2023 Office of Naval Research Global PROSPECTUS

Office of Naval Research GLOBAL Science & Technology

Approved, DCN# 0543-1718-24

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Office of Naval Research Global staff from around the world gathered in Arlington, Virginia in November 2023 for their annual Global Technology Meeting. (U.S. Navy photo by Michael Walls)

FROM THE ONR GLOBAL COMMANDING OFFICER

Greetings! Thank you for taking a moment to read the Office of Naval Research Global (ONR GLOBAL) Prospectus for 2023. In years past, the Prospectus has focused on the accomplishments of ONR GLOBAL's International Science Program. This year, we decided to expand the Prospectus so that it captures the efforts of all seven of ONR GLOBAL's technical departments. To use a rowing metaphor in which an eight-person crew comes together to move a boat more synergistically, all seven of ONR GLOBAL's departments, plus our business operations team, come together to accomplish our mission to obtain, coordinate, and make available scientific information worldwide.

2023 was an exciting year for ONR GLOBAL. Much like any Fortune 500 company's year-end document, this Prospectus takes a look back at what we accomplished in 2023, but it also sets us up for what is sure to be another exciting year of accomplishments. Through our threefold command philosophy, we'll continue to focus on our Mission and Vision to be the partner of choice for science and technology leaders around the world!

This philosophy puts our **warfighters first** in everything we do — striving to improve the lives of our Sailors and Marines at every level in the Naval ecosystem. Our research and innovation not only enable the United States to be a world leader, it helps improve conditions for all people around the world. We are determined to push beyond the limitations of current technology for the sake of our warfighters and ultimately our Nation.

We seek **constant improvement** in everything that we do. No organization is perfect, but in seeking perfection we make ourselves better. One of the most significant ways in which we are seeking improvement is through the development of our Global Engagement Plan (GEP), which will help inform our assessment of everything we do now and what we are planning to do in the future. It will help prioritize our efforts to make the most informed decisions with our limited set of resources.

We are centered on our **ONR GLOBAL family**. Once someone becomes a part of ONR GLOBAL, they are ALWAYS part of ONR GLOBAL. We take care of each other and seek ways to develop ourselves both personally and professionally — coming into ONR GLOBAL from different backgrounds, seeing things from different perspectives, and eventually departing ONR GLOBAL to do great things for our Navy and Marine Corps, wherever that may be.

The Prospectus itself reflects how ONR GLOBAL continues to expand its reach across the international Science and Technology (S&T) community. In 2023, not only did ONR GLOBAL continue to be the connecting rod between the international research community and ONR through our International Science Program (ISP), it also continued to develop prototypes through TechSolutions; to strengthen relationships through the International Engagement Office (IEO); to be the gateway for US/UK innovation with London Tech Bridge (LTB); to develop faster science, technology, research and development opportunities through its Experimentation and Analysis (E&A) and Foreign Comparative Testing (FCT) programs; and be the proverbial "eyes and ears" of the Fleet and Force through our Science Advisor (SA) program. And of course, none of this would be possible without ONR GLOBAL's incredible mission support department!

This Prospectus highlights just a fraction of the work we do to foster existing relationships and build new connections within the international scientific community to support our Sailors and Marines. I hope that this Prospectus helps you learn about our team and that you enjoy reading it as much as I enjoy leading this amazing group of professionals.

Sincerely,

CAPT Andrew Berner
ONR GLOBAL
Commanding Officer

ONR GLOBAL BACKGROUND AND MISSION RELEVANCE

The ONR GLOBAL mission of being the partner of choice for science and technology leaders worldwide started over 80 years ago in London, its headquarters.

The U.S. Office of Naval Research Global (ONR GLOBAL) provides worldwide science and technology-based solutions for current and future naval challenges. Leveraging the expertise of more than 50 scientists, technologists and engineers, ONR GLOBAL maintains a physical presence on five continents. The command reaches out to the broad global technical community and the operational Fleet/Force commands to foster cooperation in areas of mutual interest and to bring the full range of possibilities to the Navy and Marine Corps.

When ONR was founded in 1946, the command assumed the responsibility of the wartime-era's Office of Scientific Research and Development liaison office in London, which had been operating since 1941. It aimed to identify promising research opportunities in Europe and the Middle East. By 1977, ONR's European and Tokyo offices had combined to form the international field office with a single, Department of Navy (DoN) international S&T strategy for fostering global collaboration. ONR GLOBAL has increased its presence and expanded its cooperative activities with offices in Singapore, Tokyo, Santiago, Prague, Sao Paulo, Melbourne and, most recently, with sponsorship of the London Tech Bridge, which opened in 2021.

These are a few instances of ONR GLOBAL in action. These engagements are examples of the international science and technology-based initiatives that ONR GLOBAL contributes to current and future naval challenges.

ONR GLOBAL PROVIDES WORLDWIDE SCIENCE- AND TECHNOLOGY-BASED SOLUTIONS FOR CURRENT AND FUTURE NAVAL CHALLENGES.

HISTORY OF

1946 — **ONR LONDON OFFICE** created to survey, assess, and report on European S&T

1974 — **ONR TOKYO OFFICE** opened to liaise and assess Asian S&T activities

1977 — **ONR LONDON /TOKYO LAISON GROUP** established

1997 — London and Tokyo combine to form the **ONR International Field Office (IFO)** to implement integrated DoN S&T strategy for fostering international collaboration

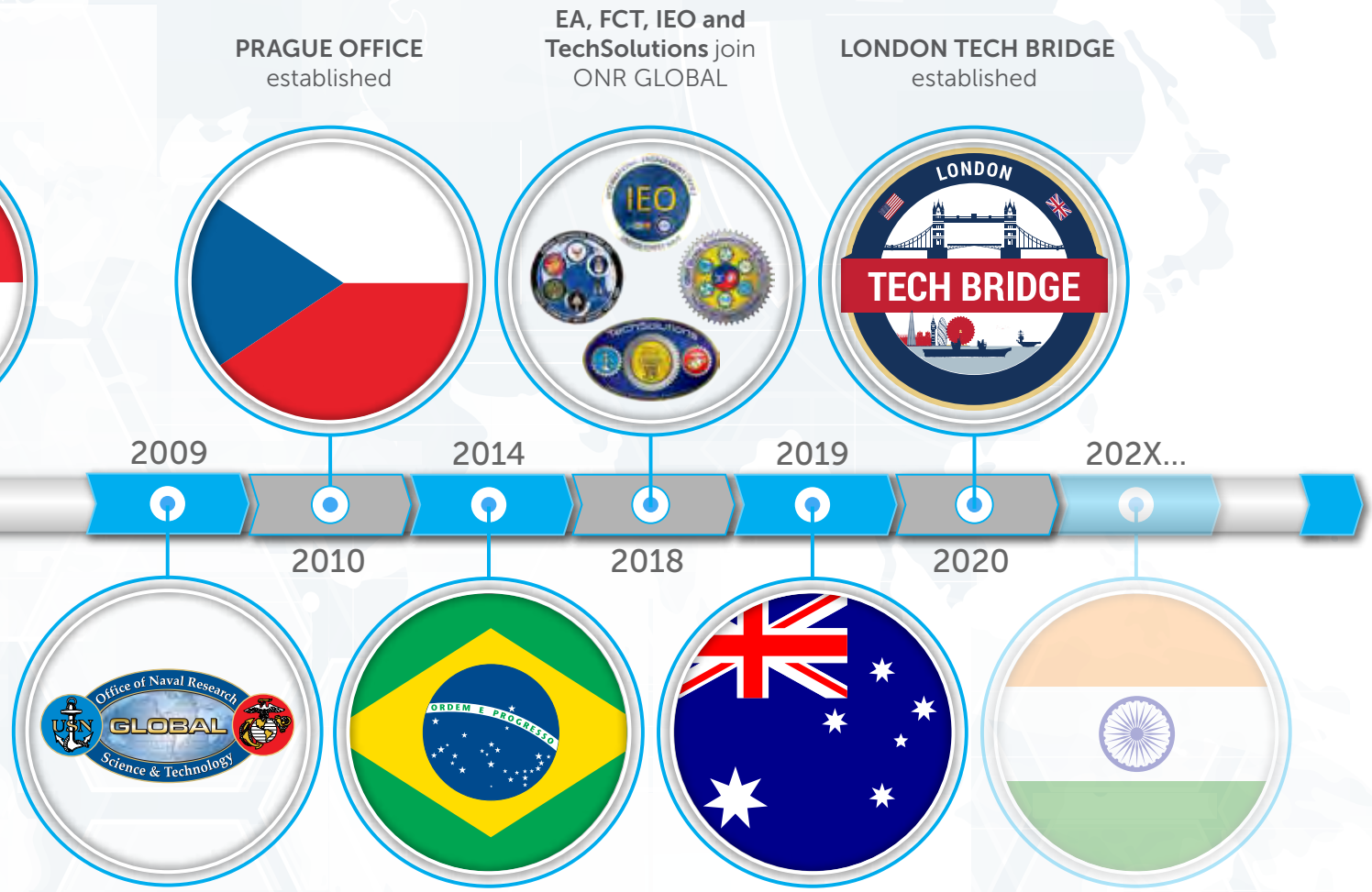
2000 — Tokyo office expands its presence with a **SINGAPORE** detachment

2002 — IFO opens **SANTIAGO OFFICE**

2003 — **OFFICE OF NAVAL RESEARCH GLOBAL** established through merger of Naval Fleet/Force Technology Innovation Office and IFO

2006 — **SINGAPORE OFFICE** established

ONR GLOBAL



DNS designates ONR GLOBAL an **ECHELON II COMMAND** reporting to CNR

PRAGUE OFFICE established

SÃO PAULO OFFICE established

EA, FCT, IEO and TechSolutions join ONR GLOBAL

MELBOURNE OFFICE established

LONDON TECH BRIDGE established

Opening soon **INDIA OFFICE**

OFFICE OF NAVAL R

ONR GLOBAL CO-LOCATED WITH OTHER DOD S&T COMPONENTS

London (USA/USAF) | Melbourne (USA/USAF) | Santiago (USA/USAF) | São Paulo (USA) | Singapore (USA) | Tokyo (USA/USAF)

RESEARCH GLOBAL

EXPERIMENTATION AND ANALYSIS

Sentinel Unmanned Air System (UAS) conducting flight tests at Camp Grafton, North Dakota in December 2023 as part of the Limited Objective Experiment (LOE) for TOEE 24.2 Frozen Flyer. (Photo courtesy of ONR GLOBAL)

The ONR GLOBAL Experimentation and Analysis (E&A) department serves to bridge the gap between the Naval Research Enterprise (NRE) and the operational fleet. E&A achieves this purpose by funding a core portfolio of individual proposals and linking S&T program officers to experimentation opportunities either via fleet or international exercises, or through customized Technology Operational Experimentation Events (TOEE). TOEEs provide an experimentation environment with realistic operational conditions focused on current naval concepts. They provide S&T initiatives of varying technology readiness levels an opportunity to get out of the lab environment and into the field, exposure to real environmental conditions and an employment by or with current warfighters. TOEEs are technology-centric but warfighter focused to enable experimentation, rapid learning and warfighter integration with technology in a safe-to-fail setting.

