



Comtech Xicom Technology, Inc headquarters in Santa Clara, CA



Expertise, capability and quality

Xicom Technology was founded in 1991 and later acquired by Comtech Communications Corporation in 2008, becoming Comtech Xicom Technology. The company is the fastest-growing supplier of both tube-based and solid state high power amplifiers (HPAs). Amy Saunders spoke with Heidi Thelander, Senior Director of Business Development at Comtech Xicom Technology to find out more about the company's presence and capabilities, and assessment of current market trends.

Question: Can you provide an overview of Comtech Xicom's development since its inception, including key milestones achieved over the years?

Heidi Thelander: The company was founded as Xicom Technologies, Inc., 26 years ago by two TWTA engineers who felt that they could build an amplifier that would live outdoors near the antenna instead of indoors in a large rack. Walt Wood and Ron Sterns turned that idea into an industry leader in high power amplifiers for satellite communications, expanding to indoor as well as outdoor TWTAs, Klystron power amplifiers, and finally, in the new millennium, solid-state power amplifiers. In 1999, Xicom established a wholly owned subsidiary in the UK, Xicom Technology Europe, Ltd., or XTEL, for sales, service and support throughout

Europe, the Middle East and Africa (EMEA). Since then, Xicom has established 12 overseas service centres and has shipped cumulatively more than 30,000 amplifiers worldwide.

In 2005, Xicom was acquired by Radyne ComStream, a solutions provider of data and video over satellite, microwave and cable communication networks, and left to operate independently and continue growing as a Radyne company. Then, in 2008, Comtech Telecommunications Corp acquired Radyne including Xicom, creating Comtech Xicom Technology as a separate division and profit centre within the corporation.

Since then, Comtech Xicom has used cutting edge technology to expand into additional markets, including airborne satcom amplifiers, and has grown steadily since its founding.

Comtech Xicom now employs over 160 people primarily at its ISO-certified Santa Clara, CA headquarters, where it has full engineering and manufacturing capabilities to support ground, shipboard and airborne satcom amplifiers.

Question: What can you tell us about Comtech Xicom's product range and capabilities?

Heidi Thelander: Comtech Xicom Technology manufactures a wide variety of tube-based and solid-state power amplifiers for military and commercial satellite uplink applications. The product range encompasses power levels from 8W to 3kW, with frequency coverage in sub-bands within the 2GHz to 52GHz spectrum, including the most common C, X, Ku and Ka satcom bands. Amplifiers are delivered for fixed and ground-based, ship-board, and airborne mobile applications.

Xicom's capabilities include:

- Experienced RF and power supply designers working together with a strong mechanical design team capable of very challenging custom packaging that includes powerful thermal modelling and design. Extensive lab facilities and strong cross-team support allow rapid development timelines and low risk efforts. Internal expertise in frequency conversion enables tighter integration for a smaller total footprint, and heavy mmwave experience reduces risk in Ka-band or higher frequency developments.
- Our tightly entwined teams make the transition from engineering to manufacturing smoothly, ensuring production version equipment is



Comtech Xicom X-band GaN SSPAs/Bucs include this 32 lb low leakage 100W linear BUC that's been through ARSTRAT certification in both single and multi-carrier systems.



Heidi Thelander, Senior Director of Business Development at Comtech Xicom Technology



available for terminal qualification and certification as soon as possible. Demand-flow lines, all-electronic work instructions, and extensive cross-training ensure the ability to quickly ramp to any production level and adjust to changing demands. Especially important with high-efficiency GaN SSPAs, and rare in the industry, is the in-house chip-and-wire capability that allows use of best available bare die from any source rather than taking what is available in packaged parts.

- With over 15 years of continuous ISO certification, Xicom's quality team has further enhanced our quality systems in support of airborne applications including the addition of increased tracking of components by lot numbers, a counterfeit parts prevention program, and extensive database tracking of any failures through a thorough Corrective Activities Management program including FRB.

Throughout its history, Xicom has been the first to establish products in each new frequency band and power level, stretching the technology to provide better solutions to customers. Xicom has extensive capabilities in Ka-band and Q-band HPA production and is moving quickly to establish production at the newer V-band frequencies.

Comtech Xicom also has experience creating extremely low leakage hardware to support multi-carrier environments with low PIM antennas at X-band.

Xicom's recent technology

developments using Gallium Nitride (GaN) solid-state devices have propelled its products to industry leadership across frequency bands and a range of power levels. The offering of high efficiency X, Ku and Ka-band SSPA/BUC products with interchangeable form factors and best-in-class power density and efficiency are currently driving adoption by customers across markets and the globe.

Comtech Xicom has the engineering expertise, manufacturing capability and quality systems needed to develop and produce high-performance, high-reliability, airborne-capable amplifiers and block upconverters for a wide range of commercial and military airborne satcom terminals.

