



● ● Jeffrey Smith, President at Riptide Autonomous Solutions

Riptide Autonomous Solutions is designing the next generation of unmanned underwater vehicles (UUV) and other autonomous marine robots for defense, research, and exploration of our world's waters.

Serving the subsea market ●●

Riptide Autonomous Solutions develops and produces autonomous undersea vehicles (AUVs). Its flagship product, the Micro-UUV, is a highly-flexible, open source AUV which provides state-of-the-art capabilities for operators and developers. Jeffrey Smith, President at Riptide, discusses the state of the AUV market, and Riptide's place within it.

Question: Can you provide an overview of Riptide's foundation, capabilities and expertise?

Jeffrey Smith: Riptide started in early 2015 with the idea of developing and fielding AUVs at a fraction of the cost of what the undersea market was accustomed to. At the time, the average AUV was about \$1 million. With Riptide starting as an unfunded, small team of engineers (three) and a very limited credit card budget, we targeted \$10,000 for a vehicle.

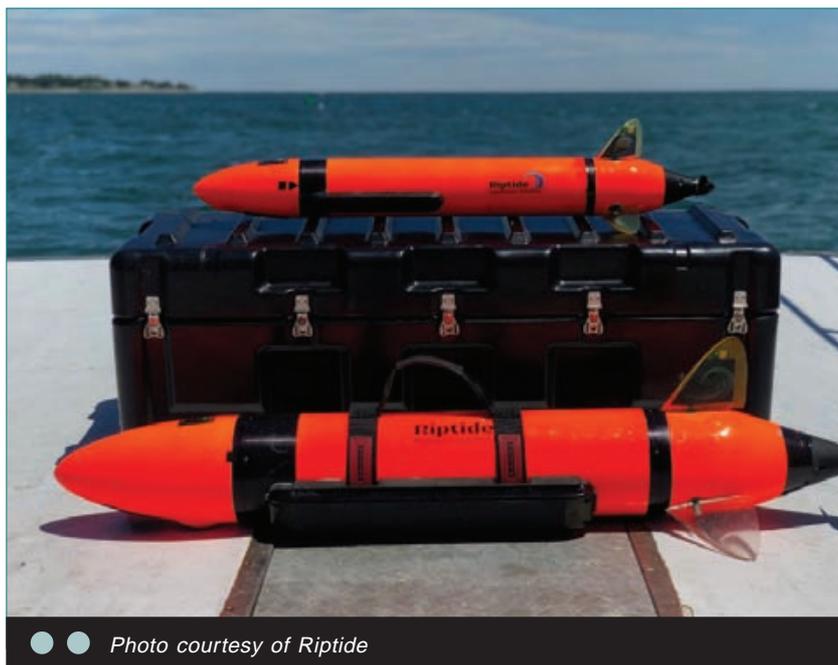
The initial team worked from Jeff Smith's kitchen, and we were able to develop our first swimming prototype in about four months. We participated in our first demo for the Office of Naval Research. Coincident with the demo, we received their first larger development award under DARPA, we received our first vehicle orders from a couple US Navy labs, and we received our first round of private investment funding. In the three years since, we have increased our staff to about 20 engineering, manufacturing, and administrative personnel, rolled out new, larger-sized vehicles, moved into a permanent waterfront headquarters, and successfully grown a company.

Question: We understand Riptide's flagship product, the Micro-UUV, is suitable for a whole host of applications. Could you outline its capabilities, and how it compares with rival products?

Jeffrey Smith: Our four primary talking points for our vehicles are "Cheaper, Deeper, Farther, and Faster." We successfully sold our first three dozen vehicles at our initial \$10,000 target without payloads. We've made a great number of improvements in vehicle subsystems, materials, and what we now include with them, so our base price has increased some, but it's still well below our nearest competitor while providing performance advantages in side-by-side spec comparisons.

I'll come back to Deeper.

