● ● *Philip Harlow, President and Chief Operating Officer, XTAR LLC*

XTAR is a trusted commercial satellite operator exclusively providing services in the X-band frequency range, which is the communications cornerstone of today's military, diplomatic, humanitarian and emergency disaster response operations. A privately-owned and operated company, XTAR supports the critical satellite communications needs of governments around the world through its two X-band payloads.

With its high-powered 72MHz transponders and global, fixed and steerable beams, XTAR provides over 4 GB of cost-effective, flexible, secure X-band capacity with coverage from Denver east to Singapore. The system can accommodate massive wideband data requirements and provides overlapping coverage with regional redundancy for increased service and reliability.

XTAR bandwidth is not application-specific; it can support and transmit to any one of the primary architectures used by government agencies today, including fixed-to-fixed, tactical-to-tactical, reach-back, broadcast and airborne platforms.

GMC Q&A

Challenges facing today's customers ● ●

XTAR LLC was founded in 2001 as the first commercial company to provide X-band satellite services. The privately-held company, which serves exclusively government and military users, started operations with the launch of XTAR-EUR at 29° East in 2005. The satellite hosts a NATO-configurable payload designed to support European customers. In 2006, XTAR-LANT was launched as a hosted payload on SPAINSAT at 30° West. XTAR was one of the first adopters of the hosted payload model. The company is currently exploring its expansion options by engaging with government policy makers and military acquisition authorities to ensure that any new systems fully address emerging user needs. Amy Saunders spoke with XTAR's President and Chief Operating Officer - Philip Harlow and International Business Director Paul Bosher to find out more about commercial X-band services, the company's areas of operation and the challenges faced by government and military users today.

GMC: X-band satellite communications are restricted for government and military use to enable reliable services. Can you outline the benefits of X-band compared to other frequencies?

XTAR: X-band is used by government-only users like intelligence, military, civil government, border control, naval and the coastguard. In the old days, it was mainly used for point-to-point communications between static sites and for trunking applications. What we've found is that, while X-band is good for those point-to-point applications, it also works really well for mobile applications. It achieves really high data rates, even with small antennas.

High data speeds are important, but it's more important that you're achieving it in a way that is efficient. Transponders have two resources: power and bandwidth. The customer pays for the larger in terms of consumption. Our transponders are 72MHz wide, compared to 36MHz for most commercial transponders. We also use a 100W amplifier, providing around 1.2W/MHz. The amount of occupied bandwidth depends on the coding, the modulation of the modem and the power on the transponder. So if 6MHz is used for power, the customer pays for both the required bandwidth and the associated 6MHz for power. To be efficient, you want to use modulation encoding to get you to the smallest consumption, to balance power with bandwidth. This is the ideal result, and you can do that with small antennas on X-band. In contrast, with Ku-band, as you use smaller terminals, you have to lower the encoding and modulation. Even using spread spectrum techniques, you end up using more bandwidth.

Reduced interference is another reason why X-band is better suited to government applications. The small 2° of separation between Ka and Ku-band satellites means that these satellite signals hit multiple antennas, resulting in signal interference. Likewise, for signals being broadcast from small antennas in particular, the signals cause adjacent satellite interference (ASI), which looks like noise. However, each X-band satellite is situated 4° away from the next, so you can use really small antennas without significant interference concerns. This means you can be really aggressive with your coding, modulation and bandwidth and put a lot of bits in each Hz. Hence with X-band, you're effectively achieving 1MB = 1MHz, whereas in Ku-band, 1MB = 3-4MHz using spread spectrum. That means that X-band is 3-4 times more efficient in some cases. Nobody knew this four or more years ago.

X-band is also resistant to rain fade and works under all conditions. We did an analysis very recently where a link was required into Honduras, a high rain zone area. With X-band, we were able to reduce the required power/bandwidth to 4MHz, to match the 4Mbps requirement. At Ku-band, the customer needed 14MHz, some three and a half times more bandwidth than it required at X-band, to achieve the same result. Some of that was power, but most of it was bandwidth.

Another advantage is that commercial X-band services are often overlooked. When you want to use X-band without risking your communications being jammed by an adversary and the resulting political uncertainty, our commercial service is a great solution. When an adversary jams a military satellite, that's an act of war. But if you jam a commercial satellite, that's a very different thing. For that reason, bodies like NATO might consider encouraging commercial companies such as

XTAR contral and antenna facility in Canary Islands. Photo courtesy XTAR

ourselves to start providing satellite communications within war-torn countries or those under significant threat.

GMC: You've commented that commercial X-band is often overlooked. What government and military applications have seen good uptake, and which sectors might see the most benefit?
XTAR: There are a lot of threats that satellites can help governments around the world with, like deforestation, illegal mining operations, piracy and smuggling. X-band is an efficient solution for all of these. It's all about finding the user with the mission that could benefit from satellite communications, and how you make it accessible to them.

There are a number of aircraft operating with airborne intelligence, surveillance and reconnaissance (AISR) platforms. These platforms are flying around, streaming data back for real-time analysis, influencing actions being made on the ground. We convinced a selection of those operators to switch to our X-band services; at one point, we had 18 aircraft on the contract. While 18 might not sound like a lot, there aren't hundreds of these airborne platforms in existence. Our aircraft numbers have since fallen because some of those were in Afghanistan and have now returned.

