



## Mitigating satellite interference

Glowlink provides cutting-edge satellite monitoring products to mitigate satellite interference. Helen Jameson spoke to President, Jeffrey Chu to get his perspective on the interference detection industry and find out how it has evolved.



**Question: Many thanks for taking the time to speak to us. You have been involved extensively in military satcoms throughout your career. Can you please begin by telling us your thoughts on how satcoms are reforming military communications? How significant are they?**

**Jeffrey Chu:** I actually began my career working on the military side of satellite communications, although through the years we have straddled both the military and commercial sides. Today we are about 50/50 in terms of revenue so Glowlink really has a broad exposure to both sides of the fence.

I think that satellite communications are definitely reforming the military. Number one, satellite communications are very local. They have incredible reach. In addition, satcoms

are wireless and one satellite can roughly cover one third of the earth's surface and this is extremely useful for military communications where you need the connectivity wherever you go, even in the most remote areas of the world. So from a connectivity standpoint it's a no-brainer. It is a must-have for military communications. The long-haul, point-to-multipoint, broadcast and wireless capabilities are features that allow the military to be highly mobile. Satellite allows military operations and missions to be completed more effectively.

I think the other benefit has to do with modern technology that is used both in space and on the ground that allows flexibility in terms of connectivity. Satellite affords a lot more flexibility in terms of the different types



of communications that are required and how you want to connect the different communications points. What I mean by this is, for instance, not just in military but also on the commercial side, you can be anywhere and you can receive video, voice or computer data. You can receive a lot of information in a transmission and that helps a lot in modern warfare where you have groups of people carrying satphones or some sort of IP device.

The communications are highly mobile, highly flexible and you can transmit a variety of information. Satellite is transforming the military in terms of overall effectiveness of communications. The efficiency is more in the realm of power consumption or how long your particular communications device can last. If your communications device has to be a huge dish or a huge truck then that is not going to be very efficient. However, if you have a handheld device, that is going to be much more effective. So that is what the technology both on the ground and in space can allow. Satellite communications have helped military communications to evolve into something way more efficient and more connected than before.

**Question: You have also had a pioneering role in the introduction of interference detection systems for the military. How have these systems changed over the years?**

**Jeffrey Chu:** The interference problem has always been around in terms of both commercial and military satellite communications. In the beginning there was clearly a big emphasis on the military side. Interference has historically always been a problem because the satellite sits up there in space and is visible to a third of the earth's surface so anybody with an uplink could intentionally or unintentionally interfere with satellite communications.

In the early days of satcom, the government flagged the military as the most predominant user of satcom. Commercial satcom really didn't happen until way after that. In the beginning, interference was very much out in the open and if some bandwidth was not being used and somebody injected a signal or a pirating signal you could see it clearly. However, this is not a very effective way of detecting interference because it is not interfering with anybody if it is out in the open, right? This is really unauthorised usage on bandwidth that you are not using anyway.

About ten years ago the technology hadn't evolved to the point where you could directly detect interference that occurred within the bandwidth of a particular carrier communications signal. You couldn't really see it because it was buried in there. We as a company first developed the technology that allows you to look underneath a com-

munications signal for any interference that is present in that particular signal. Interestingly enough, we did that for the commercial world because the commercial side gets a lot more in the way of interference than the military. All the satellite operators were saying that they were getting a great deal of interference and the only way that they could do anything about it was to ask their customers to turn-off the traffic. Well, you can imagine going to CNN and telling them to turn-off their traffic so you can look at what's underneath it. They're not going to be very happy! So about ten years ago, which was actually about the time that Glowlink was founded, we developed the technology that actually allowed you to look underneath a communications signal without having to remove the traffic. That technology is fairly sophisticated and it was developed for commercial usage but whether it is commercial or military, everybody has a need for this type of technology.

That is really how the interference detection system has evolved over the years. Before we came on the scene that type of technology did not exist. Interference detection systems of today are a lot more powerful than they were in the past.

**Question: Interference is a constant threat to troops on the battlefield and to the security of our armed forces but how much of this interference is actually caused by hostile forces and how much by human error?**

**Jeffrey Chu:** On the commercial side, most of the interferences are caused by unintentional means whether that is human error or equipment failure. The vast majority of interference is on the commercial side.

On the military side, you generally do not see a great deal of interferences. The reason for this is that the military uses a lot more discipline and they manage their frequency transmissions in a more controlled way than the commercial transmitters. If you look at the commercial guys, they have SNG (satellite newsgathering) equipment and they arrive somewhere, point and shoot. Well, they may not be pointing exactly at the right satellite.

This creates a unique problem - what happens if military communications need to use commercial bandwidth? If you are a military user you are disciplined when using your own satellites but once you start to use commercial bandwidth you are in an area where there is much less discipline and it is not properly policed. The fact that the military are using increasing amounts of commercial bandwidth is causing some of the problems. In terms of the volume of interferences, a high percentage is caused by human error or equipment failure. However if you look at the consequences of interference whether it is unintentional or intentional, on the com-

mmercial side the worst outcome is loss of revenue or a customer screaming down the telephone to say that he's lost his picture. However, on the military side it could be devastating. The worst outcome could be loss of life. So interference cannot be trivialised as it often is on the commercial side. The military have a concern that the commercial bandwidth is not as tightly policed. The main difference between military and commercial are the consequences of the interference.

