



● ● Martin Coleman, Executive Director of the Satellite Interference Reduction Group

The state of satellite interference

Over the past few years, the problem of satellite interference has been widely discussed, with most stakeholders well aware of the problem, and in many cases, some of the solutions available to resolve it. However, it remains a challenge for the satellite industry, and we have not quite solved it yet. If we look at the military satellite environment, its inherent and unique challenges make it even more difficult to resolve when it does occur. As with all sectors, the biggest challenge right now for the satellite industry is getting the users on board with the tools and techniques to do their bit towards resolving interference and increasing mitigation methods in to standard products. Martin Coleman, Executive Director of the Satellite Interference Reduction Group, discusses the key challenges and solutions in the fight against interference today.

The military accounts for a sizeable proportion of interference, both within their own environment, as well as affecting commercial services, and there are a number of reasons for this. Firstly, the military often uses equipment to its limits. Using the right kit with quality technology that ensures errors in operation are minimised makes a massive difference to delivering the service and less likely to create interference issues.

Secondly, there is often a lack of training amongst military users, with many users unfamiliar with the operational aspects of satellite equipment, let alone how to spot and deal with interference issues. This is not surprising of course, as high rotation of staff means that the same people won't be in the post for the length of time we would be looking at in the commercial world. However, if each military user tasked with operating satellite equipment was given proper satellite training at the start of that post, it would have a significant impact on reducing interference instances.

Added to that, there is often a lack of testing or operational verification of new systems with satellite operators. The equipment is, more or less, ready-to-go, and simply switched on in the field. However, making those preliminary checks is vital to ensuring that systems are working properly, and those tasked with operating it are familiar with what to do and what to look for when things aren't working as they should be.

Finally, and a major element that makes the military environment more challenging than most is exactly that – the military environment. Systems are pushed to the extreme and used in situations where there is a massive margin for error and very little time for the operators to worry about that. One example is the use of unmanned aerial vehicles (UAVs) in extreme operational conditions, which

often generate interference when control of any UAV must be absolute. To achieve this, higher transmit levels are often used and thus create problems of interference. Therefore, we need to ensure future designs of UAVs are built to minimise interference for all operational circumstances. Again, better design and testing of satellite equipment with real-life simulations will help minimise this, and also give those operating it much better understanding of the operational concerns.

The satellite operator perspective

Whilst it is true that a lot needs to be done by the military (and other) users themselves, the satellite operators do have a big part to play in reducing interference. And for the most part they have been doing their bit well, with many operators instigating a number of processes and tools to help resolve interference as quickly as possible. This includes using control centre analysis tools, such as spectrum monitoring and geolocation tools. The more data they can collect, the easier it is to determine the source quickly and ultimately remove the interference. Ruben Marentes, Director of the Network Operations Center at Intelsat, commented: "The more efficient the isolation and mitigation tools are, the faster we can address the RF complaints from customers." Despite this, Marentes believes operators need better integration with other tools to make the process better still: "I feel that integration with other tools (customer service databases) and ticketing tools (remedy and others) can make our RF tools more effective."

When it comes to military customers, the satellite operators cite adjacent satellite interference (ASI) as one of the biggest problem areas. Sometimes this is due to the extremely small antennas often deployed by the military, but it can also come down to a lack of pointing accuracy. This includes from fixed terminals, but also mobile terminals, where ensuring

pointing accuracy is of course particularly tricky. ASI is also caused by the increasing number of UAVs deployed by the military with a severe lack of accuracy.

As well as the challenges of a harsh environment, making it more likely for the military to cause, or experience, satellite interference, the processes make resolving military interference far from simple. For starters, operators are very often having to work with discreet information on location, type of use, and duration of the operation. Without all the information, it is very difficult to investigate and isolate the cause of the interference. Dealing with stakeholders can also be long-winded, as highlighted by Marentes: "The number of stakeholders and the communication proxy demanded by the military brass makes the transfer of information rather complex and slow."

The tools

However, despite the military environment and processes themselves being unique, the tools used by satellite operators are the same for all sources of interference. Marentes adds: "We use the same monitoring tools to detect interference sources in commercial segments than when ones used to isolate and troubleshoot RFI cases from the military. The way we proceed demands more from the staff in different steps, but for the most part, the resolution process is the same."

These tools enable operators to analyse and identify the interference, its characteristics, and, if geolocation can be used, they can locate the source. Over the past couple of years, we have seen a number of great innovations that are making a huge impact on interference.

