DEPARTMENT OF THE NAVY

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SBIR/STTR TRANSITIONS Newsletter

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From the Director
FY23 Is: Continue on Course, on Speed

Robert L. Smith, Director DoN SBIR/STTR

The theme for FY23 is "Continue on Course, on Speed." We are quite proud of our Phase III record. From 25 percent of the DoD's SBIR budget, our program accounts for 50 percent of Phase III awards. In FY22, we surpassed the one-billion-dollar threshold, a fantastic accomplishment. Can we do better? Absolutely. Improving the business of innovation is integral to how we execute the program. We continue to run pilots to see how we can incorporate more sustainment into the program. We continue to provide support to shipyards, depots and FRCs, to look for ways to leverage the NavalX Tech Bridges and sustain connections with fleet and force. We continue to look at ways to strengthen the SBIR Experimentation Cell and make connections to fleet and force experimentation venues. We are working hard to keep finding ways to make it easier for the Navy to get those transitions. In fact, in June, we are going to have our own Department of Navy version of an open topic. It is pretty exciting that we are going to change the way we have the conversation, saying, "Here are some technology areas where we need your help. Tell us what you can do with your commercial product to address this challenge. How do you see your technology being used?"

Businesses participating in the Navy SBIR/STTR program received over one billion dollars in Phase III funding in FY22. See the list of SBIR/STTR companies receiving Phase III awards in this issue of *Transitions*. These awards don't happen in silos; they are the result

From the Director... Continued

of our integrated collaboration. While it appears we have stovepipes of excellence, we work hard to get the right people at the table at the right time. We work at finding ways to get to yes. We help technologies along the continuum of R&D to their capability delivery. This doesn't happen overnight. These successes take a lot of hard work. Our transition program does it better than anyone else, and we should rightfully take more credit for that. We are about innovation realization.

What are we doing in FY23? Continuing on course, on speed. On course is our continual process improvement. While the companies are doing the innovative research and development, we continue to work on innovating the process to make it faster, easier, and quicker for all of us. Make no mistake: Working through federal acquisitions defense regulations is no easy feat.

We are doing a lot when it comes to cyber-security support with our Blue Cyber initiative. Please visit our website at https://www.navysbir.com/cyber.htm to get involved. Get on the list. Attend the classes. We are going to help you understand the requirements and how to achieve them without spending tens of thousands of dollars that you don't need to. Kelly Kiernan, CTO and Blue Cyber Initiative director, has open office hours and hosts webinars each month to work with our businesses.

With SBIR/STTR reauthorization, Congress has asked us to develop a SBIR/STTR due diligence requirement within the Navy to ensure that we don't have improper foreign influence within the program. The head of each federal agency that is "required to establish a SBIR/STTR program, shall establish and implement a risk based due diligence program to assess security risks presented by small business concerns seeking a federally funded award." We have to get better at protecting the small businesses' intellectual property and our technology edge against our adversaries. The SBIR/STTR due diligence program is one step in that direction.

Finally, a shout out to Navy STP: The program had a phenomenal showing at WEST 2023 and Secretary Del Toro visited the Navy STP booth. It's nice to have Navy senior leadership show support to our small businesses. Secretary Del Toro typifies that. He wants to help and knows we need small businesses for the Navy to succeed. WEST is a good example of how the Navy is supporting small businesses. The NAVAIR & NAVSEA Innovative Technologies Showcase was also a success, connecting small businesses with people in many different Naval program offices and with primes. Additionally, Navy STP's participation at Sea-Air-Space was truly noteworthy, topped off by yet another visit by SECNAV. Our small businesses took advantage of these opportunities to talk to each other, current and future customers, and others in the innovation ecosystem. These events typify the integrated collaboration that the Navy STP is all about!

So, we continue on course and on speed as we continue to quickly deliver capabilities to our warfighters.

Sincerely,

Robert L. Smith
Director DoN SBIR/STTR

Build-test-build Iterative Design Improves the Development Process for Small Businesses, Customers, Warfighters

By Jennifer Reisch, Navy STP Managing Editor

Build-test-build, crawl-walk-run, spiral, fly-fix-fly: Iterative design has many different names. Iterative design is a user-centered process of refining and improving a product or design through repeated cycles of testing, feedback and revision during the development process. Based on feedback from the customer, designers can adjust and refine the technology and test it again, continuing this cycle until the design meets the customer's needs and expectations.

By testing and refining the design in an ongoing manner, designers can catch potential issues early on and realign before investing too much time or too many resources in the final product and help ensure designers and customers are on the same page. Several small businesses participating in the Navy SBIR Transition Program (Navy STP) use the process, saving time and money and delivering solutions that truly meet customers' needs.

"Continuous Solutions has long championed a build-test-build approach to design. Termed 'iterative design' by our engineers and buoyed by our rapid prototyping capabilities, the process allows for a faster initial design process while providing flexibility in a research and development environment where real-world responses cannot always be anticipated," explained Brittany Marshall, a project manager and electrical engineer at Continuous Solutions (CS), which creates efficient electric motors and components in Portland, Oregon.

CS has utilized this process on several Navy STTR contracts, including a suite of novel common mode interference mitigation technologies, where "CS rapidly produced a first generation of specialized inductors of unique geometries that were tested and verified to perform their desired function. In subsequent designs thermal performance was improved, capacitance within the enclosure structure was reduced, and other improvements were made. This type of cycling progress ensures a more complete solution that leads to a more commercial and military ready product with each pass. By developing in-house rapid prototyping capabilities, CS has been able to keep costs relatively low and on par with traditional design process," Marshall explained.

Iterative design is a user-centered process of refining and improving a product or design through repeated cycles of testing, feedback and revision during the development process.

IMSAR, located in Springville, Utah, develops high-performance multi-mode airborne radar systems. To ensure high reliability, IMSAR uses a fly-fix-fly (FFF) method of development for the design, production, and testing of each radar system. IMSAR's FFF method tests hardware, software, and firmware development using existing radar hardware in an operational environment rather than relying solely on modeling and simulation, determining actual performance and identifying operational issues. FFF provides a structured interactive progression of development from prototyping to testing to verification, repeated until a product is ready for release.

Trident Systems Incorporated (Trident), headquartered in Fairfax, Virginia, is a veteran-owned business developing products in integrated C4I systems and electronic systems. "Trident sees the SBIR process not as a chance for us to say, 'Here's our product; it's your solution,' but a chance to really work with the customer. It's through that mentality that we really have embraced build-test-build," said Edward Baumann, a senior program manager at Trident's Integrated Systems Engineering Group.

"I typically use the phrase crawl-walk-run: You develop a piece of the technology and prove it

and make sure it works for the customer and then you do another piece and by the time you finish all the parts, you have something successful, for your company, for the customer, for the warfighter, that will actually be usable at the end of the day."

Implementing Iterative Design

Often in iterative design businesses develop a prototype of a product to test with users to gather feedback, adjusting and refining the design based on feedback and test results, continuing this cycle until the final product meets requirements.

Dynamic Dimension Technologies (DDT), located in Westminster, Maryland, uses model, test, model in its modeling and simulation work.

By involving the customer in the design process, designers can improve usability and functionality and meet the needs and expectations of the target audience, creating optimized products.

"You want the models to become as realistic as possible. Our process is model it, test the system, compare that to the model, refine the model as needed, and test with the system again until there is a high level of confidence that the model represents the product," explained Karl Leodler, president and CEO of DDT.

"Our current SBIR is modeling and simulation to support the development of amphibious autonomous vehicles. The testing we're doing compares our high-fidelity simulations and live, wave basin testing. We do model-test-model to refine our models, taking feedback from the test data, refining our models and running the tests again to keep comparing to the test data."

Trident is currently working on the SBIR topic Versatile Integrated Sensors for Towed Arrays (VISTA). "In the Phase I, we looked at the requirements and came up with a couple of key concepts that we had to be able to do and identified a couple key sensors. Then we did a lab demonstration using garden hose with some sensors taped to the hose to show that the basic concept works," Baumann said.

In Phase II, Trident is meeting regularly with the customer to understand all the issues. "Initially we used hardware from the manufacturers, wired things together, tested it and demonstrated that for the customer. Then we built prototype versions of some of the work to test in our lab. Once the hardware in the loop testing was complete and the customer was happy, we did the full prototype build. Then we demonstrated that on a lab bench. Now it's getting ready for open water testing."

Iterative design helped Trident save time and money on this SBIR technology. "Everything worked in the CAD models. The customer wasn't sure it would fit so we 3D printed the model and the circuit board, put them together and realized there was a clearance issue that's not apparent in the CAD model. We redesigned it in the span of a week, re-3D printed it and proved that the clearance issue was taken care of and confirmed the customer was happy with it," Baumann explained.

"The internal mechanicals of the towed array are made of titanium. To do a full build and then discover that there is a mechanical clearance issue would have cost us a 22-week lead time on the titanium work, as well as over $10,000 because custom small-scale titanium work is expensive.

We spent less than $10 of material and delayed executing on the purchase order by one week but were able to ultimately deliver the prototype ahead of schedule instead of significantly behind schedule."

Benefits of Iterative Design for Customers
By involving the customer in the design process, designers can improve usability and functionality and meet the needs and expectations of the target audience, creating optimized products.

