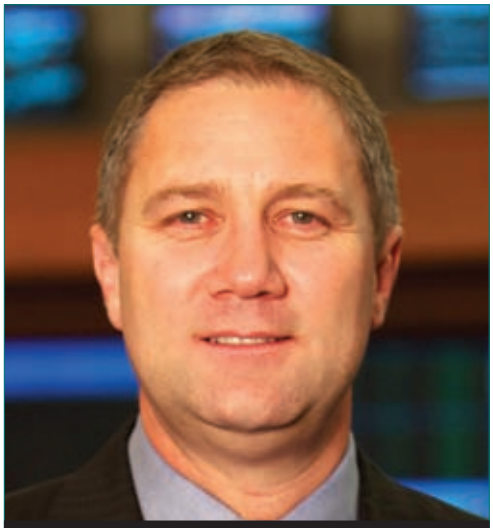

*Philip Harlow, XTAR's President and COO*

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 4GB 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 applicationspecific; 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

# Serving government and military users

Founded in 2001, XTAR was the first commercial entity to provide X-band satellite services in the world. Today, the company exclusively serves government and military users, and is currently exploring its expansion options by engaging with government policy makers and military acquisition authorities to ensure its new systems fully address emerging user needs. Amy Saunders spoke with Philip Harlow, XTAR's President and COO, to find out more about the company's operations, latest developments, and outlook for the future.

**GMC: Can you provide an overview of XTAR's development since its founding, and its decision to focus exclusively on government and military users?**

**Philip Harlow:** The decision to provide service in X-band (and thus to government users only) was a function of the environment when the company was formed in 2001. At that time, DSCS was the only X-band that the DoD had access to, and the only additional X-band, Transformational Satellite (TSAT) fleet was on the drawing board. The Wideband Gapfiller Satellites (original WGS acronym) were conceived to bridge the gap, and that is where XTAR saw the market for our services. X-band is clearly a key asset for military users, given its significant technical and operational advantages. We were there to fill the gap starting in 2004, three years ahead of WGS's first launch in 2007.

The significance of X-band has taken firm hold with the user community, and now is recognized across the world as an essential element in military and government communications. Not only has the Gapfiller program become permanent and grown to 10 satellites (original WGS funded for three satellites), with X-band now readily available across the globe to US military and government users, other countries and commercial companies have followed suit. The British, French, German, Italian and Spanish governments all have a formal X-band capability, and in other parts of the world, the Japanese, Koreans, Australians and others have significant programs in this frequency band. Telesat Canada and Optus Australia have hosted X-band payloads on their satellites. Luxembourg, in partnership with SES, has invested hundreds of millions of Euros into GovSat, an initiative that will likely expand beyond its initial satellite with time.

It is absolutely true that XTAR has a singular focus on government and military users. Not only is the frequency band reserved by the ITU for government use only, XTAR believes that only by this focus can we properly service the government users that have come to rely upon our responsiveness and dedication to their missions.

I have worked for a number of satellite companies where the tension between the commercial and government sides of the business does not always result in the best deal for the government user. In some cases, the US Government was

*Photo courtesy of XTAR*

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paying high premiums over what commercial customers could expect to pay. So, at XTAR, we retain this singular focus on the government user - their success translates into our success.

**GMC: XTAR operates entirely in X-band; how did the company come to make this decision, and what benefits does X-band provide compared with other frequencies?**
**Philip Harlow:** There are clear technical and operational advantages of X-band. Frankly, before I came to XTAR, I had looked at X-band simply as the same old stuff as C-band used to be: Large antennas, point-to-point fixed infrastructure-type communications. At first glance, nothing new. What we have come to figure out is how interesting, and even exciting X-band can be. In this more mobile world, where size, weight and power (SWAP) always pose significant constraints, X-band is proving itself to be a highly versatile and robust capability - and users are starting to appreciate that very much.