Equipping airborne platforms with X-band enhances the reliability of vital satellite communications in a cost-effective way. For example, if you're flying over South America with video on the ground and radar looking for drug running planes, you want to identify a target, get information about it, send that video back to headquarters, and then direct land, sea and air forces to intercept, as quickly and accurately as possible.

There's also the maritime market, where many ocean-going vessels have low data rates. Imagine you've got a small coastguard vessel, and with a small antenna on X-band, you can achieve 10-20MBps data rates. This means that when a vessel is intercepted, it can do fingerprinting and facial recognition, which can be live-streamed back to the central databases to get real, actionable intelligence at the point of interception. The application of X-band under these circumstances helps to fight illegal immigration, piracy and smuggling, among others.

One of our parent companies is working on satellite automatic identification systems (AIS). Large vessels on the ocean have AIS transponders, which transmit their identity and location to on-shore receivers. Meanwhile, synthetic aperture radar (SAR) satellite data enables the detection, location and direction of travel of ocean vessels to be plotted. In the Mediterranean, our parent company was able to identify boats travelling from Africa to Europe without an AIS transponder. Under these circumstances, a patrol vessel could be sent to intercept that vessel and establish its intent, which may be smuggling or illegal fishing. This kind of technology is very helpful for countries with a small navy or coastguard by allowing them to build up an accurate picture of the situation and respond appropriately.

GMC: What effect have recent world conflicts had on your business?
XTAR: We recognized some time ago that, sooner or later, troops would start to leave Iraq and Afghanistan, and we started to look at the Middle East and Africa, where there are a lot of opportunities.

There's currently an aircraft in Mali that's contracted to use our X-band satellite services, and more and more of those African countries want that capability because it was proven in Iraq and Afghanistan that they are a powerful tool against the enemy. If you know that the enemy is on the other side of the hill, you can rain down on them with artillery or other weapons. Enemies in Mali and Northern Nigeria have become a very worrying threat for much of Africa.

Much of Eastern Europe is very worried about the Russian threat, but no one wants to talk about it. Interestingly, the Ukraine Government wanted to use X-band communications and started

to work out a deal with the UK and some NATO countries, but nothing came of it. By approaching the deal through government channels, it became too expensive and too difficult. However, Ukraine could have come to us as a commercial company and that would have been much more straight-forward.

GMC: XTAR recently highlighted Latin America, particularly the Caribbean and the northern part of South America, as a region with growing demand for X-band services. What are your current activities there?
XTAR: Drug trafficking, maritime surveillance and immigration are all major areas of concern in this particular region right now.

We have a beam over the Caribbean on a service that aviation users are able to access at will on a pay-per-use basis, charged by the minute. It's an unusual mode of business, as normally Inmarsat is the only one that really does that. We've found that there are a lot of missions that could really benefit from satellite communications, but that they haven't been doing it because they can't afford the on-board equipment or the satellite service.

Our model is to make it easier for people to access the spacecraft. Customers pay for the service when they use it and they don't have to book it in advance. We recognize that not everyone can afford a full time service, but they can pay for a day here or there when they need a mission in South America, for example. This means that when they're on the ground, they're not paying for something they're not using. We've tried to be flexible in our approach to revenue so that our customers get the best deal. They might pay a little less to us each month, but they're a happy customer because they don't feel like they're getting ripped-off.

GMC: With commercial X-band services often overlooked, marketing XTAR to potential customers must be pretty challenging. How do you meet that challenge?
XTAR: We're a small company, so our major challenge is awareness: not many people know about us. If they do, they assume that the equipment we use is like C-band, with large dishes and fixed infrastructure. This is not the case. X-band terminals are manpacks, airborne and maritime terminals, and can be quite small.

When people think of commercial frequency bands, they typically think of Ku, not X; we work pretty hard to overcome that. If they get past that, they think it's capital intensive. A lot of what we do to market ourselves is word of mouth. Partnerships, such as those with equipment manufacturers to reduce costs for our customers, are key.

When you provide a customer with a small X-band deal, they tend to stay with it, or move to a larger deal, because it's a good product. They're likely to be your customers for life. There are also the smaller countries, without the budgets of the USA that have to show value for money. It's very easy for them, with flexible business models, to argue the case to spend what they have on X-band because they're getting good value for money for a capability that they wouldn't get on other frequency bands.

We're not only targeting countries with political unrest or developing economies either. We very recently announced a partnership with the UK's Primetech, which provides communications to emergency services, government departments and the armed forces. The use of X-band will provide reliable, always-on, uninterrupted communications under all weather conditions and across all terrains.

We've also found that, once one part of the government starts working with us, another part realises the potential and is more willing to trial our service. The Navy is currently testing X-band on Trident, instead of commercial Ku-band or wideband global satcom (WGS). It's also working on a similar project with Global Hawk and Predator UAVS, which currently only use Ku-band. The Navy took the aircraft design and fitted it with X-band and military Ka-band because there's very little Ku-band coverage over the Pacific Ocean. It's all about breaking the mould; because UAVs have always used Ku, they keep using Ku. Now that there's a specific reason for change, other users will likely start to look around and consider change. **GMC**

Photo courtesy International Maritime Organisation