

Landing ship dock supporting a range of critical defence and humanitarian operations, including in remote areas

### Personnel and equipment

Capable of carrying more than 300 troops, 23 Abrams tanks, 150 light trucks, and even helicopters. The exact number can vary depending on the specific mission and operational requirements, but the vessel typically has a core crew of around 160 naval personnel.

### Solutions

- Replacement of high-power HF radio transmitters
- Replacement of internal rack cabling
- New control cables
- Through-life replacement of HF radio antenna tuning unit (ATU) systems

### Benefits

- Cost-effective and resilient communications
- Operational advantages in remote areas using beyond line-of-sight (BLOS) communications without fixed infrastructure
- Global coverage for comms channels
- Increasing accessibility in communications

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## Challenges

Recent years have highlighted how imperative electronic warfare (EW) tools are in modern defence systems, with conflict situations breaking out around the world alongside continued evolving threats.

Due to these circumstances, updating this naval vessel became increasingly critical. To meet changing demands in an uncertain world, it was necessary to upgrade its communications systems.

### Operating in remote areas

The defence and humanitarian operations where the ship is deployed mean it frequently operates in remote areas at sea, where methods of communication can be limited. Reduced situational awareness can result in logistical difficulties, decreasing readiness potential, and heightening safety issues. When human lives are at risk, strong communications are paramount to ensure naval vessels are in the right place at the right time and can respond to any emergency.

### Satellite communications can falter

Satellite communications can falter in more remote areas at sea and can also be compromised during a conflict. Therefore, more robust communication options are vital for vessels to execute missions effectively.

### The impact of weather

Ships require constant access to accurate weather and shipping forecasts. High winds, rough seas, poor visibility, and strong currents can significantly impact naval operations. However, in remote areas, the reliability of access to this information decreases.

## Solution

HF radio has remained a cornerstone technology for defence systems for more than 100 years because of its consistency in offering a reliable network for global communications. As a result, when the naval customer chose to upgrade this ship's comms capabilities, investing in the latest HF radio capabilities was a strategic priority.

### Upgrading HF radio systems:

Upgrade works were extensive, requiring the replacement of high-power HF radio transmitters and internal rack cabling, new control cables and replacement of HF radio antenna tuning unit (ATU) systems. Barrett Communications, a Motorola Solutions company based in Australia, was ideally placed to upgrade the ship's HF radio system.

### Performance improvements:

Being liquid cooled, the Barrett high power HF radio systems ensure high-performance even in high-duty cycle applications.

### Through-life support:

As Barrett equipment is also manufactured in Australia, clients in the region benefit from through-life support and benefit in the long-term from faster replacements and repairs when needed.

### Cost-effectiveness:

The project was cost-effective for the customer. Cost effectiveness was achieved by utilising a commercial-off-the-shelf (COTS) solution to replace a Military off the Shelf (MOTS) solution.

# Benefits

While satellites and other comms networks might use more advanced tech, they are not always as reliable as traditional HF radio and offer less coverage. For this reason, a high-performance HF radio system remains a necessity for any modern naval force seeking to protect coastlines or operating out at sea.

HF radio is essential to successfully coordinate search-and-rescue (SAR) missions and other operations where the customer might need to deploy their vessels. HF radio enables connection to local safety authorities, which in turn administer the Global Maritime Distress Safety System (GMDSS), monitors HF radio telephone distress, urgency, and safety communications 24 hours a day. Safety authorities also broadcast marine weather warnings and distress calls from HF radio transmitters at dedicated coastal hubs.

## Operational advantages in remote areas

High-frequency (HF) radios offer naval fleets reliable communications capabilities even in remote seas where satellite and cellular signals can't always reach. HF radio communications are propagated by radio waves that pass through the upper level of the atmosphere, known as the ionosphere, which then bounce back to Earth.

## Global coverage for comms systems

Unlike satellites, HF radio provides truly global coverage. Moreover, the ionosphere is far less prone to disruption, making HF communications difficult to compromise by hostile actions. This enables vessels beyond line of sight (BLOS) to communicate securely with other crews and stations – over potentially thousands of nautical miles.

## Increasing accessibility in communications

Each layer of the ionosphere refracts and absorbs HF radio signals differently depending on the time of day. In the past, radio operators had to be experts in solar weather and meteorology to find the right frequency to transmit their signals. Now, advances in automatic link establishment (ALE) make the HF network more accessible than ever. Operators lacking technical knowledge can send and receive messages, as ALE automatically calculates the optimum frequency and selects an available channel.

## Resilient communications during and after weather events

The naval customer has access to the Bureau of Meteorology's Space Weather Services, also known as the Ionospheric Prediction Service (IPS). This uses HF radio to monitor space weather events that may impact communications technology.


Offering resilient communications during and after severe weather events, HF radio requires no additional infrastructure to operate effectively and offers robustness to naval operations.

The primary mission is to maintain readiness to support operations at home and overseas, including humanitarian aid support. Completed upgrades will maintain readiness for deployment to support home and overseas operations.

New HF radio systems on the vessel will provide significant support for naval operations in Oceania for years to come.

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