Most of the technical advantages come from the satellite spacing - X-band satellites are not subject to the same adjacent satellite coordination constraints as the commercial bands, and X-band satellites reside at least four degrees apart in space. This translates into the ability to transmit and receive into very small antennas at very high data rates, without interference from adjacent satellites. When we talk about the sub-1m antenna platforms, we can achieve 10Mbps and more from mobile platforms like maritime vessels and aircraft, and from small man-pack terminals that are set up in moments by remote users.

"Science never lies" – X-band's other significant advantage is its resistance to rain fade. X-band simply doesn't attenuate anywhere near as much as Ku-band, and certainly significantly less than Ka-band, making X-band virtually weatherproof. Often, Ku-band needs 3-4dB of additional power to keep the links available, and at Ka-band, this link margin has to be at least 8dB higher. This means at Ku-band and Ka-band, the user has to buy much more satellite capacity (bandwidth or power) which means it's more expensive.

Often, with Ku-band and Ka-band, to get high data rates to/from small antennas, the signal has to use spread spectrum techniques to make sure the signal can close. XTAR can achieve all of the above advantages without using spread spectrum techniques, which means the links are effective, but also maintain bandwidth efficiencies that result in much lower total costs to the user.

Operationally, there are factors that make this part of the spectrum attractive to a government and military user. The user base being solely government/military users, the operating environment lends itself to requiring smooth operations. There are no commercial users on our satellites - period. The users are all typically well trained, so accidental interference can quickly be isolated, is minimized and under the control of that government. Consequently, satellite news gathering trucks, Internet cafes or household consumers can be isolated in general frequency bands leaving X-band free to provide reliable, available and critical communications to government and military users only.

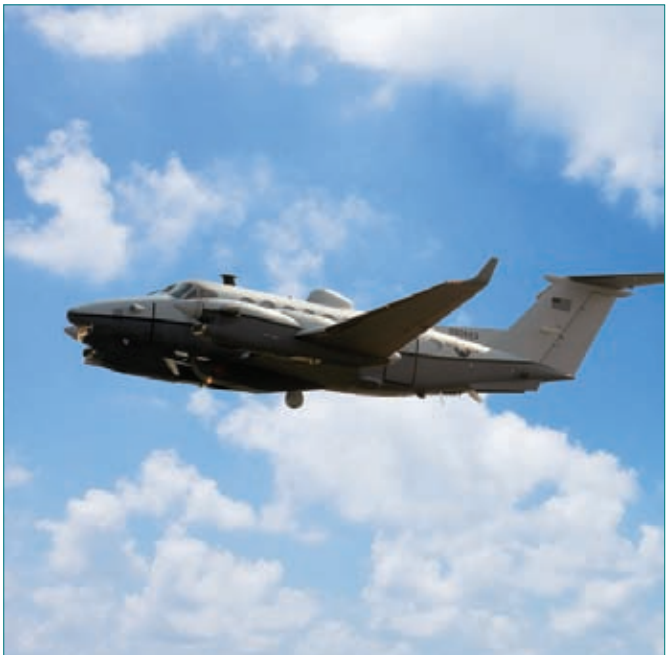
**GMC: What services does XTAR provide to its military and government customers, and how do they compare with competitor offerings?**
**Philip Harlow:** XTAR's users have come to rely on us to address complex requirements in addition to the provision of satellite bandwidth. First, we have a number of partners who know how to provide the whole end-to-end solution, and we are able to step in where we can anchor services. When we first got started, no one really knew how to use us. Commercial teleports were very few and far between, and getting licenses was a challenge - simply because no one had done this before. We've now cracked this, and there are a number of teleports that are fully capable and licensed to provide services using XTAR's satellites. It's no longer the mystery it once was.

Second, we have a number of partners who manufacture X-band equipment. Seven years ago, when I first took the position at XTAR, X-band equipment was significantly more expensive than Ku-band equipment. This is no longer the case; manufacturers are making much more X-band equipment, bringing down costs, the military is buying many more dual- and tri-band terminals, and the need for smaller and smaller terminals for SWAP challenges are driving manufacturers to invest more in their X-band terminal developments. These factors make X-band equipment competitive with Ku-band and other frequency bands' equipment. In fact, for a recent proposal submitted by XTAR we found the X-band equipment option to be less expensive than the Ku-band alternative.