G2 Ops, Inc., which provides systems modeling, systems engineering, cybersecurity, cloud engineering, and other services, uses a spiral approach in development. "We don't want to get really far down the road and discover we were way off in our interpretation of what our stakeholder requirements were," explained Corren McCoy, Ph.D., vice president of software engineering and chief data strategist at G2 Ops. Through spiral design, G2 Ops develops a piece of technology and gives it to the stakeholder to assess. This helps manage customer expectations. "They get a better understanding of what we're going to deliver."

G2 Ops' current SBIR is an industrial control system (ICS) resiliency information system, which is intended to provide views of cyber resiliency for ICSs. "The iterations that we did were first over the data layer. We built huge graphs with 100,000 or more parameters within the graphs themselves, but we needed to tune those parameters to understand what the final resiliency metrics were that we wanted to create. We showed the graph and the potential metrics that we could produce to the customer. Then they evaluated those metrics to decide which ones they thought were germane. Then we were able to determine what the user interface would look like," McCoy explained.

"Sometimes customers have expectations for a solution that the underlying data can't support. Spiral design helps us to refine their expectation of what the art of the possible is and at the same time it also helps them explore possibilities they may not have considered. Over time more of our customers understand the value of taking this approach. With the interaction between the developers and stakeholders we can get capability to them much more quickly, and as a result, it's costing our customers less."

Big Metal Additive (BMA), a metal hybrid additive manufacturer located in Denver, uses its additive manufacturing capability to "use build-test-build as a prototype development tool as well as a manufacturing and engineering service. BMA enables rapid iteration of the design-build-test cycle so customers can quickly innovate on next generation solutions. Our hybrid additive manufacturing capability avoids the typical upfront cost of traditional manufacturing, creating an agile manufacturing solution; customers can design, build, and test multiple iterations of their product in an exceptionally shortened timeframe. Time to market is reduced, and customers are not trapped into legacy design solutions. A customer can re-enter the build-test-build cycle through BMA with little consequence to resources and schedule," explained Andrea Barnes, director of quality management at BMA.

Benefits of Iterative Design for the U.S. Navy
Involving warfighters in the design process and using iterative design practices can help ensure the resulting products meet their needs and are optimized for use in real-world scenarios. This can help improve the safety, efficiency, and effectiveness of warfighters, ultimately supporting the Navy's mission.

"I've been working in the defense space almost my entire career," explained Carl Evans, founder of Tercero Technologies (Tercero), an artificial intelligence startup in Chicago. "It's all about providing capabilities to help the warfighter. Taking an agile or build-test-build approach provides value for the dollars that are being invested in research and development. By doing experiments iteratively during the project, we can show our progress to the customer, ask questions, get their feedback. It's better for them to tell us they don't like something or prefer to go in a different direction early on rather than after a year or so. It's about being smart and efficient with the resources they're providing us."

Build-test-build Iterative Design Improves the Development Process for Small Businesses... Continued

With repeated building, testing, and iterating, build-test-build maps to an agile methodology for developing a product, Evans said. "Historically, you'd have a file with the whole project planned out for multiple years and specific tasks scheduled to end on specific dates, flowing into other tasks. One challenge with that approach was that people worked on one task for many months before they started to integrate with the next phase in the process; it's a very inefficient way of developing.

"More recently, companies have started using the agile methodology with sprints: Tasks are completed over a short period of time. Everyone works on that sprint and then you test that, figure out where the issues are and do another sprint. That's the approach we take with our Marine Corps SBIR, a machine learning tool for field programmable gate arrays, which are essentially reprogrammable chips."

Minimum viable prototype (MVP) is a term used in the startup community. "The point is that rather than spending months building something and then learning the project doesn't work or no one's interested in it, you build a minimum viable version of whatever you're developing. It's not pretty, and maybe even a bit embarrassing to show your customer, but it shows the functionality. Most customers don't care about a fully polished product at that point. They care about it solving the problem that they have," Evans said. "So we have an MVP, a basic working version of the technology. It doesn't have all the features, but it's a rough end-to-end working version of where we're intending to go for the final product. We iterate on that."

"FFF has been a fundamental part of our development strategy. It has helped us quickly adapt to changing customer needs and adversary threats. It was fundamental to developing an incredibly low-SWaP counter-improvised explosive device radar system used in Afghanistan and staying in theater for 4.5 years," said Larry Moore, vice president of engineering at IMSAR.

IMSAR is currently working on a Navy SBIR to develop a low-SWaP sensor that autonomously performs all-weather, wide-area Detect, Locate, Identify, and Report (DLIR) capabilities from a group 2 unmanned airborne vehicle (UAV). FFF has played a key role in development of both the hardware and software for the autonomous sensor payload. "During the flight testing, we found software errors that prevented features from working together. Using fly-fix-fly, we were able to work out the mode switching and bugs in the software to allow for fixes. We did this by finding error messages in one flight, fixing those, and then finding the next layer of errors, like peeling an onion," said Brett Young, senior algorithms engineer at IMSAR.

BMA applied the build-test-build framework through an SBIR project developing the company's manufacturing capability for rapidly reconfigurable unmanned underwater vehicles (UUVs). "The workflow was used to achieve multiple design-build-test milestone cycles in a short timeline. The build-test-build workflow supported and accelerated the maturation of BMA's hybrid AM capability for producing UUV pressure components, while also expanding the realm of possible for next generation UUV structural designs," Barnes said. "The build-test-build framework provides significant value to any customer seeking to innovate faster than their competitors, or in the case of the Navy, faster than our adversaries. Computational analyses of novel designs are of no value if those designs cannot be built, tested, and improved upon."

A-P-T Research, Inc. (APT), based in Huntsville, Alabama, is an engineering services company developing tools for evaluating hazards and risks for safety. Mark Swanson, senior explosives safety engineering program manager at APT, also uses the term spiral to describe the company's iterative design, and set up each year of the company's current SBIR as a spiral. "We get started in year one and make it more and more useful in years two and three. And then hopefully in Phase III efforts we can expand that even more."

APT's Navy SBIR effort is about safely storing and manufacturing explosives. "Our model is focused

Build-test-build Iterative Design Improves the Development Process for Small Businesses... Continued

on the generation of debris from an explosion inside a building. We're developing a catalog of the debris. Our model will break that building up into pieces, cataloging the speed and direction of each piece of debris as it leaves its initial position. We'll integrate some trajectory models and then do that on a map view, complete with terrain. You can tell by the energy density of debris where the lethal radius is, where the high probability of injury is. You can tell how far away you need to be to be safe." To develop the DoD model, "We would use high-fidelity computations to do hundreds of simulations of various combinations of high explosives in concrete buildings, and use the simulations to build a fast running model, then compare the fast-running model results to test data. We also identified certain test series that were used to train the modeling capabilities and saved unique test series to do the validation testing at the end," explained Swanson.

Small businesses that adopt iterative design practices can reduce risk and minimize costs and improve product quality and performance, increasing their competitiveness and ability to meet the needs of their customers.

Composite Energy Technologies (CET), located in Bristol, Rhode Island, develops large and complex carbon composite vehicles and underwater pressure vessels. "Often when we're working with ONR, we follow a crawl-walk-run approach, but we don't always start crawling. Sometimes we'll start more with a walk approach, prove it out, see that it's a viable path and then go back to the basics and work our way back up backed by a lot more granular data," explained Adam Ceely, undersea program manager at CET.

Before applying for a Navy SBIR Phase I to develop a pressure vessel, CET 3D printed one. "It wasn't necessarily a useful size for anything, but it was to prove out that this is possible. In Phase I, we worked backward to what size would be useful for a Navy customer. In Phase II, we expanded that technology further using a bigger printer and looking at the best material to print these out of to get better mechanical and engineering properties. We built and tested bigger pressure vessels. If they were successful we moved on to the next one. If they failed we looked backward, changed a few things, tested again," Ceely explained.

CET is following the same walk crawl-walk-run to complete an Other Transaction Authority also funded by ONR, through the Undersea Technology Innovation Consortium (UTIC) for a carbon fiber pressure vessel capable of full ocean depth.

Benefits of Iterative Design for Small Businesses

Small businesses that adopt iterative design practices can reduce risk and minimize costs and improve product quality and performance, increasing their competitiveness and ability to meet the needs of their customers.

Ceely says CET has learned and advanced its technology very quickly using the walk-crawl-walk-run approach. "It's given us a strong footing with our approach to innovation. The build-test-build approach has allowed us to really gain understanding of this subject matter in a way that a company with decades of experience may have although we've only been doing it for the past three or four years. We're expanding on all our R&D and innovation projects and we're combining a lot of projects we've worked on separately into larger projects that we will continue to follow our walk-crawl-walk-run approach with," explained Ceely.

Build-test-build Iterative Design Improves the Development Process for Small Businesses... Continued

In addition to its work for the Navy, APT develops an explosive safety quantitative risk assessment software, IMESAFR, which is commercially available. "Every version is an example of model-test-model. We send it out to users, get feedback on what they do or don't like and update the software to meet their needs." IMESAFR was built after the development of SAFER, DoD software. "The Institute of Makers of Explosives, an industrial society, saw what we were doing with SAFER for DoD and asked if we could do that for industry. The DoD gave us the green light to build IMESAFR using the intellectual property we had developed in producing SAFER. That is also a spiral: innovating on a technology developed for the DoD for another customer," explained Swanson.