On day one of starting our vehicle design, we made a very deliberate decision to focus on our efficiencies, both hydrodynamic and electrical. Most commercial AUVs largely ignore both. On the hydrodynamic side, we reduced appendages,



● ● Photo courtesy of Riptide

GMC Q&A



FlexAir

THE POWERFUL, AFFORDABLE WAY TO STAY CONNECTED

Meet rapidly growing demand for in-flight data connectivity with the first satellite network optimized for government aircraft. IntelsatOne FlexAir provides flexibility, reliability, scalability and up to 10 times the data throughput of other networks. With multiple service offerings and subscription packages you pay only for what you use. Leverage the only true global broadband service designed for aircraft with high-performance requirements to accomplish your mission.

Learn more about FlexAir – www.intelsat.com/flex/gmc

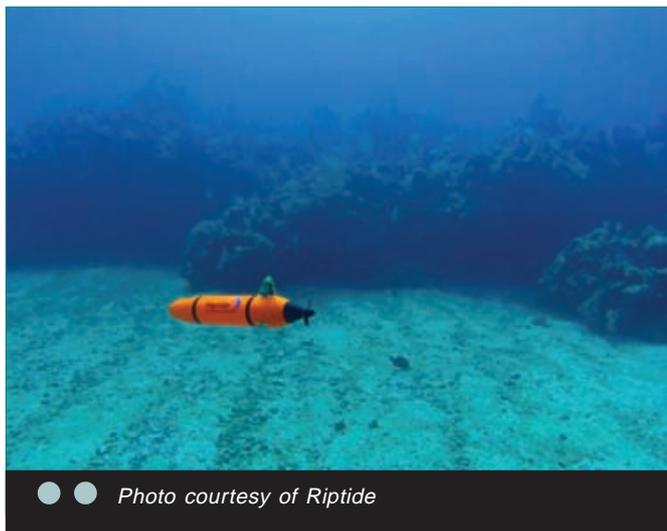
we eliminated the typical GPS and communications mast and incorporated the functionality into our dorsal fin. We moved from four typical control fins to three. And we put a great deal of work into a computational fluid dynamic model of our hull to optimize its shape. We did our best not to hang lots of extra things off the vehicle that adds drag and reduces its efficiency through the water. One recent example is working closely with a partner company; they reconfigured their acoustic modem to match our nose shape and take advantage of a forward interface to provide a fully hull conformal acoustic modem. A modem can add 20 percent drag to a small vehicle. This adds no additional drag. Electrically, we were even better. Our rough numbers indicate that we use about 1/10th of the hotel power to run the vehicle as they do. Hotel power typically is vehicle power not counting payload or propulsion power, so just sitting there doing nothing. How much does it consume? Where this provides a significant advantage is in run time. The commercial micro-UUVs out there run for 6-8 hours without a payload on lithium rechargeable batteries. On lower energy dense alkaline batteries, we run for around 40 hours. We have exclusivity for our micro-UUV with a new aluminium seawater power system that will give us a range of about 1,000 miles at 2.8 knots that we should be offering commercially in early 2019. Bringing multi-week endurance to a small affordable platform we see as a large potential game changer in this market.

Our standard micro-UUV we have validated to an operational depth of 300m. With limited run times, it does not make a great deal of sense to go deeper. But with our endurance, we have the energy reserves to go much deeper in smaller more affordable platforms. In 2018, we received our first contract from the US Navy to validate a 6,000m rated micro-UUV.

Speed has a double meaning for us. The micro-UUV is quite fast, having been run over 10 knots. But where we believe we have a larger impact is on our ability to rapidly try new things and bring new capabilities forward. Our architecture supports quickly and affordably being able to change things. We believe this is a great tool that enables the undersea developers.

Question: Unmanned underwater vehicles (UUVs) have a great deal of potential for government and military applications the world over. What's your opinion on the potential of UUV technology for these applications?

Jeffrey Smith: The government and military markets comprise roughly two thirds to three quarters of the global UUV demand currently. There are countless applications for all varieties of unmanned systems for performing the dull, dirty, or dangerous missions for these customer sets. Unmanned undersea we see growing quickly, especially as more and more of these capabilities prove themselves and as the barriers to use such as cost, complexity of operations, and logistics to name a few, come down.