Third, we constantly flex to meet the needs of the user, but unlike a government satellite, we are able to customize our solutions. It's not the case where XTAR has a particular product and a particular business approach. We recognize that we are a relatively small part of the whole mission set, and thus we try to ensure that we don't impose any unnecessary obstacles in the way of the mission. So, we adjust our approach for each application and to each procurement action without trying to force our users to conform to our business model. In some cases, that means supporting our integrator partners in their provision of services to the end-user. In others, it is providing access to the spacecraft for ad-hoc or for short term missions or training exercises.

**GMC: Where do you see the most growth in the government and military communications markets right now?**
**Philip Harlow:** Mobility. Mobility. Mobility. There is a clear demand for everything to be more accessible, compact and faster for applications that are fully mobile. This is driven by airborne in particular, which is a key vertical for XTAR. We are working with terminal manufacturers and users to solve technical and operational problems that are unique to mobile missions. X-band shines above any other frequency band with small antennas: High throughput is reliably achievable. And this is a key differentiator of X-band. When using terminals 1.2m and smaller on land, sea, and air, X-band should be the first thing that comes to the user's mind.

**GMC: Which trends and challenges are emerging in XTAR's key markets, and how is the company addressing them?**
**Philip Harlow:** The largest challenge is where we are successful. This may sound counter-intuitive, but bear with me. Where our users have had good experiences with XTAR, and identified the



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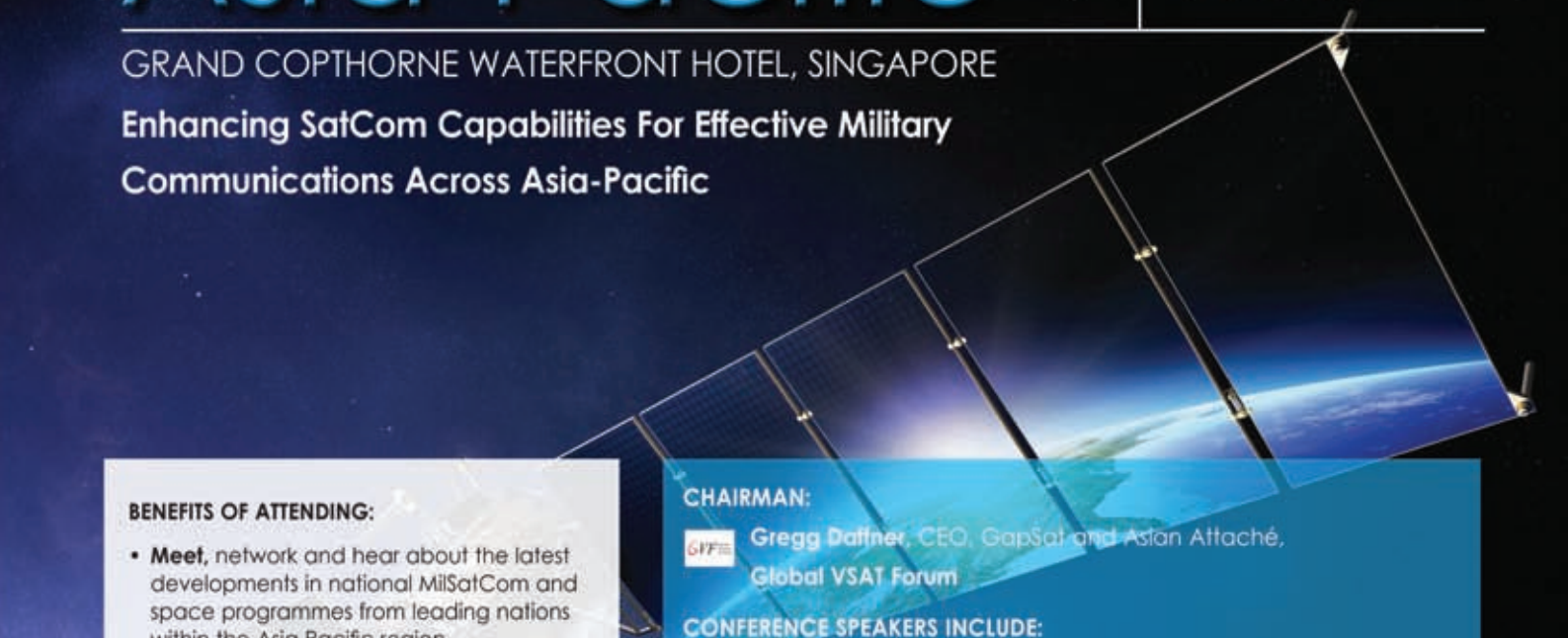