Through collaboration with the Chief of Naval Operations (OPNAV) and fleet stakeholders, E&A identifies critical opportunities for technology experimentation. E&A accelerates development of emerging technologies and concepts by enabling hands-on use by warfighters to gain valuable warfighter insight. E&A core projects are intended to be finite efforts (approximately one year in execution) to explore technology domains bound by the needs, requirements and capability gaps identified by the fleet.

The unmanned surface vessels (USVs) Ranger and Mariner from Unmanned Surface Vessel Division ONE (USVDIV-1) arrive, after a Trans-Atlantic trip, in Jervis Bay, Australia to participate in the Autonomous Warrior 2023 (AW23.2) annual exercise hosted by the Royal Australian Navy. (Photo courtesy of ONR GLOBAL)

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E&A projects are intended to do one or more of the following things:

- Explore concepts and technologies with fleet input to establish investment potential, inform NRE investment decisions and buy down transition risk. Early phase, pre-program concepts and technologies are ideal E&A candidates
- Leverage existing knowledge and technologies and apply them to emerging operational issues with the fleet to avoid new research for solvable problems
- Identify applicable warfighting capabilities and supporting S&T developmental products that bolster new Navy and Marine Corps warfighting concepts, as well as conduct concept-based experimentation

E&A facilitates six main functions to expand experimentation and analysis including:

1. Be the experimentation catalyst to guide ONR program officers through NRE E&A events
2. Identify and fund E&A proposals to support fleet and NRE needs and campaign efforts
3. Share reports and lessons learned with the greater Naval Research and Development Establishment (NR&DE) and the fleet to inform S&T development, concept of employment development and requirements
4. Establish campaigns to accelerate S&T development for fleet needs
5. Maintain a catalog of historic, ongoing and future E&A events and opportunities for the NRE
6. Develop resources and communication materials to achieve transparency of E&A activities and outputs to stakeholders

"TOEE 23.1 was a tremendous opportunity for II MEF to rapidly transition several force design concepts to functional planning and detailed execution. The TOEE team approached the exercise with the utmost professionalism and passion. Their willingness to listen and adapt to warfighter needs ensured the event was relevant to contemporary service challenges and additive to ongoing technology development. TOEE is the type of exercise that II MEF should continue to use to support the Commanding General's concept development initiatives."

Lt. Col. Ron Bess
Commanding Officer
1st Battalion, 10th Marine Regiment

Results and Achievements

In 2023, E&A sponsored 10 technologies to participate in fleet and international exercises, and conducted one TOEE series with 19 additional technologies. Each activity provided the fleet an opportunity to observe, operate and assess emerging technologies, and document feedback for the technology developers and the NRE.

Location and Fleet stakeholders and events for 2023 ONR GLOBAL E&A Sponsored Technology Experimentation.

Interesting Events/Programs/Projects

Maritime Reconnaissance and Counter-Reconnaissance Experimentation

E&A-led TOEE 23.1 Maritime Reconnaissance-Counter Reconnaissance (MRxR) throughout 2023 with the final event executed at Camp Lejeune, NC from 17 to 28 April, 2023. The experiment focused on advanced technologies to support the Commandant of the Marine Corps' Stand-in

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Force warfighting concept. MRxR will be utilized in a competitive environment against a near-peer adversary in order to extend the fleet's multi-domain awareness within contested littorals.

- The experiment utilized 19 technologies including:
  - Unmanned systems to include unmanned surface vessels (USV), unmanned aircraft systems (UAS), and unmanned undersea vehicles (UUV) with various levels of autonomy
  - Sensors (active radar, infrared, and electro-optical) with automated detection of surface, subsurface, and air tracks
  - Federation of information (detections, system geolocations, and logistics data) across the battlespace in support of a common operational picture (COP)
  - Anomaly detection and decision tools in support of expeditionary base operations
- Four units — 2D Light Armored Reconnaissance (LAR) Battalion (Bn) Mobile Reconnaissance Platoon (MRP), Combat Logistics Battalion (CLB) 26, 2D Assault Amphibian (AA) Battalion, Marine Logistics Group (MLG) Innovation Campus
- Seven ranges and waterways

Marines deploying Jaiabots for shallow water and surf zone characterization during TOEE 23.1 at Camp Lejeune, North Carolina. (Photo courtesy of ONR GLOBAL)

Collaborative Autonomy at REPMUS

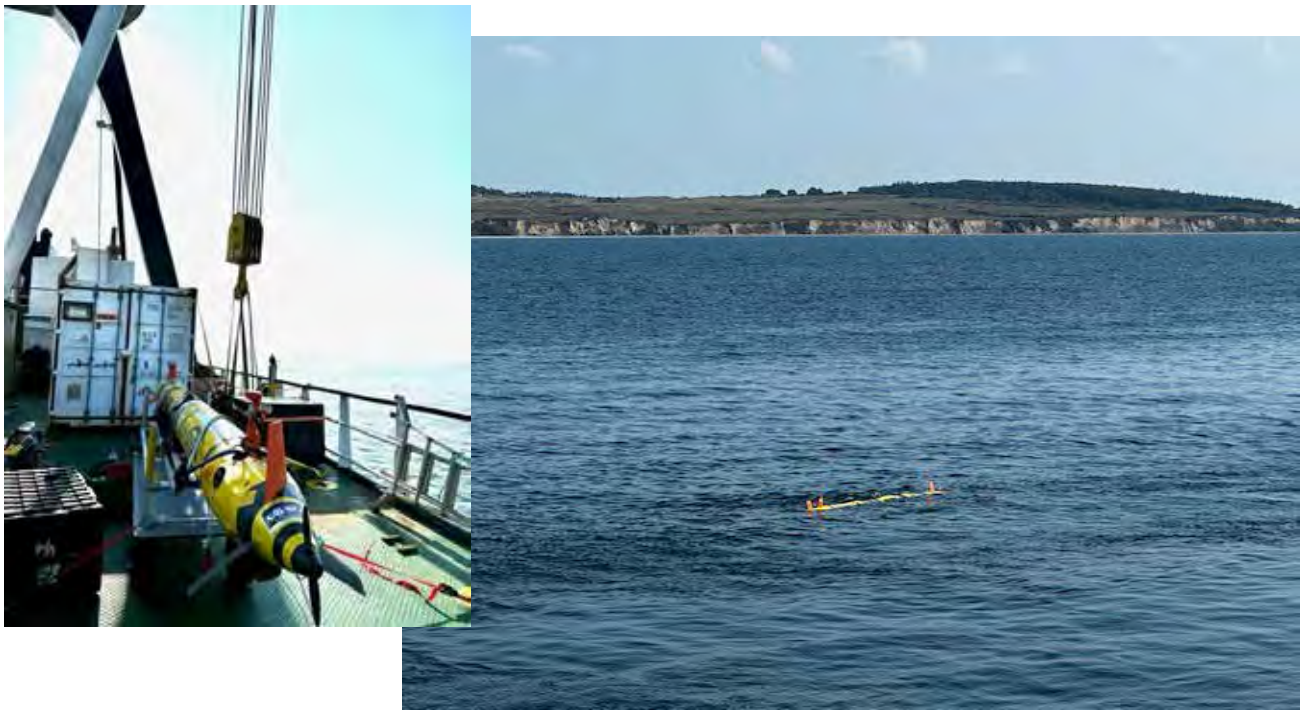
E&A sponsored a collaborative autonomy effort, executed by Naval Surface Warfare Center (NSWC) Panama City Division, during Robotic Experimentation and Prototyping using Maritime Uncrewed Systems (REPMUS) 23 with NATO partners off the coast of Portugal in September 2023. The REPMUS event focused on enabling interoperability between heterogeneous, international assets through the negotiation and implementation of a shared communication protocol for tasking and situational awareness.

Under the auspices of NATO Research Task Group (RTG) SCI-343 and in coordination with the Technical Cooperation Program (TTCP) Technical Panel 13 (TP-13), researchers from the United States have worked with partners from over a dozen nations to negotiate the Collaborative Autonomy Tasking Layer (CATL). The approach defines a common world model and series of data models that allow planners and vehicles from multiple nations to share tasking and provide

status information regardless of platform or autonomy software. To enable test and evaluation for development, the task group has created protocols for network communication and the Dynamic Compact Control Language (DCCL) for transmission underwater over acoustic links and verifying the use of the protocol.

The CATL protocol is being adopted as part of the STANAG 4817 (a NATO standardization document), which will sustain its development and maturation in the long term.

