

THINKING SMALL

A LIGHTWEIGHT, PORTABLE SATELLITE TERMINAL BENEFITS FORWARD OPERATORS

Rapid access to information via satellite feed is a key tactical advantage for any warfighter — but it's especially important for Special Operations Forces.

In the early 2000s, military operators who needed to receive communications through the military's standard Global Broadcast Service (GBS) had to use a 300-pound, three-foot satellite dish running off a generator. At the time, GBS was primarily used to transmit troop health and welfare information — along with entertainment such as Super Bowl games and NASCAR events — to military installations.

Considering their size and importance, the U.S. Air Force saw a pressing need to slim down the satellites into something more portable. Today, thanks to that effort and advances made with support from the Small Business Innovation Research (SBIR) program, forward units can receive critical data with a 20-pound portable receive satellite terminal that runs on solar-rechargeable batteries.

The first SBIR contract was secured in 2001 by New Hampshire-based Windmill International, Inc., the parent company of AQYR Technologies, Inc. Windmill noted that the Air Force was looking for a lightweight, portable, disposable satellite terminal, and the company won the SBIR contract to explore the possibilities. After initial design work, however, they determined that a disposable

system wasn't feasible because of the cost of materials. Undeterred, they pressed forward to develop a portable unit that would fulfill mission needs.

"We used more of a commercial product development strategy in the SBIR contracts as opposed to a spec-driven product development strategy," said Mark Wheeler, AQYR's director of business development. "That allowed us to address the needs of the user."

Wheeler believes this approach was key to the product's ultimate success, explaining that designers set out to create a technology that could be easily used by a Warfighter not trained in satellite communications (SATCOM). For instance, the user would be able to open a unit and receive data within minutes.

No tools were required for assembly, a special positioning technology would automatically align the system to receive data, and a small, laminated Quick Start Guide could lead the user through the simple steps to operate the unit in only a few minutes. Windmill fielded its first prototype in 2006.

"We took it out and socialized it with 80 different military units," Wheeler said. "We would show it to them and explain our thinking,



All AQYR terminal products fit into a single airline-checkable case.

based on our collective background in the military. We had what we call an empathic–design philosophy, which means we understood what it meant to actually carry this stuff and use it,” Wheeler said.



Windmill refined the prototypes into state-of-the-art individual satellite receive units, and by 2008, had introduced the KA-10 Suitcase Portable Receive Suite (PRS) and the Rucksack PRS. Both devices allowed reception of full-motion video for intelligence gathering, surveillance, and reconnaissance through the GBS broadcast. Working with another vendor, AQYR developed a flat, rectangular, slot array antenna that folded down into the PRS base. The antenna’s small aperture design aligned well with the KA frequency band used by GBS, and the flat form wasn’t as visible as a traditional dish antenna.

In 2011, AQYR received the Small Business Administration’s Tibbetts Award for the innovation and economic growth that resulted from development of its KA-10 Suitcase PRS.

In 2015 AQYR received an indefinite-delivery, indefinite-quantity production (IDIP) contract to supply the U.S. military with the highly portable Rucksack and Suitcase PRSs—developed entirely through SBIR contracts.

“We’ve gotten letters from Special Forces commanders telling us that they have made it a standard that no unit will leave home without one,” Wheeler said. “We’ve gotten a lot of feedback on how important these units are to the missions of some pretty elite elements of the military.”

Compared to two-way, send-and-receive SATCOM systems, the one-way GBS broadcast feed enables much faster transmittal of large data files, like streaming feeds from UAVs. Wheeler noted that a bi-directional satellite

system can be used in tandem with the Rucksack or Suitcase PRS.

“You can set it down next to a two-way system and use that for bi-directional communication while this one just sits there and pulls data out of the sky for you,” he said. “In many situations that kind of data is critical for mission planning and situational awareness.”

Using the lessons learned through the SBIR contract, AQYR has developed additional versions of its satellite terminals that include its advanced auto-acquisition technology, which can more readily acquire signals, as well as a family of two-way communication terminals. The terminals deliver high-speed Internet and

data access via satellite to workers at temporary sites. Users include medical and peace workers abroad and emergency responders, as well as commercial space-flight operations. The company’s Typhoon antenna was used by relief workers after the Nepal earthquake in 2015.

“One of the biggest keys to our success is the fact that any terminal we make will fit into a single airline checkable case,” Wheeler said. “These units

can be used by a soldier, a nurse, or a firefighter. They’re designed to effectively get someone communicating as fast as possible with the least amount of training.”

Something all of AQYR’s products have in common, Wheeler noted, is that they are “100 percent” dependent on the innovations Windmill and AQYR achieved while working under their SBIR contracts.

The company has since developed a 60-centimeter dish version that allows for increases in gain for better performance in the field, according to Virgil Russell, director of sales for ARA. Either antenna can be easily mounted and replaced depending on the situation and location.

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“You can use any of the antenna solutions [referring to the aperture size] depending on where you’re going in the world, which provides the Warfighter with significant flexibility,” Russell said.

The primary use of GBS today is in receiving large bandwidth video files from unmanned aerial vehicle (UAV) feeds, including geospatial, satellite, and weather data.

“The people who use these units most are the Tier One elements in the military,” said Wheeler, “what they call ‘the tip of the spear’ — special operations units across the military branches, the Seals, and some units that don’t have names. They’re people who don’t necessarily stay in the same place for very long but need to have the communications that our terminals provide.”

Antenna Research Associates, Inc. (ARA) purchased AQYR in August 2020. ARA and AQYR aligned their engineering capabilities and are working on integrating AQYR’s SATCOM suite of complete system products with ARA’s antenna solutions for the Electronic Warfare, Law Enforcement, Military Communications, Satellite Communications and Radar Markets.

By late 2021, AQYR had manufactured and sold nearly 1,000 PRS’s to military agencies for use in forward positions, places where rapid access to information is crucial to mission success. The U.S. Marine Corps, for example, has utilized the technology to support its Modeled Meteorological Information Manager (MMIM), Program Manager, and Fire Support System



The lightweight, portable terminal design assures forward operators access to mission-critical information.

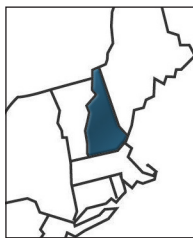
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The integration of AQYR and ARA engineering talents has enabled ARA to expand its GBS and VSAT portfolios. For example, ARA is now in the process of migrating its GBS terminal capabilities into the Army’s C5ISR/EW Modular Open Suite of Standards (CMOSS) open architecture infrastructure, allowing collected sensor data to be easily accessed and utilized on multiple platforms, a move which, according to David Feinstein, ARA’s VP of sales and business development, “shows the continued relevance of this capability by adopting it to the next generation of customer requirements.” The migration

to the CMOSS infrastructure will help enable ARA to develop both a Comms-On-The-Pause (COTP) and Comms-On-The-Move (COTM) platform.

ARA is continuing to add additional feature sets to deliver enhanced product solutions for the Army C3T PEO and the USMC MARCORSYSCOM. Some of these enhanced features and capabilities include: LEO/MEO tracking, Advanced Positioning, Navigation and Timing (APNT) integrated capabilities, Direction Finding/Electronic Warfare (DF/EW) integrated capabilities, and Integrated Flexible Terminal Interface/Terminal Manager (FTI/TM) Software.

“As our customers grow and develop, we’re going to continue to make the terminal viable for the Warfighter,” Russell added. “The SBIR program was the foundation for AQYR and its growth. It’s fantastic to see that program help further our success here.” 🌟



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