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advantages of X-band, they want more. In the DoD, if anyone asks for X-band, they are immediately steered to WGS - clearly not the best for XTAR. However, we recognize that WGS is a core asset for DoD, and military users should go there first if they want X-band. When they cannot get what they need for their mission for whatever reason (higher priority users get first dibs, coverage where they need it is lacking, or simply the amount of bandwidth they need is not available), XTAR is always ready to welcome those users back. In a lot of cases, where our users have newer terminals (sub-1m), WGS is not very welcoming. Where these terminals provide an operational mission improvement, and those newer terminals don't yet have WGS certification, XTAR welcomes them - our certification process is much simpler, and much faster than the WGS process. In fact, I think we have tested pretty much every X-band terminal there is out there before they even start any WGS certification process.

**GMC: In July 2016, XTAR and Ball Aerospace partnered to demonstrate Ball's X-band hatch-mounted flat panel antenna for the US Air Force. How will these new antennas and others like them improve military and government operations?**

**Philip Harlow:** Size, weight and power (SWAP) is a key element in enabling missions where the platform needs to be smaller, faster and more maneuverable. These flat panel antennas make a great deal of sense - they are smaller, with no moving parts, and can provide service on almost any mobile platform out there. With the Ball Aerospace tests, we achieved remarkable performance results, and I think this is going to be a true game-changer. Other manufacturers are following suit with the development of flat panel or other similar techniques to keep the SWAP within the limits of the mission platform. For airborne missions, in particular, the flat panel antennas are going to make a significant impact. Manufacturers are also seeing the value in offering their airborne customers multi-band options, where a Ku-band antenna today can work in X-band tomorrow with some quick, easy adjustments right there in the area of operation.

**GMC: XTAR is reportedly making plans for its next-generation satellite constellation. How has this project progressed so far, and what new capabilities is the company considering for these satellites?**

**Philip Harlow:** We have certainly started thinking about the next generation. With the DoD's Wideband Analysis of Alternatives (AoA) now underway, we are keenly awaiting feedback on how the DoD is going to approach its future architecture. We see the need for commercial satellites to have a number of key enhancements when supporting DoD missions of the future. We are starting to see the anti-satellite capabilities of potential adversaries in space - the US no longer dominates space the way it once did, so we need to improve mission assurance for the future. This will mean additional features to deal with the potential threats - jamming and interference mitigation are clearly big talking points. The ability to move beams, to shape beams, to notch out the source of interference, the cyber-posture for the satellites and ground infrastructure, and geolocation capabilities - all of these things will need to be clearly addressed with the new satellites.

We are also looking at where XTAR goes next. Clearly the X-band market has been robust and good for XTAR, but we recognize that X-band is not the only good solution out there, and that for some applications, other frequency bands are perfectly capable of meeting mission objectives. In addition to X-band, we have access to the military Ka-band rights for both orbital slots (29 degrees EL and 30 degrees WL), and have a number of users asking when we are going to be able to support them with those payloads. The other thing is the gap in the Pacific - we are under increasing customer pressure to fill that gap - we have US users and users from the region waiting for us to get there, so those plans are underway.