3D Maint. Bn Marines scanned the T-12 propeller (right) and successfully printed / fabricated the same propeller(s) during AW23.2 in Jervis Bay, Australia. (Photos courtesy of ONR GLOBAL)



ONR Code 32 research UUV aboard the Danish cargo ship Vina and underway during an unmanned undersea vehicle (UUV) demonstration as part of exercise Baltic Operations 2023 (BALTOPS 23). BALTOPS 23 is the premier maritime-focused exercise in the Baltic Region. The exercise, led by U.S. Naval Forces Europe-Africa, and executed by Naval Striking and Support Forces NATO, provides a unique training opportunity to strengthen combined response capabilities critical to preserving freedom of navigation and security in the Baltic Sea. (Photos courtesy of ONR GLOBAL)

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Under ONR Code 32 lead, the Schiebel S-100 autonomous camcopter carried a Light Detection and Ranging (LIDAR) sensor developed by Areté and Fugro during REPMUS 23 to demonstrate the feasibility of remote near-shore hydrographic data collection.. (Photos courtesy of ONR GLOBAL)

Sentinel Unmanned Air System (UAS) conducting flight tests at Camp Grafton, North Dakota in December 2023 as part of the Limited Objective Experiment (LOE) for TOEE 24.2 Frozen Flyer. (Photos courtesy of ONR GLOBAL)

Vision and Plans for Next CY

Frozen Flyer Group 2-3 UAS Experimentation

E&A sponsored the TOEE in 2023, which continues through 2024. The Arctic region is a strategic national security concern. Operations in any of Earth's Polar and Cold Regions (the Arctic and Antarctic as well as sub-arctic and seasonally frozen locations) can be especially challenging for personnel because of harsh and rapidly changing weather, austere infrastructure and a general lack of operational experience. Unmanned systems could potentially perform humanitarian, law enforcement and military operations in areas or conditions that might be extremely dangerous to humans. The Frozen Flyer Experiment with unmanned aircraft system (UAS) technologies is

expected to verify their performance in the extreme arctic conditions to make operations safer for our forces.

A Limited Objective Experiment (LOE), held at Camp Grafton, North Dakota, 18 – 22 December 2023, was used to evaluate and the initial selected systems from the limited technology assessment to verify they have the specific capability or can be upgraded to the needed capability. Those that passed the LOE were invited to the Advanced Capability Experiment (ACE) to be evaluated in a more challenging environment against one or more of the three operational objectives. The operational objectives are Maritime Domain Awareness, Over the Horizon Logistics, and Environmental Characterization ISO Future Operations. The ACE was held at Pituffik Space Base, Greenland on 19 February – 1 March 2024.

Three TOEEs are planned for 2024. Their mission or operational objectives are shown below:

INTERNATIONAL SCIENCE PROGRAM

Science directors serve as the international arm of ONR and the NRE. They help shape the U.S. Navy and Marine Corps' international engagement strategy and establish insight into the research agendas of ONR, the Naval Research Laboratory (NRL) and other NRE organizations.

The ONR GLOBAL mission is to become the partner of choice for science and technology leaders worldwide, and in doing so, to support the overall ONR mission of discovering, developing and delivering new technology and capability to the U.S. Navy and Marine Corps.

In support of that mission, the ONR GLOBAL International Science Program (ISP) employs technically skilled scientists and engineers to enhance international S&T engagements of the U.S. Navy and Marine Corps, and to increase its awareness of global technology. The international science team leverages several "tools" available to them including: international networking through conference attendance and in-person liaison visits; collaborations, especially within the NRE; technology-focused conferences and workshops; and procuring fundamental research grants and travel awards for international partners.

The ISP has more than 20 scientists spread across five continents to build and foster connections and partnerships, and to locate the truly outstanding and unique scientific discoveries taking place across the globe.

ISP Tools

The ISP leverages several collaboration mechanisms to empower the ONR GLOBAL mission. Specifically, the ISP sponsors visiting scientists, conferences and workshops, seed funding and research grants that will develop successful partnerships and fill in the technology gaps and needs of the U.S. Navy and Marine Corps.

(Right to left) Science Directos Dr. Marcus Tepaske and Dr. Steve Turner discuss research with Dr. Mandar Chitre of the National Univesity of Singapore while next to the ROMANIS underwater acoustic camera. (Photo courtesy ONR GLOBAL)

- **Liaison Visits** allow science directors to attend international events and visit international institutions to develop, access and discover emerging technologies.
- **The Visiting Scientists Program** facilitates short-term travel opportunities for foreign/international scientists to the United States to explore new S&T ideas or findings with the NRE.
- **The Collaborative Science Program** sponsors foreign/international workshops, conferences and seminars of naval interest.
- **Research Grants** support international scientists addressing naval S&T challenges. These grants galvanize the insertion of innovative, international S&T into core ONR and NRE portfolios.

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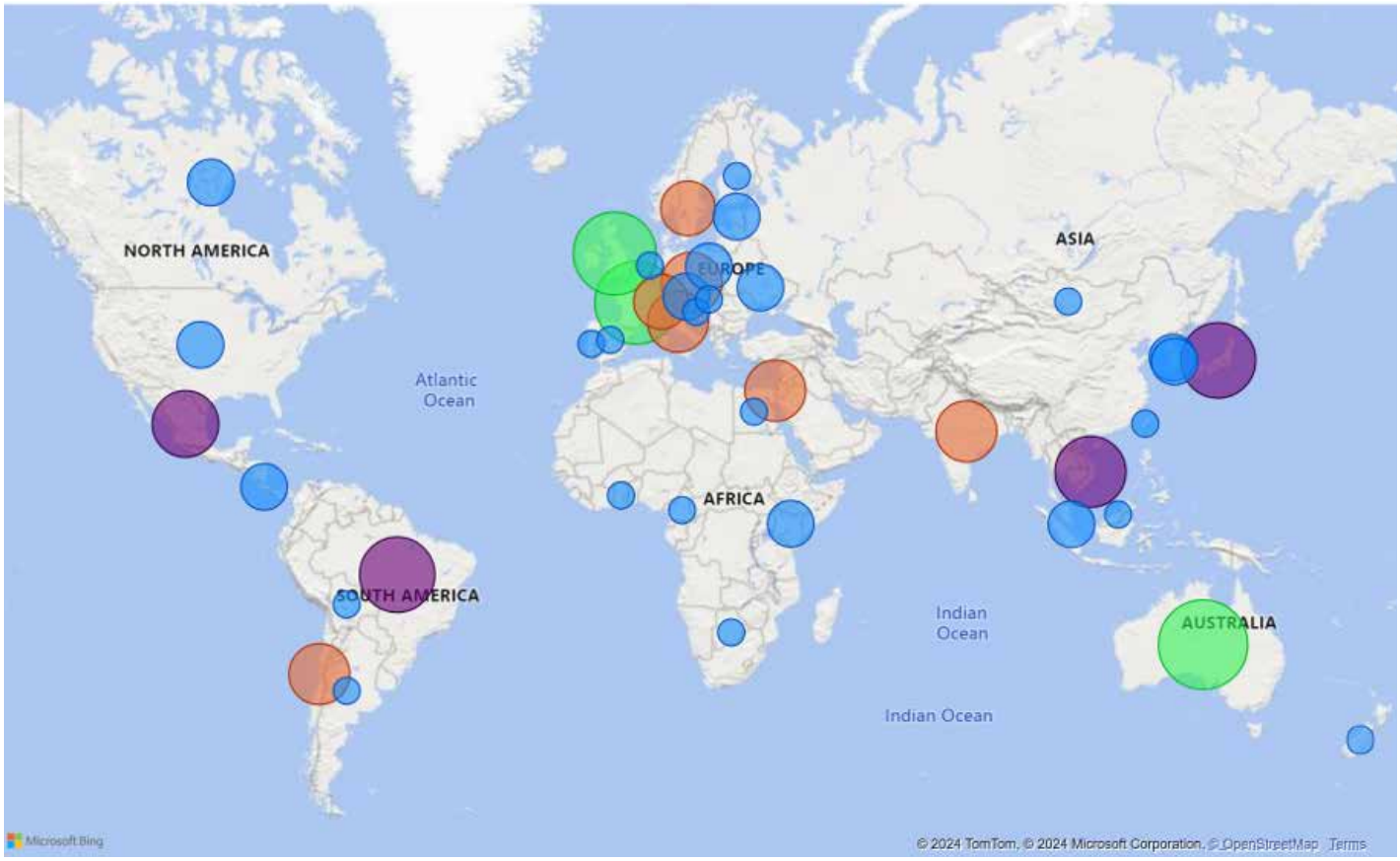
Results and Achievements

In the calendar year 2023 (CY 2023), the ISP sponsored 141 individual research projects covering various naval-relevant focus areas, to include 75 research grants, 50 collaborative science initiatives, and 16 visiting scientist programs. Altogether, the ISP engaged 112 institutions across 47 countries worldwide.

The greatest number of scientific engagements were conducted in Australia (13), United Kingdom (9), France (9), Brazil (7), and Japan (7). The future aim is to continue strong partnerships in the Indo-Pacific, European and South and Central American regions, while expanding cooperation in Africa and Middle East, with a concerted effort to establish closer ties in India.

Number of Projects by Country



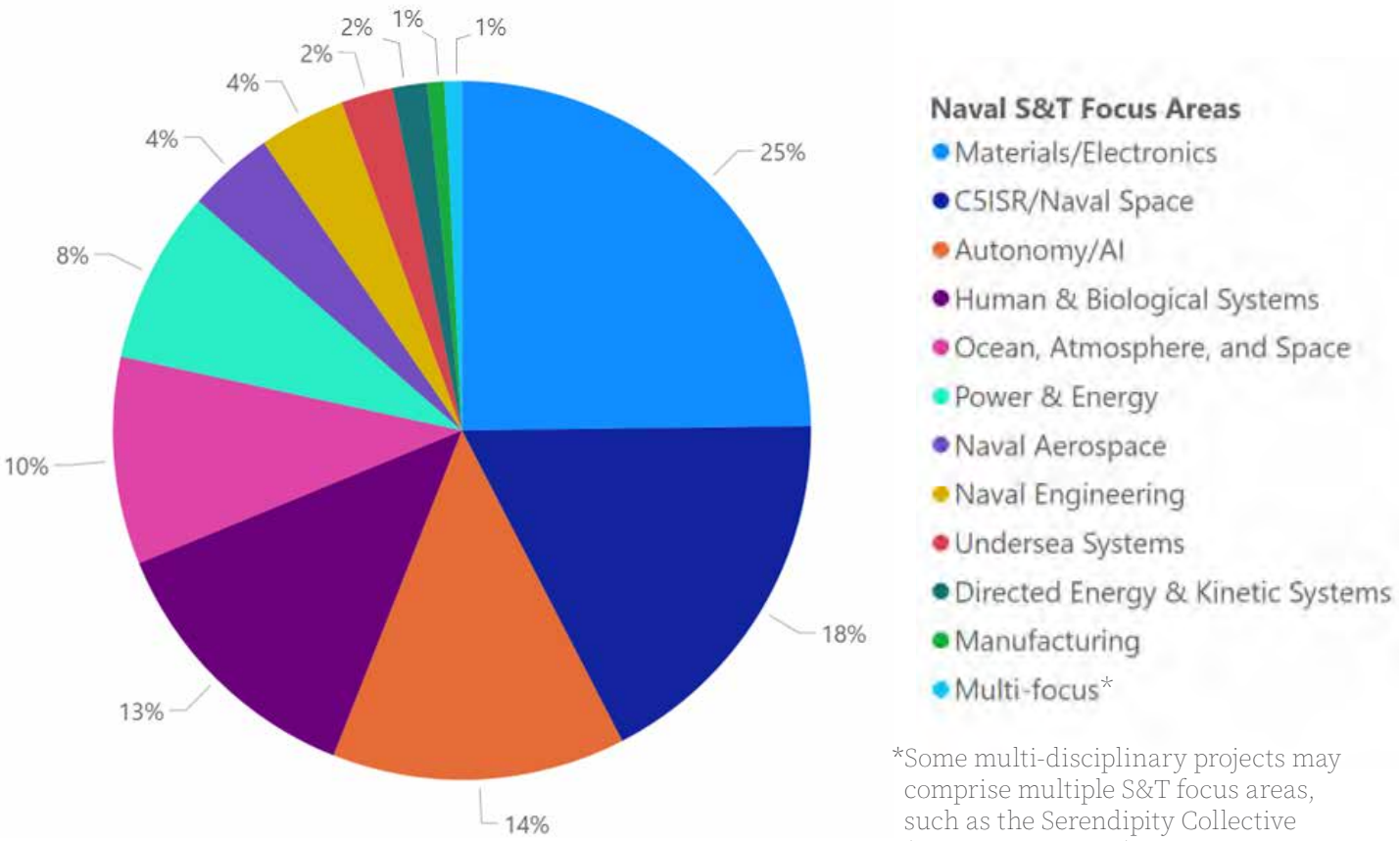
The map of scientific engagements (projects) by country categorized by color: Blue (1-2), Orange (3-4), Purple (5-8), Green (9-13).

