

A global resurgence of HF communications emphasize need for HF signal intercept and direction (HFDF) finding to support national security

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Recent changes in the global geopolitical and social environment, the rise of malicious actors, and greater sophistication in electronic warfare all mean countries worldwide are on higher alert and enhancing their security.

In peacetime, satellites provided fast, straightforward communications. By combining the vast network of satellites orbiting Earth, information is relayed to and from ground stations to deliver and exchange information at speed.

However, satellite communication can fall short in today's uneasy, geopolitically cold environment. Satellites can easily be jammed, disrupted or interfered with. And various bad actors are turning to different communication methods to drive their nefarious activity. These vulnerabilities can't be tolerated when transferring critical high-value data. That's where High Frequency (HF) comes into play.

High Frequency is an effective communication method requiring only a transmitter and receiver. Operating over long ranges, with no "middle-man" (satellite) or third-party infrastructure, makes it incredibly hard for HF radio transmissions to be denied.

First deployed in the 1930s, HF was a popular choice for safe, omnidirectional communication such as shore-to-shore, and ship-to-shore over huge distances – or beyond the line of sight (BLOS) – of around 500 to 5000 kilometres. But countries soon were distracted with smart new internet technologies as they developed.

Today, however, the world is a different place. Countries still require beyond the line of sight (BLOS) however must require greater security and basic data transfer - and as a result, HF voice and data communications are experiencing a significant resurgence, offering significant benefits over other beyond the line of sight (BLOS) alternatives.

Reigniting the HF capability

There are few countries around the world that currently don't have HF capabilities. Many adopted it early on, and have been using it in a supporting role ever since because the technology is reliable, robust and long-lasting for long-range communications. Now, it is increasingly being used in an active role, and countries are looking to enhance their HF capabilities in line with technological advancements in the space.

In the past, HF technology required specialist skills to operate. But modern-day automation has eliminated this. HF has been optimised to apply the latest signal processing, providing advanced capabilities to ensure that the communications system is easy to operate.

Also, HF hardware and software solutions are optimised for modern-day scenarios. For instance, new capabilities can be delivered by combining HF with the latest radio technologies, such as software-defined radios (SDR) – which leverages software to generate signals as opposed to hardware components - for greater flexibility and accuracy.

Given the operating climate and the technological advances, we're seeing a growing number of use cases where HF communication is reemerging as the transmission methodology of choice.

Due to its cross-sector usage and benefits, HF is considered a national asset, shared across services with a tactical and strategic purpose in support of transmitting critical national data. For example, other sectors outside of government and defence are beginning to recognise the benefits. For instance in a finance context, HF allows high-speed financial trade communications in a fraction of the time it currently takes over fibre – and at a fraction of the cost. To illustrate, sending a signal from Chicago to London would take 15 milliseconds where HF can get there in half the time.

Overcoming nefarious activity

There are, however, downsides to these technological developments, as they allow our adversaries to operate in new ways – without utilising satellite services.

The use of HF communications is no stranger to certain environments, for instance maritime defence where ships utilise BLOS to communicate over vast distances. But, today, adversaries are utilising HF in similar ways to avoid detection on the ocean, where the desirable outcome for ships conducting smuggling activities is to have a low probability of being detected.

HF also suits difficult environments such as the jungle where signal processing allows reliable communications despite the dense trees and flora – where satellites would almost certainly fail. HF will beat almost any other technology in these pockets of the world.

In response, there's an urgent need for HF communication to be intercepted in order to counter the nefarious activity being enabled by its use. HF Direction Finding (DF) is

increasingly being used as a critical tool providing the intercept and the location of the source transmission when being used as an alternative to BLOS satellite communications.

Modern signal processing supports improved interception. This provides advanced capabilities to identify and intercept HF transmission, this can also lead to Direction Finding (DF) when multiple nodes hone in on signals of interest. Once identified, a specific signal can be monitored, recorded and analysed to understand the level of activity from the source and provide a vital piece of the strategic intelligence picture.

Adapting to present-day needs with Global Reach

Since 1968, TCI – part of the SPX Communication Technologies platform – has been designing and manufacturing HFDF solutions, providing omnidirectional high-gain wide-band transmitting antennas covering the short-wave band (2-30 MHz).

In the coming years the geopolitical climate is likely to increase the interest in HF due to its secure transmission capabilities. From Europe to Asia, HF will serve not just as a back-up, but in an active role. TCI have the ability to provide the optimum solution to meet the challenges of modern day HF communications and HFDF strategic capabilities.