**Question: How common are instances of interference on the battlefield and once interference has been detected, how can it be stopped?**

**Jeffrey Chu:** There used to be no way of stopping interference. Nothing could be done. You would simply go onto a different channel. To a certain extent, they still do that now and move the traffic to another part of the frequency band where there is no interference. But if there is interference all over the place there is nowhere to go. Trying to do something with the interference has always been the Holy Grail. How do you stop it? It really takes two things. Firstly, you have to have a very powerful capability to properly detect and characterise the interference. Secondly, you have to properly understand the nature of the interference. Once you have got these two things pinned down you can bring in geolocation. Geolocation is really a term broadly applied to mean, discovering the location of the emitter of the interference. Once you have identified the interferer you can deal with it.

In the commercial world you can call someone and tell them to stop the interference or you will have to take them to court. Most of the time though, if it is due to human error they will put a stop to it but if you don't confront them with the evidence they will just deny it. Nobody wants to own up to it being their fault. However, if you confront them with the solid picture of evidence most will fix the problem.

In the military and the civilian world when you get interference you sometimes can't get the other party to cooperate so you have to go through diplomatic channels or some other means to solve it. But the key to that is finding out where the interference is coming from. That's what geolocation is all about. The concept of geolocation has been around for a long time. Up to about two years ago these systems were cost prohibitive. They were very expensive and they didn't work very well and the reason was that they were designed upon old technology that really couldn't deal with these problems effectively. Some of these legacy products simply have not been able to step up to the plate. However, these days the systems are highly effective, extremely affordable.

Interference is like the crazy uncle in the basement. Everybody has got their problems



but they don't talk about it because the customers don't want to hear that so the problem is really like a worst kept secret – nobody wants anybody to know that they have had interference, but everybody does get interference. But if you ask them if they need the technology and tools to deal with this problem they absolutely will tell you that they do. They will buy it.

**Question: Glowlink's latest product, the Wideband Global Spectrum Monitoring System, will tie in with the new WGS constellation, the first of which has recently become operational. What specific modifications have you had to employ in order to monitor these next generation satellites?**

**Jeffrey Chu:** The WGS is the next generation military satellite. It has a tremendous amount of bandwidth compared to the previous generation and is expected to become fully operational in 2012. The constellation will provide global coverage and it is going to be the United States' most powerful military satellite yet. It will have a lot of flexibility, a lot of capacity.

In that sense, we have to tweak our systems to meet the demand of the flexibility and the amount of traffic that it carries. Luckily, our system is flexible enough that we only need to tweak it a little bit. Our system ended up playing a critical role in the activation of the first WGS satellite. It has a state-of-the-art monitoring and interference detection regime that we invented called Synchronised Monitoring. That is a technology specifically

used for this type of communication. The WGS is based on a commercial satellite platform built by Boeing and they can also use the platform for commercial satellite operations as well. So the kind of technology we ushered in would be equally applicable for commercial use. Glowlink is therefore very well positioned to contribute to the community in that sense too.

**Question: In terms of the military versus commercial customers, what, if any modifications are made to your products before being sent for military use? Are there any differences?**

**Jeffrey Chu:** There are some differences in terms of applications and specific technologies. However there are some core, bread and butter issues for all customers such as product reliability, product performance and the kind of support we provide and nowadays especially, the affordability. In those areas, there is no difference. The product is equally reliable whether it is sold to the military or to the commercial sector. We provide equally responsive support and the product must meet high performance standards without breaking anybody's bank. We always have to justify the return on the equipment that people buy. It's a very stark reality for the commercial world. But even for the government world, where people often think they can print their own money, budget is critical. The product has to be affordable. So value and return on the products are becoming equally important for both military and commercial.

**Question: In your opinion, how will your products evolve in the future?**

**Jeffrey Chu:** I think we will be evolving along with our customer's needs. There is no doubt. I think there will be more features required whether it is in the type of signals that are going to be deployed and the kind of information they want to get – the whole set of complexities increase. We will meet these demands the best way we know how whilst not raising the prices. So the price will either not evolve at all or it will get lower. We are very confident of this. So as we go forward we see our products getting better but also getting more affordable and what allows us to do that is the in-house knowledge base. You must have a core knowledge base within a company to allow you to quickly adapt your products in a cost-effective manner.

We do have technology partners – it is a good thing to have technology partners - but sometimes having too much out there prevents you from quickly and effectively adapting to any new demands. As we evolve we will offer more features and more diversity, for example IP. The great thing is that these modern products are easy to change and develop through software, unlike changing a piece of hardware.

A good analogy would be the difference between trying to re-engineer an automobile and trying to re-engineer a website. One could take minutes and the other could take years and it highlights the contrast between software and hardware. Since ninety percent of our work is in software, we can quickly adapt to our customer's needs. ■



*Photo courtesy of Glowlink.*