And BMA was awarded the 2023 Technical Achievement Award for 3D Printing Innovation at the Military Additive Manufacturing Summit based on the build-test-build methodology applied to develop and deliver rapidly reconfigurable UUV pressure components to the company's Navy SBIR transition partner.

No matter what it is called, iterative design is an essential process that small businesses can use to improve their development process and customer satisfaction. By involving customers in the design process and using their feedback to refine the product, small businesses can create products that meet customers' needs and expectations while saving time and money.

A-P-T Research, Inc. is based in Huntsville, Alabama. APT provides professional engineering and programmatic services in disciplines including system safety, reliability and maintainability, quality engineering / assurance, software system safety / assurance, independent verification and validation, software development and modeling, artificial intelligence / machine learning, range safety, explosives safety, airworthiness, risk analysis, and training. https://www.apt-research.com/.

Big Metal Additive quickly produces complex metal products that replace difficult, time-consuming assemblies when built with conventional manufacturing. The company utilizes the latest design optimization software, creating advanced configurations that maximize efficiencies for a wide range of performance criteria. www.bigmetaladditive.com.

CET is redefining unmanned vehicle mission duration and capability by developing and integrating UUV hull structures and systems out of carbon fiber, using both traditional and additive manufacturing methods and techniques. https://www.compositeenergytechnologies.com/.

Continuous Solutions (CS), an 8(a) certified Women Owned Small Business located in Portland, Oregon's State Business Accelerator, solves complex problems in power, energy, and the electric motor industry. https://www.continuousolutions.com/.

Dynamic Dimension Technologies is an engineering and applied technology company providing high-fidelity simulation software, robotics, and data science solutions. http://www.dynamicdimensiontechnologies.com/.

G2 Ops, Inc., a woman owned small business, provides analytical and innovative solutions in the following areas: Model-Based Systems Engineering; Cybersecurity Requirements, Analysis, and Threat Assessment; Cybersecurity Consulting https://g2-ops.com/.

IMSAR is a global leader in the development of high-performance multi-mode airborne radar systems. https://www.imsar.com/.

Tercero focuses on advanced field programmable gate array (FPGA)-based tactical edge AI software and hardware for defense intelligent sensor and autonomous vehicle applications. https://www.tercero.ai/.

Trident Systems Incorporated delivers innovative and affordable technology solutions for mission critical government and commercial needs. Trident develops products in two primary focus areas: Integrated C4I systems and Electronic Systems. www.tridsys.com.

GE Research Partners With Small Businesses Developing Future Technologies

By Jennifer Reisch, Navy STP Managing Editor

The man who suggested the creation of the U.S. Naval Research Laboratory, Thomas Edison—an inventor known for bringing science out of the lab and into everyday life—also founded GE in 1892 along with J. P. Morgan and Charles A. Coffin. Refining the light bulb, developing the first large turbine generators, and figuring out how to deliver power over an extensive electric grid, GE has focused on innovation and tech transition since the beginning.

In 1900 GE Research was founded as the corporate R&D laboratory for GE, the first industrial research lab established in the United States. It remains the innovation engine turning research into reality for GE's industrial businesses.

"GE Research's mission has always been to keep GE on the cutting edge and to do what Edison preached so poignantly: 'Find out what the world needs and proceed to invent it,'" said Brad Pantuck, senior manager—external technology partnerships at GE Research. "Much of what we are trying to do aligns with the government, which is why GE Research has begun to partner more with the government on grand challenges where it aligns well with GE product lines. For example, we're supporting government S&T programs to accelerate future technologies to combat climate change, advance precision health, and enable safer, more sustainable air travel. We develop technology through TRL 5 and then transition it to GE businesses."

GE works with the DoD across all its sectors. "I like working at a company that has one foot in the private sector and one foot in the DoD," said Pantuck. "We can bring cutting edge commercial tech to the warfighter."

GE Aerospace and GE Power Conversion do a lot of business with the Navy and the DoD. GE Aerospace is a world-leading provider of jet engines, components and systems for commercial and military aircraft with a global service network to support these offerings. GE Aerospace and its joint ventures have an installed base of more than 40,000 commercial and 26,000 military aircraft engines, and the business is playing a vital role in shaping the future of flight.

GE Power Conversion, a subsidiary of GE Power, is an electrical engineering company. It supports electric

Brad Pantuck, a senior manager at GE Research, meets with a small business at the NAVAIR & NAVSEA Innovative Technology Showcase.

ship propulsion and grids, energy management and energy efficiency for the world's maritime fleets, from naval ships to commercial marine transport and vessels for offshore industries, doing R&D on next generation ship propulsion and electrification.

In addition to working with the DoD, GE Research does collaborative research with small companies. "We understand the challenges that companies face trying to bring technology to market. We do world class research and want to partner with other world class researchers to round out our capabilities."

GE commonly partners with cutting edge small companies bidding on SBIRs. "We commonly write letters of support when we believe in the tech. Sometimes GE has a small SOW to support, especially on Phase II. We respect companies' IP; we don't get into technical detail without an NDA in place," Pantuck explained.

CHIPS and Science Act

The CHIPS and Science Act of 2022 intends to strengthen American manufacturing, supply chains, and national security, and invest in research and development and science and technology to keep the United States the leader in industries including nanotechnology, clean energy, quantum computing, and artificial intelligence. The CHIPS and Science Act supports domestic semiconductor research, development and production. Currently,

GE Research Partners With Small Businesses Developing Future Technologies... Continued

the United States produces about 10 percent of the world's supply but none of the most advanced chips. The Act provides billions of dollars for American semiconductor research, development, manufacturing, and workforce development, intending to secure the domestic supply.

GE Research's custom labs, advanced testing facilities, and in-house multidisciplinary tech teams can work with small businesses developing this technology. The lab has been a world leader in the development of silicon carbide wafers for power semiconductor applications, with an intellectual property portfolio valued at more than $100 million. "Our country is focused right now on onshoring semiconductor production and producing microelectronics in trusted foundries. We make a great partner for cutting edge companies developing next-generation microelectronics for DoD applications, who need help with prototyping—TRLs 2-5," Pantuck said. GE Research's Microelectronics Group specializes in sensing and electronics for industrial, aerospace, and grid use cases. It specializes in high temperature, high voltage, harsh environment, MEMS, power electronics (wide band gap / ultrawide band gap), and packaging integration. GE Research has an ISO-9001 certified cleanroom for prototype and low volume production. GE Research's secure cleanroom has matured technologies that have transitioned to full production products or independent companies.

In addition to working with the DoD, GE Research does collaborative research with small companies.

"We understand the challenges that companies face trying to bring technology to market. We do world class research and want to partner with other world class researchers to round out our capabilities."

Brad Pantuck, senior manager—external technology partnerships at GE Research.

InertialWave, Inc.

InertialWave, Inc., a small business located in Torrance, California, has worked successfully with GE Research on SBIR projects and with prototyping. InertialWave develops and manufactures high performance microelectronics, test equipment, and navigation units for commercial and aerospace markets.

"Our first introduction to GE Research was at a conference sponsored by DARPA at Stanford University. They were working on a high temperature gyroscope for downhole applications under a Department of Energy program. We offer unique control systems for gyroscopes, and they were very interested in our work. We helped develop a high temperature ASIC they could use with their device. After that, our relationship continued through a semi-PNT program they had," explained Peter Bond, vice president of InertialWave.

"And then we had an SBIR contract for developing a MEMS accelerometer sensor concept and they had a fabrication process that would work for that. We gave them a subcontract to do the fabrication. Basically it's an electronic foundry process similar to making semiconductors and, as a small business, there's no way we can afford to have that type of equipment. Even if we have the ideas, we just don't have the equipment.

"In all cases, we've had really good rapport and a good exchange of data and it's worked very well. They have been helpful analyzing data based on our integration of their sensors and our devices. From a contracts management perspective, they've helped us as a small business when they have larger criteria to meet, and they also helped us get through some of the government hurdles. Right now we're expecting another agreement we can work on with them for another project they are trying to negotiate funding for."

Bond does wish GE Research were closer to InertialWave. "We're in California. They're in New York. It's not easy to get to."

Ozark Integrated Circuits, Inc.

"We love working together with small businesses because typically we get to engage with innovative and passionate thinkers with a very entrepreneurial mentality," said Stacey Kennerly, technology manager—microfabrication semiconductors at GE Research within the Microelectronics Group. "Combining the strengths of small businesses and

GE Research Partners With Small Businesses Developing Future Technologies... Continued

our capability and infrastructure enables us to co-develop very cool technology in ways that otherwise would not be possible." Ozark Integrated Circuits, Inc. (Ozark IC), located in Fayetteville, Arkansas, is partnering with GE Research, working on building and transitioning an extreme environment integrated circuit (IC) fabrication process licensed from NASA's Glenn Research Center into GE's foundry, including tapping into GE's cleanroom for prototyping.