● ● Photo courtesy of Riptide

NEWS IN BRIEF

Comtech Xicom Technology, Inc., which is part of Comtech's Commercial Solutions segment, received a contract valued at more than \$5.5 million for high-power satellite communication ("SATCOM") amplifiers to relay data for the early detection of missile launches.

"Comtech Xicom Technology, Inc. has been developing higher power millimeter-wave ("mmW") TWTA technology for more than two decades and we are a leader in the market for millimeter-wave TWTA's," said Fred Kornberg, President and Chief Executive Officer of Comtech Telecommunications Corp. "The customer required a higher power solution as part of a system upgrade and expansion and came to Comtech Xicom Technology to get the product they needed."

Comtech Xicom Technology, Inc., a world leader in high-power amplifiers, 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 8 W to 3 kW, with frequency coverage in sub-bands within the 2GHz to 52GHz spectrum. Amplifiers are available for fixed and ground-based, ship-board and airborne mobile applications. Please visit www.xicomtech.com for more information. **GMC**

RUAG MRO International has successfully completed the first inspection of an NH90 transport helicopter for the German Bundeswehr. In mid April, a crew from Transport Helicopter Regiment 10 took delivery of the NH90 maintained in Oberpfaffenhofen. This milestone gives the Bundeswehr's Federal Office of Equipment, Information Technology and In-Service Support (BAAINBw) an alternative support provider for NH90 maintenance to the original equipment manufacturer (OEM), NHIndustries.

"Our helicopter specialists prove many years of experience in the maintenance of military helicopters. This successful NH90 inspection confirms our ability to apply our experience to include the Bundeswehr's most advanced helicopter type as well," explains Volker Wallrodt, Senior Vice President Business Jets, Dornier 228, Military, RUAG MRO International. "The Bundeswehr is our long-standing customer and RUAG is well positioned to meet their requirements in full. We are able to ensure fleet availability, planning reliability, and dependable turnaround times, and all at maximum quality," Volker Wallrodt continues.

Before RUAG began working on the NH90 in autumn 2018, the related type rating needed to be obtained from the German Military Aviation Authority. This involved meeting all necessary requirements, such as rules on e.g. personnel certifications, process instructions, technical documentation, infrastructure, and also included fully equipped aircraft docking facilities, as well as on-site availability of special tooling. Information technology services also needed to be prepared for the NH90 inspections as all maintenance tasks performed on the helicopter must be documented in the Bundeswehr's IT system.

This required the Oberpfaffenhofen site to implement the requisite SASPF software, covering project management, logistics and operations management, and all dock workstations.

RUAG continues to be a partner to the German Bundeswehr over many years and provides maintenance, overhaul and logistics services for the Bell UH-1D helicopter fleet, still in use for search and rescue missions. **GMC**

Question: The autonomous undersea vehicle (AUV) market is a difficult one to crack and is facing challenges in uptake due to uncertainties regarding communications capabilities. What's your assessment of the market?

Jeffrey Smith: Communications for AUVs has always been and will continue to be one of the largest technical challenges due to the limitations of physics. Historically, it has driven complexity and redundancy into the systems because the vehicles need to act more autonomously without real-time communications. AUVs cannot be remotely piloted like air and surface vehicles that have almost infinite bandwidth compared to AUVs in the RF spectrum for streaming video and communications links. But, as autonomy and AI advance quickly, Riptide believes smaller, more affordable systems can make a large difference in addressing the applications challenges that are out there.

Question: In April 2018, Riptide introduced a new variant of its UUV product line, a deep rated version to support acoustic telemetry research programmes. What can you tell us about the new variant and its potential applications?

Jeffrey Smith: Riptide received a Small Business Innovation Research (SBIR) contract from DARPA to enable a deep-sea communications application. I cannot say much about the specifics, but I think it is a great example of the technology, flexibility, and affordability of Riptide is trying to accomplish.