Naval S&T Focus Areas

The ISP categorizes efforts on the grounds of two major classifications: 1) Naval S&T Focus Areas established by DoN, and 2) Critical Technology Areas defined by Department of Defense (DoD) to create and advance foundational scientific knowledge and support the invention of the technology needed by the Navy and Marine Corps.

As part of the U.S. Naval S&T Strategy, the Office of Naval Research identified 11 focus areas unique to the requirements of the Navy and Marine Corps.

Number of Projects by Naval S&T Focus Areas



*Some multi-disciplinary projects may comprise multiple S&T focus areas, such as the Serendipity Collective (read more on p. 23).

During 2023, ISP concentrated their efforts for research engagements in four of those areas. These and their representative subcategories are listed below:

1. **Materials/Electronics:** advanced materials, 2D/3D materials, bio-inspired materials, functional materials, kinetic materials, nitride semiconductors
2. **Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance (C5ISR)/Naval Space:** quantum cascade lasers for satellite communications, synalgebraic quantum simulator, neuromorphic photonic machines, machine-optimized cryptographic protocols, neuromorphic computing, 5G/Future G, signal processing
3. **Autonomy/AI:** machine learning, quantum, distributed robotics, intelligent unmanned systems, neuromorphic intelligence, collision avoidance, swarm intelligence, symbolic reasoning
4. **Human and Biological Systems:** synthetic biology, biomimetic systems, biofilms, human machine teaming, biogenic macromolecules, macroalgal microbiomes, metabolic engineering

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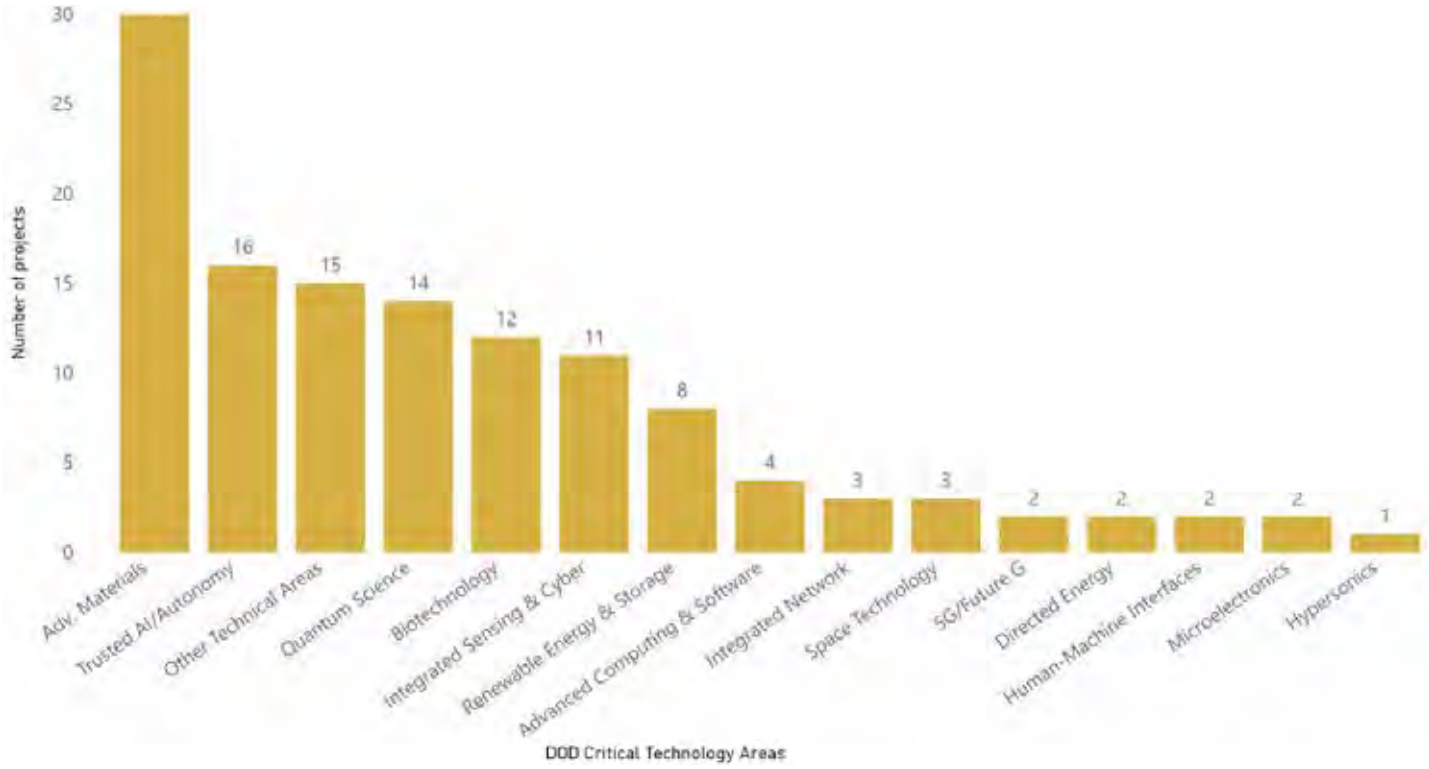
In addition to forging strong collaborations that support the four highlighted focus areas, ONR GLOBAL made significant strides in exploring the remaining seven focus areas in order to meet the current and future needs of the warfighter.

DoD Critical Technology Areas

The year 2023 was significant for the development of fundamental research projects in five of the 14 critical technology areas (CTAs) outlined in the DoD 2023 National Defense Science and Technology Strategy: advanced materials, trusted AI and autonomy, quantum science, biotechnology and integrated sensing and cyber. All of these technology realms are essential across the DoD and closely align with Navy focus areas, thereby supporting growth in scientific knowledge across a wide breadth of technological disciplines. Moreover, ONR GLOBAL is tasked with actively pursuing new partnerships in emerging disciplines (e.g., hypersonics) linked to future Navy needs. Both CTAs and novel areas are reflected in the following graph.

Number of ISP Projects by Critical Technology Areas



Prof. Winfried Hensinger, Professor of Quantum Technologies, Department of Physics and Astronomy, University of Sussex, U.K.:

"...DoD funding has been instrumental in the success of my work. It's an absolute pleasure to work with program mangers who understand the science and have an interest in the work succeeding. Because program managers understand the science, there is flexibility with the funding and how it can be spent provided it advances the overall project...Moreso for ONR GLOBAL."

Interesting Events/Programs/Projects

Serendipity Collective: Tell Us Your Craziest Ideas

Dr. Scott Walper and his predecessor for Synthetic Biology at ONR GLOBAL, Dr. Patrick Rose, who is now with SPRIND (Germany's Federal Agency for Disruptive Innovation) pulled together an innovative workshop in early 2023 to ask teams to pitch their "craziest ideas."

To attract innovators, the team worked with the company IdeatePlus, which was instrumental in helping develop and manage the event including setting up a web-based platform to crowdsource and push out a social media campaign.

The website generated 73 concepts from more than 225 active participants. The information was collected and shared with a team of experts in the fields of science and technology, arts and humanities. The experts scored proposals based on originality and feasibility. Eight teams were then invited to the "Serendipity Collective" held in Berlin in May.

From those core concepts, another panel of experts, composed of representatives from ONR GLOBAL, DEVCOM, the VW (Volkswagen) Foundation and SPRIND, chose three finalists with an award of $50,000 each to kick-start their efforts.

One award went to a team developing a novel ability to monitor brain waves, the second winning team is exploring new ways to evolve cognitive machines and third team is looking at biological signals from plants.

The Venue

(Serendipity Collective photos courtesy of IdeatePlus and ONR GLOBAL)

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Advancing Marine Science Research in Ghana: Coastal and Continental Shelf Processes

ONR Global Science Advisor, Dr. Elena McCarthy, traveled with ONR Ocean Battlespace Sensing Department Program Officer, Dr. Emily Shroyer, to Ghana to attend a kick-off meeting for a new ONR Global/U.S. Army Combat Capabilities Development Command (DEVCOM)-funded grant at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi. Dr. Cyril Boateng's project, "Protecting the Coast and Heritage of Keta Using Integrated Geophysical Methods" will develop coastal management and protection efforts using a multidisciplinary approach based on satellite imagery, geophysical surveys and the development of low-cost instrumentation.