- High power TWTA and SSPA designs
- Lightweight, compact, efficient GaN SSPAs
- Strong power supply, thermal, and frequency conversion design teams
- Extensive mmwave experience
- DO-160 certification experience with categories A1-F2
- WGS and MIL-STD qualification and certification experience
- Compact airborne in-cabin and ultra-compact, hermetic cabin-exterior amplifiers
 - Certified to DO-160 category F2
- High power survivable, airborne mmwave TWTAs

Comtech Xicom has developed and DO-160 certified both SSPAs and Block

Upconverters (BUCs) for in-cabin ARINC-type and out-of-skin hermetic configurations. Very high efficiency technology and advanced packaging techniques enabled industry-leading power density products that meet the tough environments of airborne applications.

Another key area where Comtech Xicom has extremely strong capabilities and product offerings is in amplifier 'systems' which include all manner of redundant and power-combined configurations of multiple HPAs to meet customer defined architectures. Xicom's provision of these systems reduces the need for customer in-house engineering and simplifies customer integration and test while incorporating Xicom's extensive understanding into the operational design and control. Xicom has also innovated with phase combined systems to offer higher output powers, greater reliability and soft-fail capability with no service interruptions through our Continuous Power Systems.

Question: Which geographical and vertical markets are key to Comtech Xicom's business, and how have they changed over the years?

Heidi Thelander: Comtech Xicom started as a US-focused commercial satcom outdoor TWTA manufacturer selling largely to teleport operators and satellite news gatherers (SNG), and that portion of the business remains important today. However, Comtech Xicom has addressed and incorporated



Comtech Xicom airborne products include in-cabin air-cooled and hermetic cabin-exterior SSPAs/BUCs



many additional market segments over the years including satellite-based video distribution and direct broadcast systems (DBS), government/military strategic and tactical satcom terminals, gateways for high-throughput satellite (HTS) systems, and mobile satcom systems aboard ships and aircraft. The majority of Xicom's business is in these newer areas where the growth has occurred. Growth over the first 10-15 years of the company was in the original market plus video distribution and DBS, as well as some solid growth in government. More recently, the growth has been in the HTS gateway business, especially at Ka-band, and in military and commercial airborne markets.

Geographically, Comtech Xicom expanded outside the US dramatically in the early 2000s and continues to grow the global business. As with many industries, the international sales are cyclical in nature by country or region, but international sales overall have remained an important part of our business, with current strength in parts of Asia, eastern Europe, and specific mid-East and African countries. Latin America, which had been strong, has recently been hit by governmental and currency uncertainty. Opportunities in significant oil-producing countries seems to ebb and flow with the price of oil, which should see a comeback as interest rates and inflation rises. NATO and other US allies have recently also shown signs of spending more on military, including satcom terminals, but the procurement cycles are long, and quantities limited. Overall, worldwide demand is currently strong, especially with the proliferation of HTS systems across the globe.

Question: Comtech Xicom does a significant amount of business with the US Government. How do your government customer needs differ from commercial customers, and how does Comtech Xicom meet those needs?

Heidi Thelander: With some cyclical variation, about half of Comtech Xicom's business has been government for at least a decade – split between larger strategic applications, like hardened airborne amplifiers for critical communications systems, and smaller tactical applications where size, weight, and efficiency vie with robustness to be the most important characteristic. While all customers care about these, our military customers generally demand

greater performance than commercial customers who may be more focused on cost or customer support, or even how a piece of hardware supports their business plan. Because the government makes up such a large portion of our business, Comtech Xicom has continued to innovate with their needs in mind, always working to provide smaller, lighter and more efficient amplifiers, and adding features to solve problems in innovative ways.

Comtech Xicom has led the industry with innovative approaches to power combining, linearizer optimization, power supplies, switchable multi-band frequency conversion, power consumption management, and liquid cooling, to mention a few. Many of these advances were driven as problem solving for a military customer; a side benefit is that most of these solutions also have applications in commercial markets.

Another thing that government customers care about is longevity and support throughout the lifetime of a program, which can be longer than the normal lifetime of a commercial product. Comtech Xicom has been a reliable and stable supplier with good processes in place to handle the inevitable challenges seen over the life of a program – the company can be counted on to respond appropriately and work with integrators and end users to

resolve issues and not point fingers or hide behind obsolescence.

Question: The satellite industry is witnessing a great moment of change right now; which innovations do you think are having the biggest impact, and how will they affect Comtech Xicom in the future?