Ozark IC produces modules for extreme environments (from 200°C to 800°C) that contain ICs, boards and packages, and the most significant parts are the ICs. These ICs are designed by Ozark IC using unique technology such as the silicon carbide (SiC) fabrication process at GE. "We've had a wonderful experience with GE Research; the company is a delight to work with. Earlier, we did some low temperature ICs for space applications. Then we progressed to extremely hot environments with ICs and packages. Our first commercial product is basically a computer that can work at and above 200°C, temperatures where traditional computers would die," explained Nick Chiolino, senior program manager at Ozark IC. The company is currently working on more challenging applications that work at about 350°C. "The temperature range that I have been running programs on have been 350°C to 800°C. That technology is a lot less mature and there are very few suppliers, so GE Research is a very important and valued provider."

While Ozark IC develops the substrates on which the ICs sit and designs the ICs taking into account their interaction with these substrates, GE Research facilities produce the ICs. "The SiC technology that is typically used for super high temperatures has been used in the power industry for a long time. Ozark IC has adapted this SiC technology to enable signal processing at extremely high temperatures," Chiolino said.

This groundbreaking fabrication technology that has uniquely produced the only ICs ever to demonstrate stable operation for over a year at 500°C was originally developed at NASA Glenn Research Center. Ozark IC has extended it by creating tools, IP and patented design techniques. "Several government agencies are interested in this SiC technology for applications that range from enhanced geothermal well monitoring to jet engine controls, hypersonic vehicles and environment sensing on leading edge wings and more. There's a lot of interest to have this technology become a commercial capability. Via an SBIR Phase II project, DARPA has provided us the ability to transfer this technology out of NASA Glenn into GE Research. This is a major step in securing the U.S. supply chain for high temperature electronics," he said.

Ozark IC is working with GE Research to make this technology commercially available to the public. "We have discussions weekly with Stacey Kennerly about transferring this technology. GE Research has been a joy to work with. Their people are very responsive; I'm thrilled with how responsive they are," Chiolino said.

He has not been to GE Research's facility yet. "I plan on going soon, but from what I can tell they have a very impressive fabrication facility full of very intelligent and experienced thin film engineers that know how to take an adolescent technology like this and get it transferred into a commercial product. GE has shown a very intense, very deliberate willingness to be involved in this transfer. I assume they have products for which they would like to use this technology, because they make large systems for extreme environment applications too.

"We really struck a good relationship of mutual needs with GE; we don't have a thin film fab, but we have the tools and the designers and the expertise to design and test the ICs, and GE is our fab partner. They're the experts in how to make the physical circuit; they will have the best SiC fabrication facility in the U.S., and maybe the world. It's a small community when you get into high temperature electronics, but having a partner like GE is saving this technology. For GE Research to look at a technology like this and know that it could be something special for high temperatures is a compliment to the incredibly good work that the group at NASA Glenn Research Center has done, but it's a boon to us as well. This is a wonderful opportunity for us. Combining our ability to design, model, test and package advanced compound semiconductors with their SiC development and fabrication capabilities should provide amazing results."

Ozark IC has asked GE Research to be part of another proposal they submitted in January for a NASA Phase II. "If we get this award, we will be doing another project with them and hopefully many more," he said.

How to interact with GE

GE Research and GE Aerospace typically find companies through professional networks, not through an administrative SBIR liaison. If you would like to work with GE Research, Pantuck suggests attending professional meetings, working appropriate networks, or demonstrating your technical expertise in respected journals.

Additionally, to collaborate with GE Research on a specific technology area you can fill out a form available at: ge.com/research/contact-us. A GE Research representative will respond to the form submission.

Information on doing business with GE Aerospace, including the Supplier Diversity & Small Business Program, is available at the following link: https://www.geaerospace.com/company/doing-business. Small businesses can send capability statements to aviation.suppliercommunications@ge.com. GE is interested in the following NAICS codes for aerospace: 336412, 336413, 541715.

Connect with GE at Upcoming Events

GE will be attending the following upcoming conferences and events:

Show Name	Location	Date
ASME Turbo Expo 2023- Turbomachinery Technical Conference & Exposition	Boston	June 26-30
Tinker and the Primes	Midwest City, Oklahoma	Aug. 8-10
Tailhook	Reno, Nevada	Aug. 24-26
AFA	Washington	Sept. 11-13
MED Week-Minority Enterprise Development	Virtual	Sept. 20-21
NMSDC	Baltimore, Maryland	Sept. 22-25
AUSA	Washington	Oct. 9-11
ATA Association	Denver	Nov. 9-12
AAAA Cribbins	Huntsville, Alabama	Nov. 13-15
AAAA Luther Jones	Corpus Christi, Texas	Nov. 13-15
DEFENSE MANUFACTURING CONFERENCE (DMC) 2023	Nashville, Tennessee	Dec. 11-14
AFA	San Antonio, Texas	Jan. 5-7, 2024
WEPTAC	Nellis AFB, Nevada	Jan. 10, 2024

NSRP Celebrates Over 50 Years of Shipyard Collaboration

By Jonathan Leggett

The National Shipbuilding Research Program (NSRP) recently celebrated its 50th anniversary. Since its inception the NSRP's goal has remained the same: to reduce production costs and to accelerate delivery schedules through improved shipbuilding methods. The NSRP collaboration manages and focuses national shipbuilding and ship repair research and development funding on technologies and processes with the goal to reduce the total ownership cost of ships for the U.S. Navy, other national security customers, and the commercial sector. The organization also develops and leverages best commercial and Naval practices to improve the efficiency of the U.S. shipbuilding and ship repair industry.

The NSRP began as a research and development (R&D) program in 1971 under the guidance of the U.S. Maritime Administration. The program's initial goal was to respond to the direction given to the Secretary of Commerce in the Merchant Marine Act of 1970 to collaborate with shipbuilders in developing plans for the economic construction of vessels. Oversight of the program has changed over the years and is currently managed out of the Naval Sea Systems Command (NAVSEA) with the NSRP collaboration's administration offices located in Summerville, South Carolina. Recently, Benjamin D. Canilang was named the new NSRP Program Manager at NAVSEA, taking over for Erik Oller who served in the role for over two and a half years.

On the industry side, the Executive Control Board, consisting of a senior management representative for each member shipyard, serves as the governing collective for the NSRP collaboration. Breaking the organization down further, the NSRP splits out into working groups called panels which are aligned to major Department of Navy initiatives. Each of the nine panels elects a chair and vice-chair who organize the panel activities.

The nine panels include: Ship Design & Material Technologies; Ship Warfare Systems Integration; Business Technologies; Electrical Technologies; Planning, Production Processes & Facilities; Surface Preparation & Coatings; Welding Technology; Workforce; and the Sustainment Working Group. The panels meet throughout the year and industry members can request an invitation by contacting the panel chairs and/or vice chairs.

The NSRP annually funds R&D projects that the shipbuilding industrial base can partake in through two opportunity categories: Research Announcements (RAs) and Projects and Panel Projects. RA and Panel Project funds are awarded annually ranging anywhere between $6M to $9M. For example, during the 2021 NSRP days at NAVSEA's headquarters, 21 projects were selected for awards which were valued at over $8.2 million. RA and Panel project solicitations can be located on the NSRP website: www.nsrp.org.

RA projects provide a method of contracting for R&D based upon notices posted on SAM.gov and the NSRP website which identify areas of research interest. They are issued when NSRP desires new and creative solutions to problem statements and/or advances in technologies, tools and processes and are more flexible than traditional solicitation formats such as requests for proposals, which require specific solutions or outcomes. This allows the NSRP to state its objectives in general terms of need or interest, allowing for flexibility in solutions provided.

The NSRP Executive Control Board also allocates

funding for a portfolio of projects which are solicited through the nine NSRP panels. These projects typically last 12 months or less and are funded at $150K or less.

Updates and results from recently concluded and ongoing R&D projects are presented at the biennial All Panel Meeting that brings together all nine panels of the NSRP. At this event the participants discuss technology gaps in the areas of ship design, construction, and modernization; and to share best practices in the shipbuilding and support enterprise. At the most recent All Panel Meeting, which took place in March 2023, over 90 NSRP and ManTech project-related presentations were given. Slides from the event can be viewed at the NSRP page located at: https://www.nsrp.org/nsrp-and-industry-events/#1651685668057-796678d6-14d1. The next opportunity to participate in this event will be in March 2025.

In addition to the panel groups working collaboratively to find common solutions, the NSRP also serves as a conduit to connect industry partners with the individual shipyards through the NSRP Shipyard Delegates (NSDs). NSDs serve as a primary point of contact for NSRP-related information flowing into and out of the shipyard. These shipyard delegates can be contacted through the NSD page located at https://www.nsrp.org/nsrp-shipyard-delegates.