Dr. Boateng's kickoff meeting at KNUST in Kumasi, Ghana (Photo courtesy of ONR GLOBAL)

Since the kick-off meeting, ONR Global has remained involved by linking Ghanian coastal research efforts at KUNST with those at the University of Ghana and the University of Cape Coast. Dr. McCarthy recently introduced Dr. Boateng to engineers at the Woods Hole Oceanographic Institute (WHOI) who will help train Ghanaian students how to develop low-cost ocean sensors, and will support a workshop on the development of low-cost environmental instrumentation being held in Africa next year.

On a side trip to Cape Coast to attend the 3rd Annual Workshop of the U.S.-West Africa Coastal Resilience Research Consortium, Dr. McCarthy gave a talk on ONR Global funding opportunities. The organization was started by several professors at U.S. universities who recognized the importance of collaboration between the African diaspora.


Attendees at the US-West Africa Coastal Resilience Research Consortium in Cape Coast, Ghana. (Photo courtesy of ONR GLOBAL)

Her final event was the West Africa Marine Science Symposium (WAMSS) in Accra. The conference was attended by over 100 scientists and policy makers from Cameroon, Benin, Nigeria, South Africa, Ghana, the U.S., and Germany. The conference focused on effective marine research and conservation models and, importantly, how to strategically link funders with potential grant applicants. To this end, Dr. McCarthy gave a presentation about ONR Global on the first day of conference, which focused exclusively on funding opportunities for African scientists.

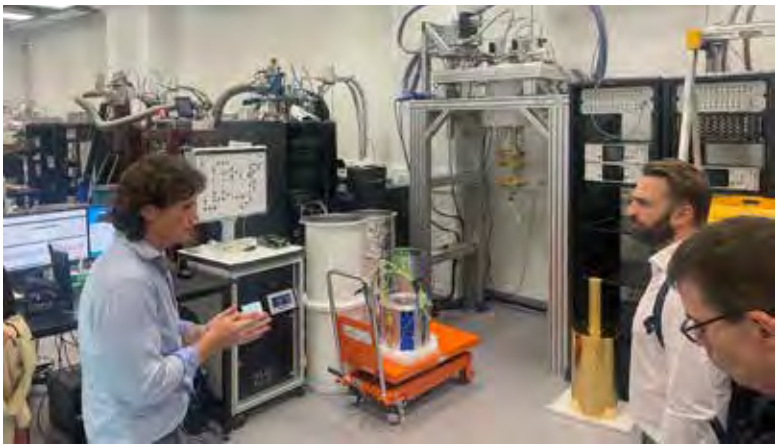
During her visits, Dr. McCarthy met dozens of scientists who wanted to work with ONR Global or who had been supported in some way by ONR Global in the past. In a wonderful example of

the long-term value of U.S. investment in research in other countries, one of the attendees at the conference, Dr. George Waife, of the University of Ghana's Marine and Fisheries Department, emphasized that ONR and ONR Global were "very instrumental in what we have become in the region." He presented a copy of his seminal book on coastal research in Ghana which was funded by ONR Global from 2008-2012.

Qubits: Building Blocks of Quantum Computers

Dr. Clint Novotny and Cmdr. Joel Feldmeier visited the University of Sydney's Nanoscience Hub to discuss the ongoing research at the university's quantum laboratory — a partnership between Microsoft and the University of Sydney.

The university has a strong history of quality quantum science research, specifically in the areas of controls, characterization and architecture. Recently, the University of Sydney Quantum Team (in collaboration with Microsoft) invented a single chip that can generate control signals for thousands of qubits (the building blocks of quantum computers).

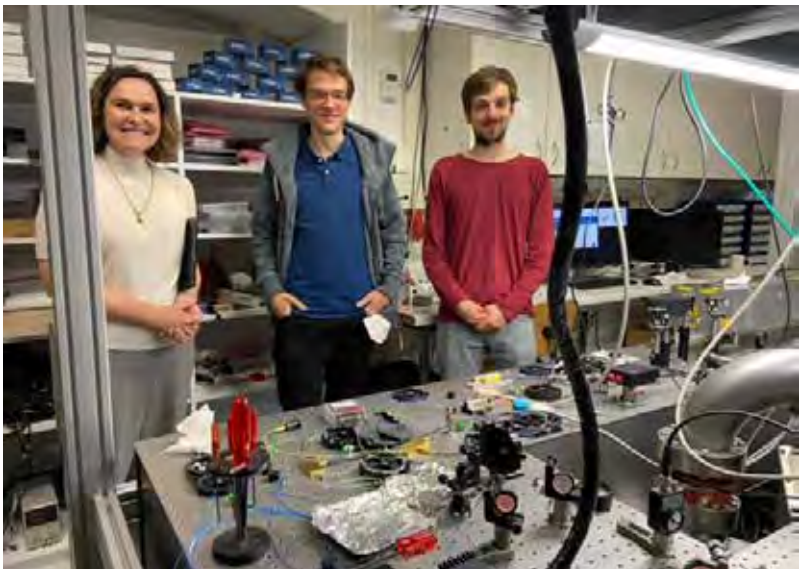


Professor Davis Reilly (left) discusses the ongoing research at the University of Sydney's Nanoscience Hub quantum laboratory with Science Directors Dr. Clint Novotny (center) and Cmdr. Joel Feldmeier (right). (Photo courtesy of ONR GLOBAL)

Quantum Interferometry of Mesoscopic Building Blocks Of Life

Dr. Martina Barnas, science director, met with University of Vienna Prof. Markus Arndt, who leads the Quantum Nanophysics group. Under a research grant received from ONR GLOBAL, Arndt and his team are exploring the first step towards quantum interferometry of the mesoscopic building blocks of life.

The research is exploring the foundations and applications of matter-wave interference with mesoscopic objects, such as tailored molecules, clusters and biomolecules and mesoscopic nanoparticles, to understand the interface between quantum science and classical observations. It will also aid in the development of new tools for quantum-assisted sensing on biologically relevant nanomaterials.



Dr. Martina Barnas (left), science director, poses at the University of Vienna with two students who are working on a research project sponsored by ONR GLOBAL with the Quantum Nanophysics group at the university. (Photo courtesy of ONR GLOBAL)

SCIENCE ADVISORS

A Live Fire Demonstration onboard USS Savannah (LCS-28) during the Vanishing Act series of demonstrations in October of 2023. (Photo courtesy of ONR GLOBAL)

The Science Advisor Team at the University of Rhode Island, Narragansett Bay Campus in Kingston, Rhode Island. (Photo courtesy of ONR GLOBAL)

Office of Naval Research (ONR) Global science advisors (SAs) are U.S. government civilian scientists, engineers and technologists selected for three-year career development tours. SA positions are competed nationally. SAs report to Navy and Marine Corps operational commands worldwide, covering a broad range of naval warfare S&T disciplines.

SAs serve as the Fleet/Force operational commands' senior S&T liaisons who discover and develop technology solutions that address high-priority capability requirements. They accomplish this by partnering with government, academia and industry. While embedded within Fleet/Force commands, SAs prioritize S&T requirements, provide capability solutions, lead experimentation events and connect warfighters to technologically advanced capabilities. Overall, SAs help shape S&T investments in support of high-priority Fleet/Force needs.

Brian Visser, One Marine Expeditionary Force (I MEF) science advisor, discusses multiple ONR systems under test with Commander, Naval Surface Force (CNSF) Science Advisor Rebecca Boxerman at Technical Concept Experiment 23.1 on Red Beach at Camp Pendleton Marine Corps Base. (U.S. Navy photo by Michael Walls)

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Results and Achievements

ONR GLOBAL science advisors significantly advanced the U.S. Navy's science and technology capabilities in all areas of warfighting but especially in surface, undersea, information and unmanned domains. Among other partnerships, the SA program collaborated with the NRL and ONR's Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting department (C5ISRT). The SA program also successfully solidified a multilateral partnership that resulted in the first ever SA position within the Fleet Information Warfare Command-Pacific (FIWCPAC). This increases the total number of ONR GLOBAL SAs to 23.

The annual industry tour is a vital two-way bridge between ONR GLOBAL Fleet/Force SAs and the national S&T community from commercial, government and academic enterprises. These tours represent the SA program's continuing effort to remain abreast of emerging sciences and state-of-the-art technologies throughout the community. The advancements being made have the potential for future Fleet/Force applications by solving high-priority challenges.

In 2023, the SA team visited 17 organizations across three different New England states tripling the number of 2022 tours. Organizations visited include: ThayerMahan, U.S. Coast Guard Research and Development (R&D) Center, Raytheon Technologies Research Center, LM Sikorski Helicopters, University of Rhode Island, Quonset Point, Anduril Dive, Draper Lab, Boston Engineering, Massachusetts Institute of Technology Lincoln Laboratory and others.

March 2023. Attendees of International Maritime Exercise 2023 listen to a technology presentation aboard the RFA Cardigan Bay docked in Bahrain. They included Rear Adm. Sean Bailey (second from left), then the deputy commander, U.S. Naval Forces Central Command and Fifth Fleet, and ONR GLOBAL Science Advisor Capt. Matthew Harper (first row, second from right, wearing suit). (U.S. Navy photo by Michael Walls)

The ONR-sponsored Ocean Aero TRITON aboard the RFA Cardigan Bay during International Maritime Exercise (IMX) 2023 in Bahrain. TRITON is an autonomous underwater and surface vehicle that can sail and submerge autonomously to collect data both above and below the ocean's surface. (U.S. Navy photo by Michael Walls)

Vice Adm. Brad Cooper, Commander, U.S. Naval Forces Central Command(NAVCENT) and U.S. Fifth Fleet (FIFTHFLT), presented **Mr. Muhammad Patel, science advisor** to NAVCENT FIFTHFLT, with a Civilian Service Commendation Medal on 10 July 2023 stating:

"Mr. Patel provided exceptional support to TF-59 (unmanned and artificial intelligence task force) by performing emerging technology scans for digital ocean seabed, space prototype concept development, mesh network node stress testing at REPMUS 22 and service on Digital Horizon 22 vendor evaluation committee. He also contributed directly to the sustainment of TF-52 (Mine Countermeasures Task Force) by securing over $1 million in dual modality unmanned teaming experimentation funds from ONR for International Maritimes Exercise 23."