We see a large opportunity for undersea swarming, but when traditional platforms cost \$1 million or more and run for a day or so, there is a large question about the cost and effectiveness of the swarm. With our price and endurance, we think we enable this capability. We proposed this concept to DARPA, but DARPA has always pushed the envelop well beyond standard, developing capabilities. DARPA wanted longer ranges between the vehicles which drove us much deeper than we could demonstrate with a 300m maximum operational depth rating. I've been in the undersea technology space for 25 years and I am unfamiliar with any vehicles less than 15 inches in diameter and under 1000lbs that have gone to 1,500m. Showing the flexibility of our architecture, we built three 7.5 inch diameter

vehicles under the contract to that depth rating under our \$1 million base funding.

Question: In September 2018, Riptide announced its first expansion with the creation of Riptide Autonomous Solutions Canada. What can you tell us about this move? Why now, and why Canada?

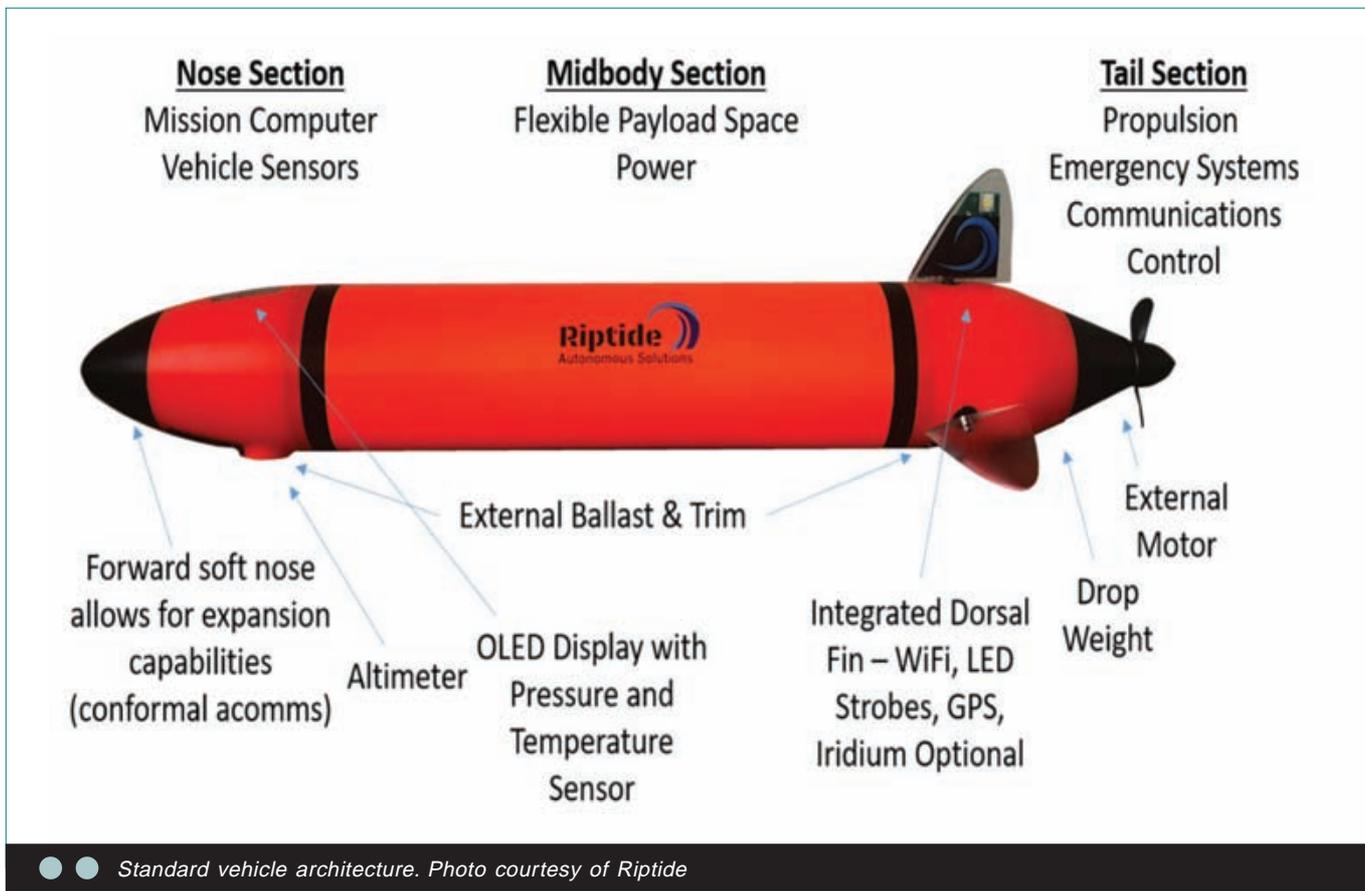
Jeffrey Smith: Since Riptide started, we've been interacting heavily with the undersea research and development community in Nova Scotia. We've built several key partnerships with companies there and we have sold multiple vehicles into Canada. The Canadian Navy has several new UUV programs coming up for acquisition and the Federal and Local governments in Nova Scotia have a large quantity of assistance programs available for developing maritime companies.