NSRP Panel Chairs and Vice Chairs

NSRP Panel	Chair / Vice Chair
Business Technologies	Chair: Jamie Breakfield – Ingalls Shipbuilding Vice Chair: Patrick Roberts – SSIUSA
Electrical Technologies	Chair: Jason Farmer – Ingalls Shipbuilding Vice Chair: Walt Skalniak – Ashby Company
Planning, Production Processes and Facilities	Chair: Dale Samples – Fincantieri Marinette Marine Vice Chair: Patrick Cahill – CahillConsulting, L.L.C.
Ship Design and Material Technologies	Chair: Monika Skowronska – General Dynamics NASSCO Vice Chair: Victoria Dlugokecki – Naval Architecture/Marine Engineering Consultant
Ship Warfare Systems Integration	Chair: Perry Haymon – Ingalls Shipbuilding Vice Chair: Harold Howard – Newport News Shipbuilding
Surface Preparation and Coatings	Chair: Vacant Vice Chair: Robert Cloutier – Consultant
Welding Technology	Chair: Paul Hebert – Newport News Shipbuilding Vice Chair: Kevin Roossinck – Ingalls Shipbuilding
Workforce	Chair: Vacant Vice Chair: Maurissa D'Angelo – D'Angelo Technologies
Sustainment	Chair: Kirsten Walkup – BIW Vice Chair: Kaipo Crowell – Kakou Professional Development

Navy STP Hosts Three Innovative Technologies Showcase Events

By Kimberly Rouleau

The Navy SBIR Transition Program (Navy STP) promoted the innovative Navy SBIR/STTR technologies of several small businesses during three in-person events this year, which facilitated one-on-one meetings between small business participants and Navy personnel, industry partners, and other acquisition stakeholders. In addition to these events, Navy STP promotes small business technologies through Tech Talks and an enhanced online presence on the Navy STP Virtual Transition Marketplace (Navy STP VTM), which provides additional information on Navy technology topics for small businesses participating in the program. The Navy STP VTM is available at https://vtm.navyfst.com/.

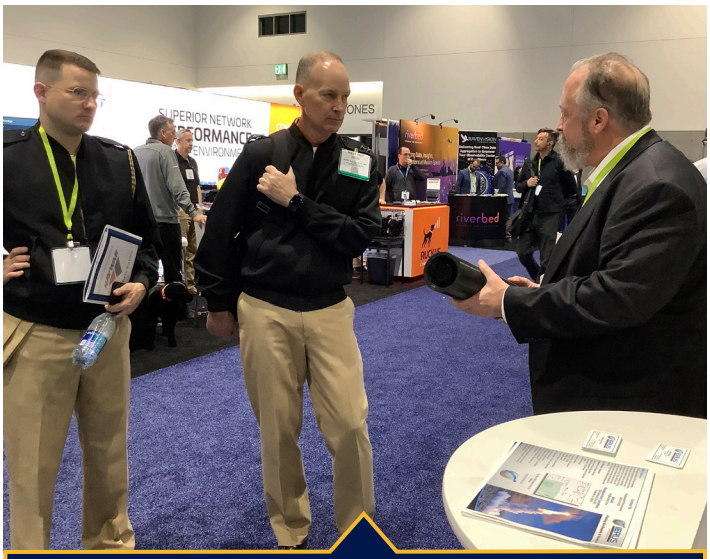
WEST 2023 Innovative Technologies Showcase

Cohosted in San Diego by AFCEA International and the U.S. Naval Institute, WEST connects professionals in the Navy, Marine Corps and Coast Guard with industry leaders and senior military and government officials.

At WEST 2023, the Navy STP Innovative Technologies Showcase booth hosted 27 projects by 26 small businesses participating in the program. Featured technologies included advanced electronics, autonomy, battlespace environment, command, control, communications, computers and intelligence (C4I), electronic warfare, ground and sea platforms, human systems, materials and manufacturing, sensors, sustainment, and weapons technology.

The third day of WEST 2023 included Navy-funded technology demonstrations by two Navy STP participants. Tagup, Inc. demonstrated "LAV25 Logistics Optimization using Machine Learning," and Intelligent Fusion Technology, Inc. presented "A Metadata Management and Visualization System for Radio Frequency Activity Modeling and Pattern Recognition."

During the event, several high-ranking Navy officials and flag officers, including Secretary of the Navy Carlos del Toro, Commander of Naval Information Warfare Systems (NAVWAR) Rear Admiral Doug Small, and Director of NavalX Stephen Plew, visited the Navy STP booth to talk with small businesses about their technologies.



Rear Adm. Doug Small talks with a Navy STP small business at WEST 2023.

NAVAIR & NAVSEA Innovative Technologies Showcase 2023

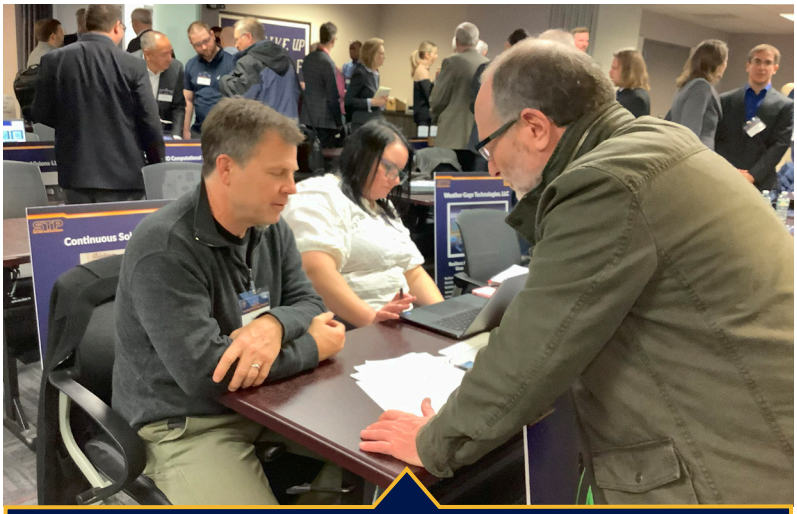
At the NAVAIR & NAVSEA Innovative Technologies Showcase in March, 62 projects were on display over the course of three days. This event in Washington, which was attended by almost 200 people, was targeted just for small businesses, and gave Navy STP participants the chance to meet representatives from the SYSCOMs and industry partners. Featured SBIR/STTR technologies included advanced electronics, air platforms, autonomy, biomedical, C4I, cyber, electronic warfare, energy and power technologies, engineered resilient systems, ground and sea platforms, human systems, materials and manufacturing processes, modeling and simulation technology, sensors, sustainment, and weapons technologies.

Keynote speakers during the event included NAVAIR Deputy Commander Tom Rudowsky, the Executive Director of NAVSEA Giao Phan, and the Executive Director of the Office of Naval Research (ONR) Dr. Douglas Blake.

"This event celebrates integrated collaboration," said Robert Smith, DoN SBIR/STTR director, during his opening remarks. "We work collaboratively to help you be successful. Your technology allows Sailors and Marines to come home safe every day."

Sea-Air-Space 2023 Innovative Technologies Showcase

S-A-S, presented by the Navy League of the United States, is the largest maritime exposition in the United States. Held in April in National Harbor, Maryland, S-A-S brought together industry partners and key military decision-makers from different countries for education sessions, policy discussions and two exhibit halls.



The NAVAIR & NAVSEA Showcase gave Navy STP participants the chance to meet representatives from the SYSCOMs and industry partners.

For two of the three days of the event, the Navy STP Innovative Technology Showcase booth, featuring 49 projects from 45 small businesses, engaged the fleet, primes, and acquisition stakeholders by promoting DoN sponsored SBIR/STTR innovative technologies through one-on-one meetings. SBIR/STTR technology categories highlighted included advanced electronics, air platforms, autonomy, biomedical, C4I, electronic warfare, energy and power, ground and sea systems, human systems, materials and manufacturing processes, modeling and simulation, sensors, sustainment, and weapons technologies.

Secretary of the Navy Carlos Del Toro meets with a small business at the Navy STP Innovative Technology Showcase booth at S-A-S 2023.

On the third day of S-A-S, the Navy STP booth featured demonstrations from Navy STP participants. Scott Toppel, president of Avatar Partners, Inc., presented "On Demand Training for Maintenance Technicians with Simplified, Intelligent Augmented Reality (SIA)." Tony Morris, president and CEO of American Maglev Technology, presented "Passive Cooling for Aircraft Carrier Jet Blast Deflectors (JBD)." The team from Hydronalix presented "Limited-Production Swarming Unmanned Systems (UxS) to support HADR Operations."

During S-A-S, several high-ranking Navy and flag officers visited the Navy STP booth and were presented with an overview of the small businesses' technologies. Secretary of the Navy Carlos del Toro, Chief of Naval Research Rear Admiral Lorin Selby, Commander of NAVWAR Rear Admiral Doug Small and Commander of the Marine Corps Systems Command Brigadier General David Walsh were some of the leaders who engaged with the small businesses.

"To be invited to be part of Navy STP is an honor, and it's taken us here to be part of [Sea-Air-Space] where we can demonstrate our technology," said Don Hamilton, director of Navy Accounts for Dignitas Technologies.