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Interesting Events/Programs/Projects

International Maritime Exercise 2023

U.S. Naval Forces Central Command (NAVCENT) led a multinational exercise, 26 February-17 March 2023, across U.S. Central Command's (CENTOM) international waters. IMX23 was developed to exhibit global resolve to preserve the rules-based international order and offer a unique chance to cooperate with maritime partners in the region.

Ships sail in formation, March 15, 2023, in the Gulf of Oman during International Maritime Exercise 2023. IMX/CE 2023 is the largest multinational training event in the Middle East, involving 7,000 personnel from more than 50 nations and international organizations committed to preserving the rules-based international order and strengthening regional maritime security cooperation. (U.S. Navy photo by Mass Communication Specialist 2nd Class Elliot Schaudt)

A total of 50 maritime partner nations and international organizations operated in the Arabian Gulf, Arabian Sea, Gulf of Oman and Red Sea. The exercise included 7000 personnel, 35 ships and more than 30 unmanned and artificial intelligence systems. The five primary areas of focus were: combined command and control, maritime security, mine countermeasures, unmanned systems and artificial intelligence integration and global health.

March 2023. ONR GLOBAL Science Advisors Muhammad Patel and Lakeisha Williams at International Maritime Exercise (IMX) 2023 in Bahrain. (U.S. Navy photo by Michael Walls)

U.S. Fourth Fleet Hybrid Fleet Campaign 2023: Revolutionizing Naval Operations
The Hybrid Fleet Campaign, October 2023 with U.S. Naval Forces Southern Command/4th Fleet (USNAVSOUTH/FOURTHFLT) in Key West Florida, marked a significant leap forward in naval warfare and strategy.

The mission centered on utilizing unmanned systems in a permissive environment to develop tactics, techniques and procedures against U.S. competitors. Its primary goal was to drive innovation and experimentation that would refine unmanned systems' command and control infrastructure, and help shape the vision of a hybrid fleet by the 2030s for the Chief of Naval Operations.

An Aerosonde unmanned aircraft system launches from the flight deck of Spearhead-class expeditionary fast transport ship USNS Burlington (T-EPF 10) during FOURTHFLT Campaign Event in the Atlantic Ocean October 9, 2023. (U.S. Navy photo by Chief Mass Communication Specialist John R. Fischer/Released)

These experimentation events stood out as the largest technology-focused gathering in its field, boasting 305 participants, including 25 high-ranking officers and Senior Executive Service members, 10 foreign partners, 18 industry partners and representatives from 47 DoD commands.

Key operational objectives included the assessment of unmanned systems in advanced kill chains, contested littoral operations, survivability and sustainment at sea.

On 19 October 2023, Adm. Lisa Franchetti, Chief of Naval Operations, wrote a personal note to D**r. Chris Heagney, science advisor** to FOURTHFLT, commenting on Hybrid Fleet Campaign experimentation events:

"...The amount of effort and detailed coordination you and your team provided helped highlight the capabilities that unmanned systems can bring into the fight. I always say people are our "secret weapon." The ingenuity of the exhibits that were on display are a testament to that spirit...Eye-watering work — great to see it in person!"

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II Marine Expeditionary Force (MEF) Tactical Services Oriented Architecture (TSOA)
TSOA, a USMC program of record, is a collection of software that provides a common, open architecture for command and control applications.

There are two main components of TSOA, the server oriented infrastructure (SOI) and the SIGMA. The SOI is essentially an aggregator for many different types of data. The SIGMA is a translator — meaning it can take aggregated data and translate to other system's protocols. For instance, the SIGMA could take Topographic Analysis Kit (TAK) aggregated data from the SOI and translate it to GCCS-J (OTH gold protocol). The architecture is meant to be replicated at different echelons and adjacent commands so that the data can be shared.

The TSOA configuration at II MEF allows for the aggregation and fusion of multiple data sources from program of record and non-program of record sources at both non-secure and secure levels. This facilitates the information sharing of experimental sensors and other data sources from the II MEF watch floor to the tactical edge and back. During Large Scale Exercise 23 (LSE 23), the II MEF watch floor was able to simultaneously visualize unit locations participating in LSE 23, units supporting the USNORTHCOM southwest border surge, and the deployed 26th Marine Expeditionary Unit (MEU), despite those units using different common operational picture feeds and classification levels.

The capabilities of that architecture have proven very beneficial to II MEF C2 systems interoperability and creation of a true common operational picture and will remain a critical enabler to more capable coalition exercises in the future.

TSOA used in the field. (U.S. Marine Corps Photo by Lance Cpl. David Staten)

Vanishing Act Demonstrations

The SA program worked with Naval Special Warfare (NSW), Johns Hopkins University Applied Physics Laboratory (JHU APL) and other ONR program offices to deploy the latest technologies during the event. Vanishing Act resulted in a certified system and process for rapid experimentation onboard Independence Class Littoral Combat Ship (LCS2V) that is being considered as a future program of record.

Vanishing Act was a series of demonstrations that involved live fires out of a containerized Mk41 VLS launcher from the back of an LCS2V. The Vanishing Act events were both joint, with personnel and equipment from the Army Mid-Range Capability Office.

This series of events increased lethality and survivability for the LCS2V ship class and is being assessed as a Surface Warfare Mission Package addition by multiple program offices. Commander, Naval Surface Forces Pacific (COMNAVSURFPAC) and the Strategic Capabilities Office (SCO) sponsored the series.

As a follow-on to Vanishing Act, multiple targeting solutions were assessed as part of Vanishing Act Reloaded.

RIMPAC22 live fire demonstration onboard the USS Tulsa in 2022. This was part of the Vanishing Act series of demonstrations. (Photo courtesy of ONR GLOBAL)

TECHSOLUTIONS

A demonstration of the Flashing Light to Text Converter (FLTC) at Sea Air Space (SAS) 2023 in Washington. The TechSolutions-sponsored software uses a ship's existing signal lamp to send Morse code by translating it from text via a laptop or tablet. The software on the receiving end then translates the Morse code back into text that can be easily read by the receiver. (Photo by U.S. Navy Photographer Michael Walls)

TechSolutions addresses challenges identified by Sailors and Marines by rapidly developing science and technology-driven prototype solutions by linking warfighters to the science and technology community. The goal is to have a prototype in the hands of the requesting Sailor or Marine within 12 months — emphasizing warfighter focus and agile development with the NR&DE.

TechSolutions accepts requests from anyone in the Fleet/Force, regardless of rank, rate or military occupation specialty (MOS). Once a technology request or new idea is received, the team works closely with the submitter and subject-matter experts to ensure that the problem is clear and the required solution capabilities are well-defined. TechSolutions then turns to the NR&DE network of labs, warfare centers and affiliated university research centers for proposed solutions. The submitter can be involved throughout the process - from the beginning designs to the program reviews. If available, the submitter guides the development team and participates in the prototype demonstration and assessment.

Once a prototype is developed, TechSolutions works with transition sponsors, and the submitter and their command to identify paths for adoption and support - possibly through an existing program of record, Government Services Administration (GSA) catalogue or Navy Type Command (TYCOM) supply.

TechSolutions responds to needs and requirements from the Fleet/Force

- TechSolutions wants to hear from Sailors on the deck plate and Marines at ground level about their operational challenges
- NR&DE members are selected to quickly develop solutions, potentially in partnership with industry or academia
- Advanced technology prototypes with high-impact capabilities are delivered to the Navy and Marine Corps within 12 months

Our website provides additional program and contact information to warfighters and stakeholders around the globe: https://www. onr.navy.mil/techsolutions.

Rear Adm. Lorin Selby looks on as Scott Steward, then-deputy director, TechSolutions, explains how the FLTC is able to send and receive Morse code by translating it into text on a tablet or laptop. (Photo by U.S. Navy Photographer Michael Walls)

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Results and Achievements

In 2023, TechSolutions responded to warfighter technology needs by delivering solutions ranging from expeditionary structures (such as temporary hangars and piers) to mission planning tools and training aids. Four new development projects were initiated, four prototypes were delivered to warfighters, and the team managed a total of 13 active projects over the course of the year while continuing to transition completed projects into the field and to acquisition partners.

TechSolutions received a record 51 requests for solutions from warfighters in 2023. This was the year that TechSolutions simplified the request process with instructions to warfighters to reach out to team members directly via email or phone, rather than registering for access through an online portal. Additionally, TechSolutions is now featured on the newly released ONR mobile app with a "Warfighter Ideas" link on the main page to guide warfighters through making a request. The "quicklink" button for "prototypes" on MyNavy Portal continues to be a driver for connecting warfighters with ideas to TechSolutions.

The TechSolutions team maintained direct outreach efforts with Sailors and Marines with virtual and in-person events nationally and internationally, using ONR Active Duty and Reserve Components and connections with ONR GLOBAL's Science Advisors.

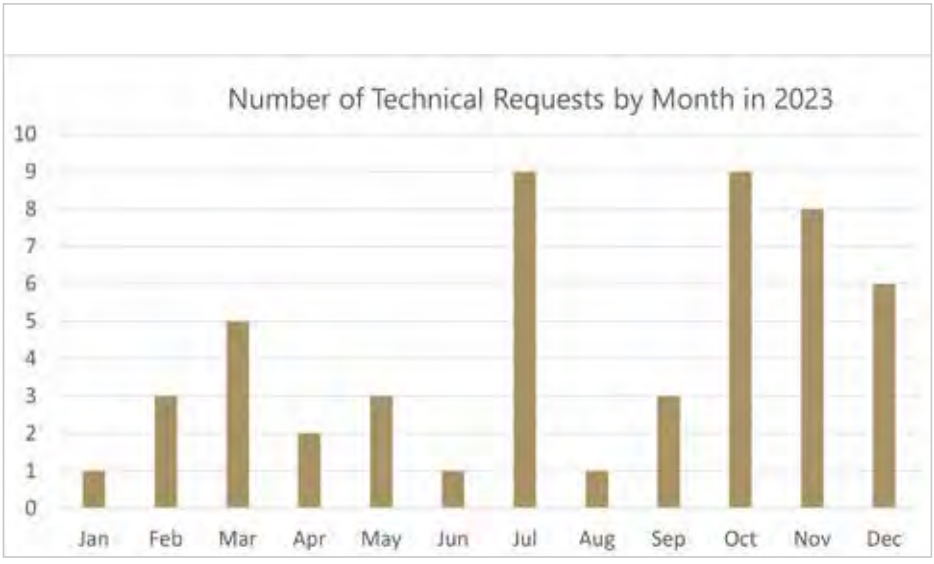
Key 2023 Program Results and Achievements:

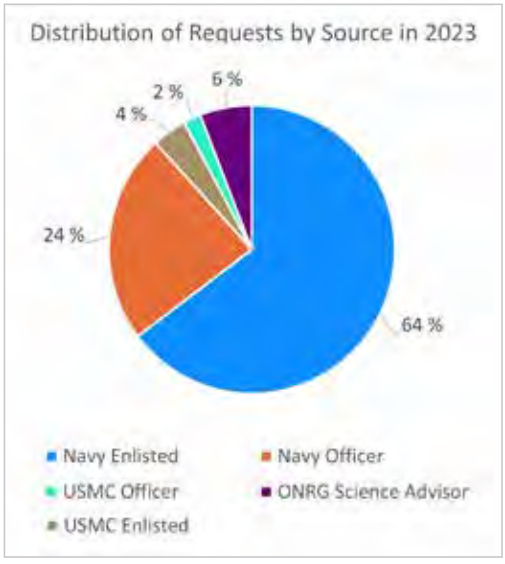
- 51 tech requests in 2023 (42% above average number of 36)
- 45 requests received from Marines and Sailor
- 6 requests received from ONR GLOBAL Science Advisors on behalf of warfighters at their commands
- TechSolutions cost shares projects with partner organizations

In 2023 TechSolutions received record tech requests from the fleet and force for broad and diverse capabilities from the commands listed below:

Request Number	Solution Request Title
TS-945	Ground vehicle reconnaissance/aerial assisted driving
TS-946	Plane captain LSE training simulator for USN MH-60 squadrons
TS-947	Anti-Helicopter Submarine Launched Countermeasure
TS-948	Undersea Sensor Power Systems (USPS)
TS-949	SIPR Request
TS-950	Ground Crew Aircraft Movement Training System
TS-951	Lowlight Simulator
TS-952	Firearms Simulator
TS-953	Create tablet based system for performing aircraft Daily and Turnaround inspections
TS-954	CTPL Dashboard
TS-955	MH-60R ADTS Kits
TS-956	Model-based Tool for Planning at the Operational level of War
TS-957	Firefly

Request Number	Solution Request Title
TS-958	Surf observation Tool
TS-959	Data Analytics for Tailhook Operations
TS-960	Overhead Mounted AC Unit Access Panel
TS-961	Crash & Salvage Trainier
TS-962	Multi-Compatibility Tactical Vision Enhancing Devices
TS-963	Heat Mitigation - NINJA system
TS-964	Uniform Recycleing
TS-965	Alternative Investments
TS-966	Plastic Drinking Container waste
TS-967	Supply Cross Platform Tracking & Asset Management
TS-968	Supply Corps Collaboration App
TS-969	Shipboard / Field Handheld "RF Sniffer" for EMCON validation
TS-970	Automated Howitzer Aiming System
TS-971	AMPHIBIOUS MEDICAL TRIAGE, TREATMENT, TRANSPORT (AMT3)
TS-972	Landing Gear Tire Spin
TS-973	EOD Low Temp Battery
TS-974	EOD No Freeze Solvent
TS-975	EOD Wide-Area Denonator
TS-976	SKED Force Revision Updates implementation
TS-977	Fresh Drinking Water in the FOB
TS-978	Religious Needs Assessment (RNA) APP
TS-979	Comms APP
TS-980	Mobile Emergency Landing Pad
TS-981	Barcode
TS-982	Bridge to Bridge Comm
TS-983	Strategic Electromagnetic Spectrum AI/ML Tactical Warrior





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Dynamic Air Traffic Control (ATC) Refresher Training System (DARTS)

The Office of Naval Research (ONR) Global recently awarded the Navy and Marine Corps Achievement Medal (NAM) Lt. Cmd. Sam Hughes, who requested the development of a new, more efficient way to train radar operators resulting in TS-848 Dynamic Air Traffic Control (ATC) Refresher Training System (DARTS). Hughes came up with the idea of using a simulation program for training radar operators while working as the Air Traffic Control (ATC) Integrated Product Team (IPT) lead at the Naval Air Warfare Center Training Systems Division (NAWC TSD). DARTS is now being delivered to 35 Navy and Marine Corps sites.

TechSolutions Director, Jason Payne, presenting the NAM to Lt. Cmdr. Hughes. (Photo provided by ONR GLOBAL)

ATC Subject Matter Experts During Fleet Review

- "This will make training much faster."
- "This trainer gives us much more control and is easier to operate as an instructor than other systems we use."
- "This will help bring new operators up to speed quicker."
- "The trainer will help me prepare for my upcoming qualification test."
- "This will streamline onboarding."
- "This will help standardize our training."
- "The system does a lot of the instructor work so I can focus on the student."

"It was a team effort and as soon as we get it out to the fleet and it works, that'll be the greatest award I could receive. The entire IPT team was pivotal. The Advanced Gaming Interactive Learning Environment (AGILE) worked hand and hand with the NAWC TSD ATC team and the fleet to ensure that what they delivered was exactly what the fleet needed with thanks to TechSolutions."

-Lt. Cmdr. Hughes

Interesting Events/Programs/Projects

In 2023, ONR GLOBAL's warfighter focus, led to numerous engagements with TechSolutions. Three of its recent projects were included in the U.S. Navy and U.S. Marine Corps-led Large Scale Exercise (LSE) 2023 in August. More than 25,000 Sailors and Marines across the globe participated in LSE 2023, which was a live and virtual globally-integrated exercise designed to refine the synchronization of maritime operations.

TechSolutions Helped Deliver a Solution to a Warfighter within Two Months of Request
Master Chief Avionics Technician Andrew Karsten, the lead of curriculum for a Naval Aviation Maintenance Center for Excellence Training (NAMCE-T), wanted to give his students more than just PowerPoint instruction. He wanted them to get a feel for the parts of the plane they were going to be tasked with repairing — an E-2D Advanced Hawkeye. Getting parts for that hands-on experience, though, was a challenge. Master Chief Karsten reached out to TechSolutions and asked the question, "Is there a way you could help me potentially get a 3D printer or connect me to somebody who could do 3D printing?" TechSolutions coordinated with the NR&DE network to find a 3D printer able to support the warfighter's request. The 3D printer solved training and readiness issues for Karsten and his team of instructors while training Sailors to use 3D printers. As all of the advanced E-2Ds are operational with no additional spare parts to help train students, with the 3D printer the team could manufacture their own. "Our philosophy is 30% classroom, 70% doing something physically with their hands, interacting with either an aircraft or a device that accurately represents the aircraft," said Karsten. "Rather than me telling them how it's done, they're able to do it."

TS-679 Flashing Light to Text Converter (FLTC)
The FLTC uses a ship's existing signal lamp to send and receive optical lamp communications via an intuitive chat session on a tablet computer. The FLTC bridges a user gap in Morse code capability with an upgrade kit that allows Sailors and Marines to use existing ship signaling and searchlights to send and receive Morse code that can be translated into text on tablets. During SLE 2023, the FLTC Team was able to successfully conduct a shore-to-ship demonstration with Marines who had been quickly trained in the field. (Photos below courtesy of ONR GLOBAL)

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TS-923 Signature Management Application For Real Time (SMART)
SMART is a planning tool that provides valuable feedback of logistic information, how that information should be relayed, and calculates the timing and sequence of events in an operational environment. A Marine major in the Combat Logistics Regiment II said the SMART planning tool "provided situational awareness and operational risk analysis functions, filling a gap that the force experiences with tools/equipment currently available to them."

TS-915 Expeditionary Littoral Enabler (ELE)
Delivered by TechSolutions' performers, Naval Surface Warfare Center (NSWC) Carderock Division and Penn State Applied Research Lab, to the Marine Combat Logistics Battalion 26 (CLB-26) for a fleet battle problem (FBP) limited objective event (LOE) at Camp Lejeune, North Carolina. Marines used the rubberized, inflatable pier, fabricated with drop-stitch technology, to provide small craft docking for the transfer of supplies and/or casualty evacuations. The event involved training Marines to deploy, anchor and stow the ELE. The ELE field evaluation took place in August as part of LSE 2023 demonstrated littoral sustainment. The unit remained with CLB- 26 throughout the summer so Marines were able to utilize its capability from different locations, slowly building up from employment at a boat ramp to employment from the beach. ELE is the result of a request submitted in 2022 by ONR GLOBAL's science advisor to Marines Forces Command (MARFORCOM) for a near shore discharge to supply Marines in an expeditionary advanced basing operations (EABO) environment.

Observers standing on an Expeditionary Littoral Enabler (ELE) during the Limited Objective Experiment at Camp Lejeune, NC, in May 2023. On the end, at right, is Science Advisor Jeremy Hoff, MARFORCOM. (Photo Courtesy of ONR GLOBAL)

The ELE allows Marines operating in the littoral environment to deploy the pier prior to small boats or unmanned surface vessels arriving to resupply them. Once supplies and other equipment are offloaded, the pier can be disassembled for storage or for transport to another location. The pier can enhance future capabilities with contested logistics, aligning with Force Design 2030 concepts. (Photos and graphics below courtesy of ONR GLOBAL)

TS-787 "Expeditionary Hangar (X-HANGAR)"
X-HANGAR, an inflatable hangar covered by advanced materials, had a final demonstration by the NRL development team with local Marines of the III Marine Expeditionary Force (III MEF) at

Camp Futenma, Okinawa in September 2023. This followed a field exercise at I MEF in July that included multiple aircraft covered by different variants of fabric. After repairs the vendor will make final delivery to III MEF. (Photo with an MV-22 in Okinawa)

ONR GLOBAL's science advisor to III MEF communicated an urgent need statement from Marine Corps leadership in the Pacific theater for an expeditionary hangar. NRL developed a solution with TechSolutions funding based on an inflatable structure designed by i2K Defense, and a camouflage cover from Ametrine Inc. Alternatively, the X-HANGAR can also be used as a cover for the modular sections of Fibrotex's ULCANS Inc., a product that is an Army program of record, with similar effect. In Okinawa, the team demonstrated an Ametrine cover atop the inflatable structure. NRL plans additional development to make the design more rugged and to simplify user operation for customers in the USMC and USAF.