It starts with solutions from companies like Integrasys, aimed at reducing interference occurring by ensuring antennas are setup and pointed correctly from the start. Alvaro Sanchez, Sales and Marketing Director, Integrasys comments: "Remote systems are often setup by soldiers that do not have the required

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● ● *Alvaro Sanchez, Sales and Marketing Director, Integrasys*

technical skills, and cannot call the NOC for guidance, so they need easy-to-use tools to streamline the process. At the same time, soldiers' lives are dependent on the communications being provided, therefore it is absolutely essential to ensure maximum availability for accurate and reliable communication."

Integrasys has a growing product portfolio aimed to help here. That includes Satmotion Pocket, a simple mobile app that helps those users through a simple step-by-step process to install a satellite link. The tool makes sure that the antenna is not misaligned and greatly improves accuracy and reduces errors, including satellite interference.

Following installation, whether that has been done correctly or not, there will always be a need for constant monitoring satellite transmissions. There is a growing number of tools available to do just that. That includes Crystal's Spectrum Monitoring and Recording (SMR) solution. It gives an overview of all spectral bandwidth at a glance and allows hundreds of transmission spectral segments to be periodically sampled and examined for any of several user-defined error conditions. Roger Franklin, CEO at Crystal, cites a large government maritime company, which is using Crystal SMR to control 30 physical spectrum analysers located around the world. The customer experienced episodes of false interference on a particular carrier. He comments: "A situation like this could take days or even weeks to isolate, which is simply not acceptable in a military situation." Thanks to Crystal SMR, the interference was quickly isolated and could subsequently be resolved.

Kratos is another company providing RF monitoring, as well as interference detection, and geolocation services for both military and commercial environments. These include Kratos' Monics family of products, providing

centralised RF spectrum monitoring and advanced interference detection, including carrier-under-carrier detection and characterisation.

John Monahan, Senior VP for Kratos SATCOM Products, understands the challenges of military satellite communications: "Protected MILSATCOM must provide low probability of interception, detection, and exploitation, and be survivable, to include anti-jam communications. Strategic protected MILSATCOM must also provide robust command and control services in benign, contested, and nuclear operational environments."

Bearing this challenging environment in mind, Monahan believes the industry as a whole needs to get much better at assuring satcom in a contested environment: "As reflected in the Space Enterprise Vision (SEV) outlined by General John Hyten, Commander, United States Strategic Command, military service leaders are looking closely at a variety of ways to restructure space operations, including expanding commercial partnerships. Commercial SATCOM providers need to be ready to step up to the challenges of protecting military communications using their commercial capabilities."

An example of such cooperation is the work Kratos is doing for the US Department of Defense (DoD). Kratos provides RF monitoring, interference detection and geolocation services for all DoD leased Ku, C, and X-band commercial bandwidth worldwide. To provide DoD with worldwide coverage, Kratos is expanding its current infrastructure by adding seven new worldwide monitoring sites, hosting more than 60 antennas and providing visibility to over 50 satellites, 100 beams and 200 transponders.

Franklin echoes that belief: "We need



● ● *Roger Franklin, CEO at Crystal*



● ● *John Monahan, Senior VP for Kratos SATCOM Products*

to get the whole industry behind the initiatives to reduce interference. This includes getting on board with Carrier ID. Better monitoring tools and automating processes will also have a massive impact on reducing errors before they happen."

Integrasys has also launched a number of solutions for continuous monitoring, including its Alusat seamless network maintenance system, which allows the NOC operators to detect any degradation from remote sites. Sanchez notes: "The combination of Satmotion Pocket and Alusat has solved major Adjacent Satellite Interference between two major satellite operators. Alusat was able to detect which remotes needed re-pointing and the remotes were easily re-pointed within minutes, using Satmotion Pocket."

Sanchez believes the satellite operators should be doing more to incentivise interference reduction: "In our opinion, satellite operators should increase prices if customers cause interference, as the satellite operators lose revenue from other customers due to noncompliance with Service Licensing Agreements."

Better geolocation tools are also important, helping operators to locate the source of interference once identified. Companies such as Kratos and Siemens Convergence Creators have been innovating a great deal here.

Using all the tools in the box

It is clear that, when it comes to interference, no matter the source or who is affected, we need to be working together as an industry, and using all the tools in the box. There is a growing number of technology solutions and a number of industry-wide initiatives in place, now we just need everyone to adopt the tools available to really make a difference. **GMC**