Upcoming Events

DATE	EVENT & LINK	LOCATION
July 31-Aug. 4	Conference on Uncertainty in Artificial Intelligence (UAI) https://www.auai.org/uai2023/	Pittsburgh
Aug. 8-10	Space & Missile Defense Symposium & Expo https://smdsymposium.org/	Huntsville, Alabama
Aug. 8-10	Tinker and the Primes https://tinkerandtheprimes.com/	Midwest City, Oklahoma
Aug. 18-21	National Guard Association of the United States General Conference & Exhibition https://www.ngaus.org/events/145th-general-conference-exhibition	Reno, Nevada
Aug. 28-30	2023 AUVSI Pathfinder Symposium https://auvsipathfinder.com/	Huntsville, Alabama
Sept. 6-8	ASNE's Fleet Maintenance & Modernization Symposium (FMMS) https://www.navalengineers.org/Symposia/FMMS2023	San Diego
Sept. 11-12	Air, Space & Cyber Conference https://www.afa.org/events/air-space-cyber-conference	National Harbor, Maryland
Sept. 20-21	National Cyber Summit https://www.nationalcybersummit.com/	Huntsville, Alabama
Sept. 25-28	2022 Future Force Capabilities Conference and Exhibition https://www.ndia.org/events/2023/9/25/3305---ffc	Huntsville, Alabama
Sept. 25-28	OCEANS 2023 https://gulfcoast23.oceansconference.org/	Biloxi, Mississippi
Sept. 29-30	Unmanned Systems West https://www.unmannedsystemstechnology.com/events/unmanned-systems-west/	San Diego
Oct. 3-4	ManuSec USA: Cyber Security Conference https://usa.manusecevent.com/	Chicago
Oct. 16-18	2023 Fall Joint AIA/NDIA Industrial Security Committee Conference https://www.aia-aerospace.org/events/2023-fall-joint-aia-ndia-industrial-security-committee-conference/	Tucson
Oct. 17-20	GridSecCon https://www.nerc.com/pa/CI/ESISAC/Pages/GridSecCon.aspx	Québec City, Canada
Oct. 23-26	Industrial Control Systems (ICS) Cyber Security Conference https://www.icscybersecurityconference.com/	Atlanta
Oct. 30-Nov. 3	Military Communications Conference https://milcom2023.milcom.org/	Boston
Nov. 7-8	Naval Submarine League (NSL) Annual Symposium & Industry Update https://www.navalsubleague.org/events/annual-symposium/	Arlington, Virginia
Nov. 14-16	International Security Conference & Exposition (ISC East) https://www.isceast.com/en-us/show-info.html	New York
Nov. 27-30	AAircraft Structural Integrity Program (ASIP) Conference http://www.asipcon.com/	Denver
Nov. 27-Dec. 1	I/ITSEC 2022 https://www.iitsec.org/	Orlando, Florida
Nov. 28-30	Defense TechConnect Innovation Summit & Expo https://events.techconnect.org/DTCFall/	Washington

Phase III Navy Contracts

The following table reports Phase III awards made by the U.S. Navy directly to small businesses for FY22. SBIR/STTR firms also receive many Phase III awards directly from state governments, DoD prime contractors and others in the private sector, which are not reported below.

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
MCSC	N151-069	Aptima, Inc.	47QFLA-19-D-0012	$350,006	ONR
	AF01-216	AQYR Technologies, Inc.	47QFCA-20-D-0005	$2,608,339	MARCOR
	A09-051	Corvid Technologies, LLC	M67854-18-D-0008	$183,522	MARCOR
	N05-039	Frontier Technology Inc.	M67854-20-D-6517	$816,555	NAVSEA
	N142-086	Hyperion Technology Group, Inc.	M67854-20-C-6702	$616,645	MARCOR
	SB162-003	IST Research Corp.	47QFCA-20-D-0004	$5,767,505	MARCOR
	A04-210	Outdoor Venture Corporation	M67854-22-C-5001	$686,607	ARMY
	N171-077	Premier Solutions Hi, LLC	M00318-21-P-0030	$29,913	NAVSUP
	N162-081	Rini Technologies Inc	M67854-22-C-5100	$876,312	MARCOR
	AF183-005	Sabel Systems Technology Solutions, LLC	47QFLA-19-D-0007	$4,512,897	MARCOR
	AF191-005	Sehlke Consulting LLC	47QFLA-20-D-0004	$7,582,073	MARCOR
	AF191-005	Sehlke Consulting LLC	47QFLA-21-D-0004	$33,933,516	MARCOR
	N152-122	Tactical Edge, Inc.	M95494-21-C-0022	$2,004,883	ONR
	N162-121	Trident Systems Incorporated	47QFLA-21-C-0015	$2,373,972	ONR
MCSC Count			**14**		
MCSC Total				**$62,342,744**	
NAVAIR	N02-152	Adaptive Methods, Inc.	N68335-15-G-0018	$2,840,000	NAVAIR
	N03-074	Advanced Acoustic Concepts, LLC	N61340-20-C-0028	$380,000	NAVSEA
	N093-164	Aerospace Mass Properties Analysis Inc	N68335-21-C-0452	$1,436,964	NAVAIR
	Multiple	Alliant Techsystems Operations LLC	N00019-17-G-0011	$5,428,386	NAVAIR
	Multiple	Alliant Techsystems Operations LLC	N00019-19-C-0050	$63,743,284	NAVAIR
	N00-123	American Systems Corp.	N61340-20-C-0018	$1,524,684	NAVSEA
	N08-T004	Aptima, Inc.	N61340-18-C-0020	$24,996	NAVAIR
	N151-015, N132-099	Architecture Technology, Inc.	N68335-20-G-1044	$1,249,911	NAVAIR
	N06-002	Arete Associates	N68335-15-G-0016	$40,000	NAVAIR
	N141-065	Azure Summit Technology, Inc.	N00164-17-D-JT09	$2,065,690	ONR
	AF083-053, N141-065	Azure Summit Technology, Inc.	N00164-22-D-JW52	$2,406,260	USAF, ONR
	N03-190	BSC Partners LLC	N61340-14-C-0002	$6,000,000	NAVAIR
	N04-081	C3I, Inc	N68335-17-G-0011	$2,929,839	NAVSEA
	N151-021	Chesapeake Technology International, Corp.	N68936-18-G-0006	$3,171,528	NAVAIR
	AF171-054, N15A-T014	Coherent Technical Services, Inc.	N68335-19-G-0057	$1,467,343	USAF, NAVAIR
	N201-015	Compass Systems, Inc.	N68335-22-G-0012	$10,379,879	NAVAIR
	N101-018	Cornerturn, LLC	N68335-18-D-0002	$379,429	NAVAIR
	N112-154	Corrdesa, LLC	N68335-22-C-0305	$996,703	NAVAIR

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
NAVAIR	N01-161, N05-095	Creare LLC	N00421-22-C-0018	$6,990,592	NAVAIR
	N06-T023	Creare LLC	N68335-18-D-0067	$2,680,512	NAVAIR
	AF093-025, OSD11-IA3	Design Knowledge Company, The	47QFLA-21-D-0018	$6,456,422	USAF
	OSD14.1-AU4	Edge Case Research, Inc.	N68335-20-C-0160	$999,529	NAVAIR
	AF071-320	Engineering And Software System Solutions, Inc.	N68335-20-C-0315	$124,448	NAVAIR
	N05-039	Frontier Technology Inc.	47QFCA-21-C-0024	$50,841,249	NAVSEA
	AF06-016	Frontier Technology Inc.	GS05Q-14BM-D-0001	$4,781,183	USAF
	N07-010, N132-096	Frontier Technology Inc.	N68335-16-G-0014	$2,002,500	NAVAIR
	N151-015, N181-007	Fuse Integration, Inc.	N00421-22-G-0002	$14,690,716	NAVAIR
	N181-051	G2 Ops, Inc.	N68335-20-G-0004	$836,510	NAVSEA
	N192-085	Global Engineering And Materials, Inc.	N68335-22-G-0006	$885,000	NAVAIR
	Multiple	Hydronalix, Inc.	N68335-22-G-0002	$1,620,000	NAVAIR
	AF112-144	IMSAR LLC	N68335-18-G-0015	$2,693,148	NAVAIR
	N07-034	Innovative Defense Technologies, LLC	N68335-15-G-0039	$1,086,000	NAVAIR
	N07-137, N171-012, N171-049	Innovative Defense Technologies, LLC	N68335-19-G-0036	$1,726,756	NAVWAR, NAVAIR, NAVSEA
	N07-034	Innovative Defense Technologies, LLC	N68335-20-G-0001	$792,595	NAVAIR
	N20A-T017, N202-126, N193-A03-2	Intelligent Automation, Inc.	N61340-22-C-0021	$945,000	ONR
	J201-CSO1	IT Cadre LLC	N00019-21-C-0047	$1,047,123	NAVAIR
	N06-123	Lambda Science, Inc.	N68335-21-C-0007	$896,019	NAVAIR
	N162-086	Lead Dog Technologies	N68335-21-G-0013	$732,504	NAVAIR
	N90-085	Logis-Tech, Inc.	N00421-20-C-0042	$315,171	NAVAIR
	A14-032	Mayflower Communications Company, Inc.	W56JSR-20-D-0021	$2,908,035	ARMY
	N102-129	Mercury Mission Systems, LLC	N68335-22-C-0496	$472,360	NAVAIR
	N10A-T042	Metis Design Corporation	N68335-21-C-0006	$57,914	NAVAIR
	A03-070, N141-019	Monterey Technologies, Inc.	N68335-18-G-0034	$2,030,000	USA, NAVAIR
	N08-023, N08-008, N101-042	Navmar Applied Sciences Corporation	N68335-15-G-0013	$3,264,351	NAVAIR
	N06-125	North Star Scientific Corporation	N68335-19-G-0037	$24,113,148	NAVAIR
	N102-129	Physical Optics Corporation	N68335-16-D-0027	$890,366	NAVAIR
	N102-129, N152-096	Physical Optics Corporation	N68335-17-G-0032	$4,562,110	NAVAIR
	Multiple	Physical Optics Corporation	N68335-19-G-0041	$22,468,228	MARCOR, NAVAIR
	N102-129	Physical Optics Corporation	N68335-20-D-0032	$19,617,210	NAVAIR
	N121-045	Progeny Systems Corporation	N68335-17-G-0054	$7,871,552	NAVAIR
	N96-278, N05-082	Progeny Systems Corporation	N68335-18-G-0039	$1,791,357	NAVSEA, NAVAIR
	N98-115	Progeny Systems Corporation	N68335-20-G-1046	$1,679,341	NAVSEA
	N142-102	R Cubed Engineering, LLC	N68335-22-G-0041	$6,676,770	NAVAIR