Heidi Thelander: In the satcom industry, we are seeing the biggest impact in two areas:

- The advancement of new HTS system architectures including the low and medium earth orbit (LEO/MEO) systems consisting of hundreds or thousands of satellites and the addition/extension of these into V-band and potentially optical communications.
- The rapid expansion of in-flight communications (IFC) as well as maritime use of satcom – this is in part driving the new HTS architectures but is its own major trend in the industry

Comtech Xicom has already been affected by these changes in terms of Ka-band capacity expansion, development of new products for the LEO/MEO systems, development of a new V-band HPA, and development of new airborne SSPAs.

These changes have also driven an



Comtech Xicom Continuous Power Systems provide soft-fail capability with no interruptions due to phase change and restoration to desired output power within milliseconds

The Next Generation for SATCOM Ku-band

Downsizing and high linear gain

- World's first GaN MMIC with multiple amplifier stages, matching circuit and linearizer in one chip

Low distortion for high signal integrity

- Built-in linearizer enables low distortion in power transmitters

Ku-band GaN HEMT line-up expansion

- Combining GaN MMIC with existing 50W and 80W GaN HEMT enables configuration of multiple power amplifier stages



50W GaN HEMT



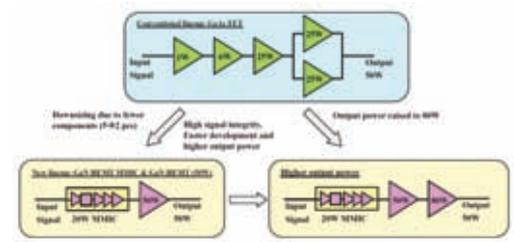
80W GaN HEMT



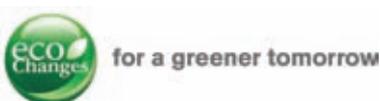
20W GaN HEMT MMIC

Environmental awareness: All products comply with regulations governing the use of hazardous substances in electrical and electronic equipment (RoHS).

Mitsubishi Electric's Ku-band 20W monolithic microwave integrated circuit (MMIC) amplifier for satellite earth stations, features the world's first gallium nitride (GaN) high-electron mobility transistor (HEMT) MMIC with integrated linearizer to compensate for distortion. The MMIC GaN HEMT, has an output of 43dBm (20W) and linear gain of 20.0dB, will contribute to the downsizing, high-performance and faster development of power transmitters. Along with the company's existing 50W and 80W GaN HEMTs the range enables power transmitters to be configured for a wide range of output power.



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emphasis on process in support of airborne certifications and other enhancements to our design and manufacturing processes. Comtech Xicom has also expanded significantly the use of Gallium Nitride (GaN) throughout the solid-state product line, significantly improving their cost/Watt and efficiency.

There is also a smaller but still significant trend in expanded availability and use of X-band frequencies worldwide. This shift fits nicely with Xicom's industry leading X-band GaN SSPA product line-up, providing significant new opportunity for the company in solid-state.

Question: The mobility markets are really booming right now, with inflight connectivity and maritime communications becoming big demand drivers for satellite capacity. What's your take on the expansion of the mobility market, and how will it affect Comtech Xicom?

Heidi Thelander: The expansion of the mobility market is the biggest change in satcom that has barely happened so far. Although airlines are adopting IFC as quickly as they can, the reality is that

a huge number of existing aircraft have no IFC, and many that do have only relatively low data rate air-to-ground (ATG) capability. So, the remaining opportunity is enormous, and competition is fierce. The current situation with many integrators and service providers, plus many amplifier suppliers trying to get a toehold in this market, cannot maintain long term, so consolidation is expected at all levels. While there are no guarantees, Comtech Xicom's position in the market is sufficient to give it a very good chance of surviving and flourishing in it. And we will remain heavily focused on it from a technology and business development standpoint.

Regarding the maritime market for satcom, it is also rapidly changing and expanding, but the market itself is quite different than the airborne. Other than cruise ships and some military vessels, most of the maritime applications are lower data rate and largely receive (vs transmit), which enables use of lower power, lower cost L-band terminals. C-band also has large beams for covering oceans, so currently maritime tends to make less use of the HTS systems; it remains to be seen if the new LEO/MEO

systems will change that. There are higher power maritime applications which Comtech Xicom is well-positioned to support with the new GaN product line, but the large numbers of chips are likely to go with products outside of Xicom's range.

Question: What expectations do you have for Comtech Xicom in 2018 and beyond?

Heidi Thelander: The future is bright for Comtech Xicom with a good base of current on-going programs, solid positions in growing markets, a relatively new and leading-edge product line-up for SSPAs and TWTAs, and some new technologies that have customers very excited about adoption. While predicting an industry and the global conditions for success is not entirely possible, the likely path forward for Comtech Xicom is one of continued growth as a company, with most of that growth coming from the newer market areas.

My expectation for Xicom is that it will continue its technology leadership in the industry, it will lead the way in new markets, and it will grow significantly over the next five years. ■



Xicom SuperCool™ Liquid-cooled TWT is the same as air-cooled in RF and power supply