For Riptide, multiple parallel activities aligned, and it became the right time for us to do this to have an expanding local representation. To get this started, Riptide moved Lenny Baker to the area to lead this effort. Lenny is our principal hardware architect and has been primarily responsible for driving Riptide's power efficiencies as high as they are. Plus, Lenny has ties to the area and is looking forward to the challenge of standing up this new subsidiary for us.

Question: What's on the horizon for Riptide in the rest of 2019 and beyond?

Jeffrey Smith: Riptide's largest focus currently is to deliver the growing backlog of vehicles coming due to our customers. We have consolidated our operations to a new headquarters in Plymouth, MA, and are currently in the process of more than doubling our floor space, with the new leased area being allocated entirely to manufacturing space. In doing so, we are expanding our physical footprint and capabilities, plus adding several new manufacturing resources as we grow and mature as a company. This activity is critical for our growth and having the capabilities and the capacity to meet our increasing customer demand.

As we look into 2019, we have multiple development



● ● Standard vehicle architecture. Photo courtesy of Riptide

programs we need to continue to execute on and work to transition into vehicle production efforts. For a fairly small team, we have been extremely busy balancing our development efforts with our deliveries. With the increasing demand and contract awards, we will continue to grow our team. In my 15 years in the UUV market, I have never witnessed such an exciting time. I am very pleased we have come as far as we have in such a

reasonably short period but with the steep market demand, we need to keep accelerating our efforts to grow and expand our presence and market position.