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
NAVAIR	N04-247, N06-011, N98-035	RDA, Inc.	N68335-20-G-3039	$5,585,360	NAVAIR
	N96-061	Reynolds Systems, Inc.	N68936-18-G-0004	$271,851	NAVAIR
	N101-034	Rock West Composites, Inc.	N68335-18-G-0041	$4,507,516	NAVAIR
	N03-025, N112-127	Scientific Systems Company Inc.	N68335-15-G-0030	$4,084,786	NAVAIR
	N08-023, N101-014	SeaLandAire Technologies, Inc.	N68335-20-G-1049	$4,221,557	NAVAIR
	N04-007, N093-168, N101-005	Signal Systems Corporation	N68335-20-G-1062	$3,748,316	NAVAIR
	N15A-T013	Soar Technology Inc	N61340-22-C-0024	$2,985,648	NAVAIR
	N96-232	Stottler Henke Associates, Inc.	N68335-19-G-0046	$99,776	NAVAIR
	N172-111	Systems & Technology Research LLC	N68335-22-G-0008	$2,950,999	NAVAIR
	N08-006	Technical Data Analysis, Inc.	N68335-21-G-0003	$242,206	NAVAIR
	AF083-139	Technology Service Corporation	N68335-22-C-0637	$2,236,081	NAVAIR
	AF083-139	Technology Service Corporation	N68335-20-C-0535	$3,100,218	NAVAIR
	AF103-180	Technology Service Corporation	N68335-20-C-1002	$402,312	NAVAIR
	N111-016	Toyon Research Corporation	N68335-17-G-0026	$9,110,216	NAVAIR
	N193-A01	Toyon Research Corporation	N68335-20-G-1003	$997,870	NAVAIR
	N02-079	Triverus LLC	N00019-19-C-0064	$119,595	ONR
	N05-T005	Ultra Communications, Inc.	N68335-21-G-0027	$1,999,263	NAVAIR
	N08-023, N101-014, N101-014	Undersea Sensor Systems, Inc.	N68335-20-C-0221	$1,100,796	NAVAIR
	N10B-T049	Vision Products LLC	W909MY-21-C-0036	$400,000	NAVAIR
	N151-052	VRC Metal Systems, LLC	47QFLA-21-D-0003	$3,601,750	NAVAIR
	N96-150, N01-139	Zivko Aeronautics, Inc.	N00421-21-C-0022	$1,396,525	ONR
NAVAIR Count			**74**		
NAVAIR Total				**$361,173,254**	
NAVFAC	N152-098	Diversified Technologies, Inc.	N39430-22-C-2411	$847,194	NAVFAC
	N131-060	DRG Undersea Consulting, Inc.	N39430-22-C-2402	$178,507	NAVFAC
	AF193-CSO1	Transtecs Corporation	47QFLA-22-C-0002	$6,685,358	USAF
NAVFAC Count			**3**		
NAVFAC Total				**$7,711,059**	
NAVSEA	AF192-001	202 Group LLC	47QFRA-22-D-0001	$21,238,905	USAF
	N02-139	Aculight Corporation	N00024-18-C-5392	$19,993,105	NAVSEA
	N97-090, N98-106, N03-074	Advanced Acoustic Concepts, LLC	N00024-19-C-6311	$24,899,584	NAVSEA
	N112-137, N20A-T010	Advanced Technology And Research Corporation	47QFCA-22-C-0017	$660,741	NAVSEA
	N00-123	American Systems Corporation	N61340-22-C-0001	$14,487,700	NAVSEA
	N00-123	American Systems Corporation	N64267-21-C-0072	$4,305,000	NAVSEA
	AF192-001	ANSOL Inc.	47QFLA-20-D-0016	$2,903,982	NAVSEA
	N87-047	Applied Mathematics Inc	N00189-21-P-G010	$419,040	NAVSEA
	OSD10-HS5	Aptima, Inc.	47QFLA-20-D-0015	$1,393,923	ONR
	N96-150	Arete Associates	N61331-21-D-0006	$16,903,585	NAVSEA
	N122-141	Arete Associates	N66001-20-C-0025	$8,949,213	ONR

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
NAVSEA	N96-150	Arete Associates	N61331-21-D-0006	$16,903,585	NAVSEA
	N122-141	Arete Associates	N66001-20-C-0025	$8,949,213	ONR
	N151-022	Atmospheric Plasma Solutions, Inc.	SPMYM2-22-P-1753	$106,960	NAVSEA
	N151-022	Atmospheric Plasma Solutions, Inc.	SPMYM2-22-P-2022	$207,000	NAVSEA
	N07-108	Beacon Interactive Systems LLC	N00039-18-C-0034	$1,719,059	NAVSEA
	N121-046	Beam-Wave Research Inc.	N00173-18-C-2013	$105,000	NAVSEA
	N091-071	Cape Henry Associates, Inc.	47QFLA-20-D-0008	$11,295,891	ONR
	N01-150	Consulting Network, Inc., The	N00024-19-C-5228	$1,851,000	NAVSEA
	N181-059	Corvid Technologies LLC	N00173-20-C-2023	$600,000	NAVSEA
	N04-081	Critical Communications Controls & Instruments LLC	N68335-22-G-0035	$362,431	NAVSEA
	AF21A-TCSO1	Defense Unicorns, Inc.	47QFCA-22-D-0503	$7,061,231	USAF
	N131-039	Dragonfly Pictures, Inc.	N68335-21-C-0211	$136,510	NAVSEA
	N05-039	Frontier Technology Inc.	47QFLA-20-C-0006	$325,068	NAVSEA
	N05-039	Frontier Technology Inc.	N00174-19-D-0006	$2,252,512	NAVSEA
	N07-010	Frontier Technology Inc.	N63394-17-D-0003	$1,078,635	NAVSEA
	A06-035	Frontier Technology Inc.	N64267-22-C-0300	$4,447,062	ARMY
	AF192-001	G2 Ops, Inc.	47QFLA-21-C-0011	$25,344,514	NAVSEA
	A13-058	Gomez Research Associates, Inc.	N00174-19-C-0021	$7,012,246	ARMY
	N151-051	Heureka Corporation	47QFLA-21-C-0006	$335,650	NAVSEA
	N05-163	Innovative Defense Technologies, LLC	N00024-21-C-5100	$18,542,150	ONR
	N01-137	ITA International, LLC	N50054-19-P-1061	$728,879	ONR
	N121-061	Jardon & Howard Technologies, Incorporated	N61340-19-C-0030	$196,293	NAVSEA
	N121-061	Jardon & Howard Technologies, Incorporated	N61340-22-C-0023	$2,117,897	NAVSEA
	N122-132	Kinetic Protection, LLC	47QFLA-21-D-0002	$2,394,672	NAVSEA
	N122-132	Kinetic Protection, LLC	N00024-22-C-5350	$16,273,005	NAVSEA
	Multiple	L3 Adaptive Methods, Inc.	N00024-20-C-5211	$8,303,153	NAVSEA
	N03-146	L3 Adaptive Methods, Inc.	N00039-17-C-0043	$309,829	NAVSEA
	N95-209	L-3 Chesapeake Sciences Corporation	N00039-18-C-0024	$2,826,783	NAVSEA
	N03-146	L3 Technologies, Inc.	N00039-22-C-9000	$3,214,713	NAVSEA
	N95-209	L3 Technologies, Inc.	N66604-21-D-L000	$4,047,119	NAVSEA
	N132-140	La Jolla Logic, Inc.	47QFLA-22-D-0003	$200,000	NAVWAR, NAVSEA
	N11A-T017	Makai Ocean Engineering, Inc.	N00039-18-C-0016	$1,181,060	NAVSEA
	N04-044	Maritime Applied Physics Corporation	N00024-22-C-2228	$1,956,100	NAVSEA
	N04-044	Maritime Applied Physics Corporation	N68335-21-C-0575	$484,096	NAVSEA
	N05-054	Materials Sciences LLC	N65540-15-D-0011	$2,406,918	NAVSEA
	N121-058	Materials Sciences LLC	N68335-22-C-0103	$693,994	NAVSEA
	N121-092	MI Technical Solutions, Inc.	47QFLA-20-C-0002	$50,529,429	ONR
	N121-092	MI Technical Solutions, Inc.	47QFLA-22-C-0001	$3,594,440	ONR