We have plenty of runway on the current satellites, end of life for both is 2021 and beyond, so we have time to decide exactly which technologies and capabilities we'll include on the new satellites. In the meantime, we'll continue to grow the business, particularly in the airborne vertical, and be able to offer even more effective service once we get to the new fleet.

**GMC: What's on the horizon for XTAR for the rest of 2017 and beyond?**

**Philip Harlow:** 2017 is a year for growth. We have a great team, and a loyal set of users that just love the advantages they get from working with XTAR. Even as troops have been withdrawn from Iraq and Afghanistan, we have been steadily increasing our market share and we're going to build on that success. We are a small operator - just two satellites, so our market presence is in niche applications with a small subset of users where our flavour of X-band makes sense. We've never expected to simply poach business from the large Ku-band networks, those fixed networks are well-served by Ku-band. We're focused on users who require mission-critical capabilities and situations in which X-band has crucial advantages. **GMC**

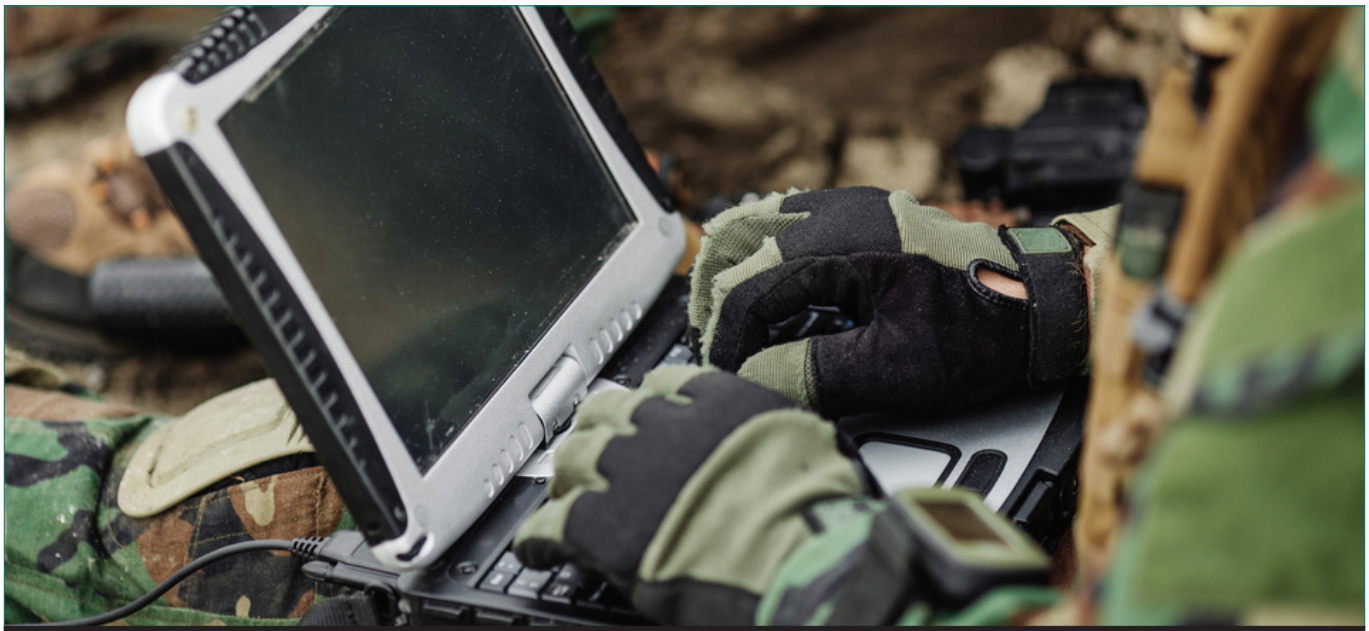

*Photo courtesy of XTAR*