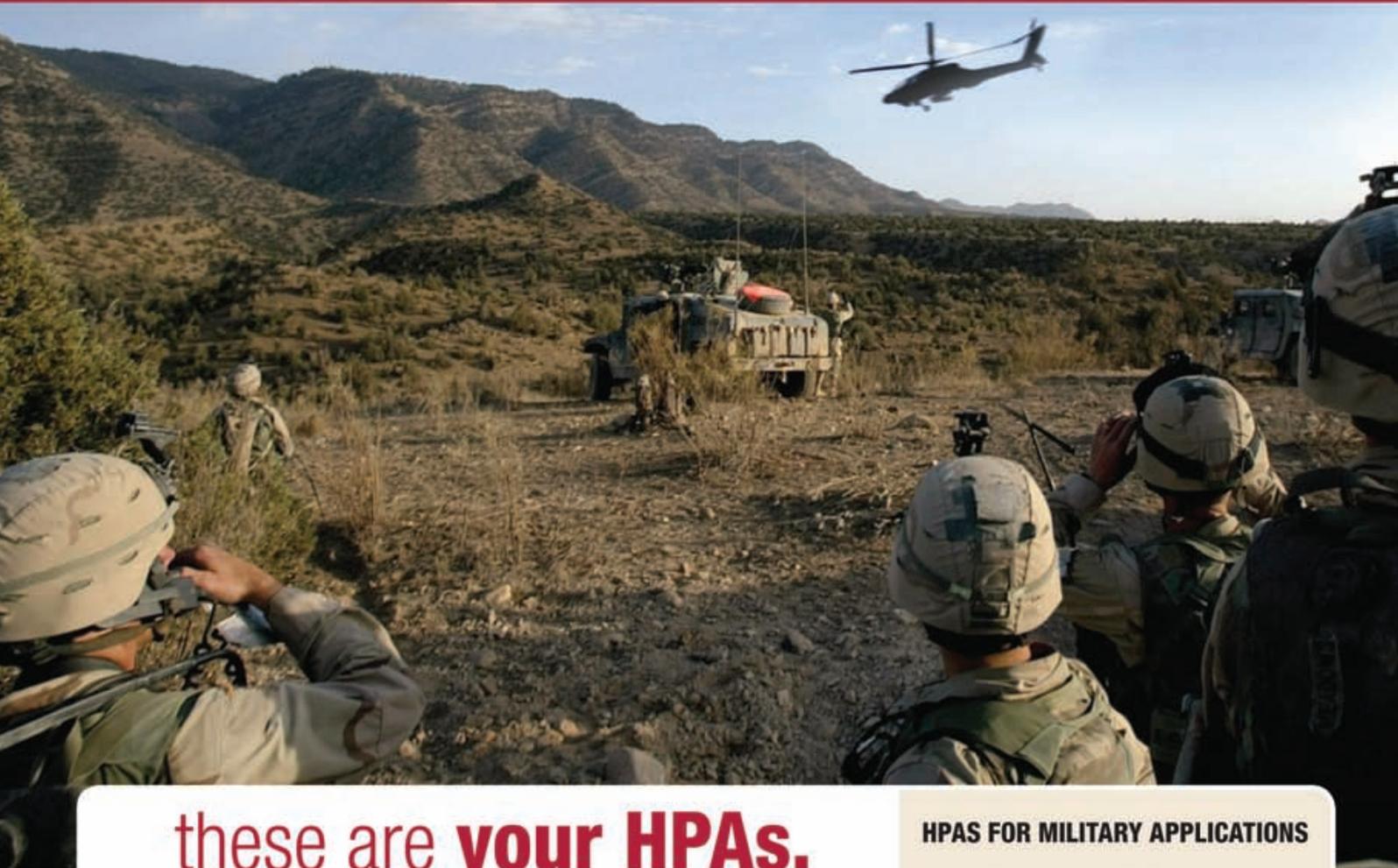
As we look out past 2019, we expect to see a continually expanding line of flexible, persistent products, but most importantly, we see larger and larger vehicle volumes needed by our customers.

GMC



● ● Photo courtesy of Riptide

If this is **your office...**



these are **your HPAs.**

Superlinear® TWTAs

LEFT: 2.5 kW X-band

CENTER: 750 W Ku-band TWTA

Solid State BUCs

RIGHT: 160 W peak Ka-band GaN BUC



Warfighters shouldn't have to fight against their equipment.

That's why CPI amplifiers feature better efficiency and unmatched reliability even in the harshest of climates, keeping you connected anywhere at any time.

CPI offers:

- Better efficiency
- High reliability
- Rugged designs
- TWT, solid state and klystron technology
- Linearizer, BUC, and integral switch control options
- More than 20 service centers worldwide
- 24/7 technical support

For more information, please visit www.cpii.com/satcom, contact your local sales representative, or call us at **+1 (650) 846-3803**.

HPAS FOR MILITARY APPLICATIONS

- Up to 700 W Ka-band TWTAs
- SuperLinear® TWTAs in Ku- and Ka-band, delivering 25 to 540 watts of linear power
- C- and Ku-band HPAs for troposcatter applications
- 400 to 750 W C-, X-, and Ku-band indoor and outdoor TWTAs
- 2500 W SuperLinear® and CW X-band TWTAs
- X-, Ka- and Ku-band GaN BUCs

Download our new app!
Search: **CPI Satcom**



satcom  products