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
NAVSEA	N04-073	Mide Technology Corporation	N64498-21-D-0001	$535,221	NAVSEA
	N02-025	Mikel, Inc.	N66604-20-D-H001	$1,993,279	NAVSEA
	N02-039	Mikros Systems Corporation	N63394-16-D-0018	$2,556,748	NAVSEA
	A03-070	Monterey Technologies, Inc.	N00024-17-C-5244	$125,000	NAVAIR
	DLA171-002	ORBIS SIBRO, Inc.	47QFLA-20-D-0020	$2,916,404	NAVSEA
	N11A-T031, N06-148	Pacific Science & Engineering Group, Inc.	47QFLA-22-D-0002	$105,820	NAVSEA
	N96-273	Progeny Systems Corporation	N65236-22-C-8019	$1,050,000	NAVSEA
	N96-278	Progeny Systems Corporation	N00024-18-C-6265	$9,419,028	NAVSEA
	N96-278	Progeny Systems Corporation	N00024-18-C-6410	$43,438,874	NAVSEA
	N96-278	Progeny Systems Corporation	N00024-19-C-6108	$1,895,711	NAVSEA
	N96-278, N98-115	Progeny Systems Corporation	N00024-19-C-6115	$14,273,145	NAVSEA
	N98-122, N02-024	Progeny Systems Corporation	N00024-19-C-6118	$6,844,382	NAVSEA
	N151-036	Progeny Systems Corporation	N00024-19-C-6201	$16,164,766	NAVSEA
	N00-049	Progeny Systems Corporation	N00024-19-C-6267	$15,319,104	NAVSEA
	N96-278	Progeny Systems Corporation	N00024-20-C-5213	$7,667,780	NAVSEA
	N96-273	Progeny Systems Corporation	N65236-16-D-8013	$1,773,816	NAVSEA
	N99-100	Progeny Systems Corporation	N66604-21-D-H100	$6,689,930	NAVSEA
	N152-113	Scientific Solutions, Inc.	N00039-19-C-0062	$408,000	ONR
	N05-059	Sedna Digital Solutions, LLC	N00024-18-C-6264	$7,866,312	NAVSEA
	SOCOM96-002	Seemann Composites, LLC	N65540-15-D-0015	$556,165	NAVSEA
	N112-142	Seemann Composites, LLC	N00024-20-C-2410	$1,951,855	NAVSEA
	N112-142	Seemann Composites, LLC	N00024-22-C-2449	$5,001,883	NAVSEA
	SOCOM96-002	Seemann Composites, LLC	N00167-19-D-0002	$11,543,018	NAVSEA
	AF192-001	Silicon Mountain Technologies, Inc	FA4610-20-D-0016	$49,487	USAF
	Multiple	Simventions, Inc.	N00178-15-D-3001	$2,381,883	Multiple
	N03-016	Systems Engineering Associates Corporation	N66604-20-D-L000	$3,066,478	NAVAIR
	N02-082	Teledyne Instruments, Inc.	N00253-19-D-0005	$76,731	ONR
	N092-128	Test & Evaluation Solutions, LLC	N68335-21-G-0014	$1,811,000	NAVSEA
	N98-114	Ultra Electronics Ocean Systems Inc	N00024-19-C-6207	$650,000	NAVSEA
	N04-138	Ultra Electronics Ocean Systems Inc	N00024-20-D-6202	$6,494,546	ONR
	N121-076	Ultra Electronics Ocean Systems Inc	N63394-19-C-0007	$17,519,605	NAVSEA
	DHA17B-001	Valkyrie Enterprises, Inc.	47QFCA-20-C-0012	$8,879,227	DHA
NAVSEA Count			**80**		
NAVSEA Total				**$504,716,533**	

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
NAVSUP	N102-129	Mercury Mission Systems, LLC	N00383-22-C-H017	$5,114,156	NAVAIR
	N102-129	Mercury Mission Systems, LLC	N00383-22-C-H012	$1,930,394	NAVAIR
	N102-129	Mercury Mission Systems, LLC	N00383-22-C-H013	$2,990,610	NAVAIR
	N102-129	Mercury Mission Systems, LLC	N00383-22-C-H015	$3,192,575	NAVAIR
NAVSUP Count			**4**		
NAVSUP Total				**$13,227,734**	
NAVWAR	N112-170	Bascom Hunter Technologies, Inc.	N00039-19-C-0020	$153,397	NAVWAR
	N06-072	Basic Commerce & Industries Inc	N66001-20-D-3413	$786,425	ONR
	N132-139	Charles River Analytics, Inc.	N00039-22-D-1002	$687,000	NAVWAR
	N101-100	Epsilon C5I, Inc.	N68936-21-G-0003	$6,056,734	NAVWAR
	N05-039	Frontier Technology Inc.	N64267-20-D-0041	$6,662,645	NAVSEA
	N121-106	Fuse Integration, Inc.	N00039-20-D-0008	$2,939,000	NAVWAR
	N07-146	Imagine One Technology & Management Ltd	N65236-12-D-3885	$24,084	NAVWAR
	N05-163	Innovative Defense Technologies, LLC	N00039-21-C-1001	$1,375,045	NAVSEA
	N06-095	Nova Photonics, Inc.	N00039-22-C-0014	$757,000	NAVWAR
	N96-273, N121-103	Progeny Systems Corporation	N00039-16-D-0006	$6,832,524	NAVSEA, NAVWAR
	N093-196, N10A-T045	SOLUTE	N00039-19-D-0002	$1,300,000	NAVWAR
	N093-196	SOLUTE	N00039-21-D-1009	$4,598,833	NAVWAR
	N132-098	Spectranetix, Inc.	FA8750-17-D-0195	$1,778,409	NAVAIR
NAVWAR Count			**13**		
NAVWAR Total				**$33,951,096**	
ONR	N08-077	AeroVironment, Inc.	N68335-19-G-0059	$3,597,303	ONR
	N171-080	Applied Research In Acoustics LLC	N00014-20-C-2050	$96,917	ONR
	N171-080	Applied Research In Acoustics LLC	N00014-21-C-2006	$31,208	ONR
	N101-089, N00-107	Arete Associates	N00014-22-C-2007	$692,345	NAVAIR
	AF151-041	Blue Storm Associates Inc.	N00014-22-C-2015	$674,065	USAF
	N08-T030	Boston Engineering Corporation	N00014-19-C-2013	$279,060	ONR
	N192-129	Carley Technologies, Inc	N61340-22-C-0017	$1,348,634	ONR
	N192-129	Carley Technologies, Inc	N61340-22-P-0044	$119,380	ONR
	N193-A03-3	Cognitive Performance Group of Florida, LLC	N00014-21-C-2031	$893,401	ONR
	N05-157	Craft Engineering Associates, Inc.	N68335-22-C-0039	$1,800,000	NAVSEA
	N151-071	Daniel H. Wagner Associates, Incorporated	N00014-21-C-2014	$1,500,000	ONR
	N152-108	Design Interactive, Inc	N00014-21-C-2037	$100,000	ONR
	N132-130	Enomalies, LLC	N00014-21-C-2027	$200,000	ONR
	N07-139	H S Owen LLC	N00014-21-C-2042	$665,000	NAVWAR
	N07-139	H S Owen LLC	N00014-22-C-2003	$629,191	NAVWAR

Phase III Navy Contracts... Continued

PHASE III SYSCOM	TOPIC NUMBER	FIRM	PHASE III CONTRACT	AMOUNT	PHASE II AWARD SYSCOM
ONR	N102-182	Hydronalix, Inc.	N00164-22-C-JR93	$649,862	Multiple
	N05-163	Innovative Defense Technologies, LLC	N00014-19-C-1054	$154,300	ONR
	N121-082	Knexus Research Corp.	N00014-20-C-2007	$395,430	ONR
	N181-079	Knexus Research Corp.	N00014-21-C-2007	$1,715,355	ONR
	NASA Z1.05	Lasermotive, Inc.	N00014-22-C-2011	$2,325,000	NASA
	N141-072	MATSYS Incorporated	N00174-18-D-0015	$543,953	ONR
	N112-158, N181-040	Mercury Mission Systems, LLC	N00014-22-C-2001	$810,710	ONR, NAVSEA
	AF131-094	Northwest Research Associates, Inc.	FA9453-17-C-0078	$150,000	USAF
	AF171-124	Platform Systems, Inc.	N68335-22-G-0030	$5,366,365	ONR
	N08-077	Progeny Systems Corporation	N00014-20-C-2040	$2,944,798	ONR
	N192-124, N192-134	Qualtech Systems, Inc.	N00014-22-C-2020	$768,132	ONR
	N06-162	RE2, Inc.	N00014-21-C-2030	$2,831,207	ONR
	N10A-T045, N093-196	SOLUTE	47QFLA-21-D-0019	$1,975,409	NAVWAR
	N162-121	Trident Systems Incorporated	N00014-21-C-1081	$699,386	ONR
ONR Count			**30**		
ONR Total				**$35,440,506**	
SSP	N143-129	Advanced Scientific Concepts, LLC	N00030-21-C-1004	$5,467,004	SSP
SSP Count			**1**		
SSP Total				**$5,467,004**	
OTHER NAVY	AF193-DCSO1	Dcode Group, Inc., The	FA3020-21-A-0008	$490,500	USAF
OTHER NAVY	MDA12-017	MZA Associates Corporation	N00189-22-P-0695	$84,400	MDA
OTHER NAVY	AF211-CSO1	Prescient Edge Corporation	47QFCA-22-C-0016	$43,209,904	USAF
OTHER-NAVY COUNT			**3**		
OTHER-NAVY TOTAL				**$43,784,804**	
GRAND COUNT			**208**		
GRAND TOTAL				**$1,005,471,990**	

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