The TS-881 Horizontal Construction App

The TS-881 Horizontal Construction App is a new development. It began in August to support horizontal construction through an application by allowing for real-time calculations, approximations and work estimates based on engineering data collected on-site. The application will provide a real-time augmented-reality (AR) view of the generated estimates, allowing users to visualize the repairs to roads, earthworks, obstacles, airfields and ports.

TS-935 Transmission Emission Device (TED)

TED is a force protection system that can be deployed in an expeditionary advanced base operations (EABO) scenario. The project team had several meetings and workshops for TED with a final demonstration with Marine 2nd Intel Battalion from II MEF at TREX 23.2, Oct. 9-20, at the Muscatatuck Urban Training Center in Indiana. The Marine Corps Tactical Systems Support Activity (MCTSSA) will follow up with an assessment of the system.

TS-944 Mixed Reality Trainer for the T-45

The TS-944 Mixed Reality Trainer for the T-45 was initiated in early 2023 with NAWC TSD and CNATRA at a kickoff event in April. Stakeholder representatives joining the team at the kickoff included OPNAV N98, multiple program offices, TYCOM, ONR program officers and ONR GLOBAL science advisors. The team highlighted the current T-45 current training gap and its effect on fleet readiness. The first test and evaluation event occurred in December with very favorable results.

ONR Global TechSolutions Director Jason Payne (center) receiving the Dr. Judah Go1dwasser Award. This award for leadership, eponymously named for the late, noted ONR Global Program Officer, recognizes an individual at ONR Global who consistently goes well beyond excellence in the performance of their duties in their position and demonstrates selfless devotion to bringing out the best in their colleagues. (U.S. Navy photo by Michael Walls)

INTERNATIONAL ENGAGEMENT OFFICE

The Naval Surface Warfare Center (,) Panama City Division hosted a Swedish delegation in April 2023 for a site visit and discussions on the topic of Amphibious Warfare. (Photo courtesy of ONR GLOBAL)

The International Engagement Office (IEO) consist of six country directors, program support, foreign disclosure analyst, deputy and a director. As a team our goals are to serve, engage, interface, gain and connect. We accomplish those goals by:

- Promoting opportunities for shared collaboration in research and development in support of delivering innovative warfighting technology.
- Partner nation engagements, with the goal of building and supporting system capabilities, this is a critical element of international engagement.
- Our collaboration with international partners through relevant efforts seeks to improve our interoperability with their forces to support future cooperation efforts.

During the Defence and Security Equipment International (DSEI) 2023 event in London, L3 Harris introduced the Maritime Autonomy Surface Testbed (MAST)-13 Autonomous Surface Vehicle (ASV). CNR (second from left) received a tour of the MAST-13 ASV from Dstl and L3Harris personnel. (Photo courtesy of ONR GLOBAL)

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Results and Achievements

Capability Analysis Workshop (CAW)
IEO hosted three bilateral CAWs — two with the United Kingdom and one with Australia on undersea warfare and integrated air missile defense — to identify operational gaps and ensure bilateral engagements are directed to key operational problems. To ensure the capability analysis process is repeatable, IEO created a Capability Analysis Process Guide and Users Guide to facilitate future workshops.

Australia

Concepts and Requirements Steering Group (CRSG)
ONR GLOBAL IEO hosted the Concepts and Requirements Steering Group (CRSG) with 35 Australian delegates at ONR Headquarters in Arlington, Virginia for a week in May. They held working level discussions in seven working groups:

- Navy Logistics
- Electronic Warfare
- Maritime Unmanned Systems
- Expeditionary Warfare
- Information Warfare
- Surface Combatant
- Undersea Warfare
- Maritime Aviation Warfare

The event culminated in briefs to Flag Officers and Senior Executive Service personnel. Updates were presented to in September via a secure video teleconference.

Part of the Australian delegation visiting the USMC Memorial with Capt. Lindsay Rhiener, USMC. May 2023. (Photo courtesy of ONR GLOBAL)

The CRSG-STSG Group hosted by Rear Adm. Lorin Selby, Cdre. Darron Kavanagh, Royal Australian Navy, and Dr. Anh Duong. (U.S. Navy photo by Michael Walls)

United Kingdom

U.S.-U.K. Senior Naval National Representative (SNNR) and the Maritime Technology Working Group (MTWG) continue to drive future integrated warfighting (FIW) through interchangeability. Priorities include identifying and prioritizing capabilities required to solve bilateral operational problems (BOPs): long range fires (LRF), integrated air and missile defense (IAMD) and undersea warfare (USW).

The MTWG, co-chaired by the Chief of Naval Research (CNR), Rear Adm. Rothenhaus, and Andy Bell, chief technology officer, Defence Science and Technology Laboratory (Dstl), was hosted in Washington in March 2023.

The U.S.-U.K. Senior Naval National Representative (SNNR), co-chaired by the CNR and Rear Adm. James Parkin, Royal Navy (RN), was hosted in Washington, DC in June 2023.

(L to R: Capt. Andy "Big Tuna" Berner, Lt. Matt Merz, Rear Adm. Kurt Rothenhaus, Beth Huber Sherenco, Kim Pavlovic, Col. Lance Lewis) Rothenhaus and delegation visit the U.S. Embassy in London for a meeting with the U.S. Ambassador, Jane Hartley. (Photo courtesy of ONR GLOBAL)

Pentagon, Feb. 2023 - U.K. Force Development delegation visited the Pentagon for discussions of Force Design 2045 and to conduct table top exercises (TTX)

NSWC Dahlgren, May 2023 - Dstl delegation visit for hypervelocity projectile technical discussions, followed by information exchange to support U.K. Decision Point.

Pentagon, Oct. 2023 - U.S.-U.K. Above Water Working Group (AWWG) inaugural meeting in conjunction with a capability analysis workshop

Bahrain, March 2023 - International Maritime Exercise (IMX), aligned with mine countermeasures (MCM) staff talks

Formidable Shield 23, May 2023 - Live fire allied demonstration of deterrence and defense of the Euro-Atlantic region, including a demonstration of IAMD-Target

RAF Molesworth, May 2023 - U.K. NIFE demonstration

Portugal, Sept. 2023 - Successful demonstration of unmanned systems at Robotics Experimentation Prototype Maritime Unmanned Systems (REPMUS)

Canada

Navy Science & Technology Senior Scientific Representative (NSTSSR)-TD - NSTR
In early FY 2023, ONR GLOBAL hosted a SNNR where Royal Canadian Navy (RCN) Director

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General of Naval Force Development, Cmdre. Jason Armstrong, gave a brief on the RCN's Capital Equipment Priorities and Projects. The Defence Research & Development Canada presented on the future of underwater warfare and underwater surveillance in the Arctic region. Josh Smith from John Hopkins University Applied Physics Lab (JHUAPL) presented on Tactical Advancement for the Next Generation (TANG) and its ongoing program to support the design of the next generation of Canada's combatant surface vessel. Lt. Col. Jack Long presented on artificial intelligence/ machine learning (AI/ML) to help support warfighter decision-making on the battlefield and the DoN's long term strategy in its application.

The Director General of Canada's R&D Programme of Defense, David Hazen, joined the SNNR during the Defense S&T Executive (DSTX) working group meeting held in June of 2023. This was the inaugural meeting and was co-chaired by the Under Secretary of Defense for Research and Engineering, the Hon. Heidi Shyu, and Dr. Jaspinder Komal, Assistant Deputy Minister, Defence Research and Development Canada (ADM(DRDC)

- In the DSTX meeting, Mr. David Hazen provided a joint U.S.-Canada Navy Perspective where he emphasized uncrewed autonomous vehicles, the Arctic Ocean (navigability), and "great power competition" as the current and forthcoming naval strategic imperatives. To address these imperatives, the navies will focus S&T collaboration on AI/ML, undersea warfare and cyber defense.
- The SNNR meeting in Jan 2024 provided an update on ongoing collaborative efforts between the U.S. and Canada with AI/ML and Undersea Warfare as well as provide an opportunity to explore areas of collaboration on cyber defense.

SNNR-TD - Front Row L to R: Mr. Adrian Hewitt (DRDC), Mr. Zahir Daya (DRDC), Mr. Wayne Liu (ONR GLOBAL), CDR Ted Delgado (ONR GLOBAL), Cmdre Jason Armstrong (RCN), RADM Lorin Selby (ONR), Mr. Phil Edwards (DRDC), Dr. Sean Pecknold (DRDC), Mr. John Woods (ONR GLOBAL)

Back Row L to R: Mr. Josh Smith (JHUAPL), Mr. Bob Headrick (ONR), Cdr Niall Hanratty (RCN), Ms. Beth Huber Sherenco (ONR GLOBAL), LCdr Andrew LaBerge (RCN), Mr. Steve Strausser (ONR GLOBAL), Mr. Warren Connors (DRDC) (U.S. Navy photo by Michael Walls)

Sweden

U.S.-Sweden SNNR, co-chaired by the Chief of Naval Research (CNR) and Brig. Gen. Patric Hjorth, Director Naval System Department, Swedish Defence Materiel Administration (FMV), was held in Washington on Jan. 27, 2023. The SNNR was the culmination of a week-long in-person bilateral engagement that included site visits to NRL, Naval Surface Warfare Center Carderock Division and the Marine Corps Warfighting Lab. In addition to the site visits, our teams conducted Technical Project Officer working level meetings throughout the week on the topics of radar collaboration, unmanned maritime systems and mine warfare and surface warfare technologies.

The US-Sweden SNNR was hosted at ONR Headquarters in Arlington, Virginia in January 2023. (U.S. Navy photo by Eric Anderson)

Rear Adm. Rothenhaus spoke with his Swedish counterpart, Rear Adm. Fredrik Lindén, in an office call during the Defence Security Equipment International symposium in London, U.K.. The SNNR Principals plan to meet during the SAS Symposium in April 2024. Sweden will host the next in-person SNNR engagement in 2024.

- X-band Active Array Antenna successfully completed testing of two Saab X-band radar arrays at NSWC Dahlgren.
- NSWC Panama City Division hosted a Swedish delegation in April 2023 for a site visit and discussions on amphibious warfare. An information exchange annex for amphibious warfare systems technology has entered U.S. staffing for authority to negotiate in Nov. 2023.
- A U.S. delegation visited Sweden for naval command, control, communications and computers (C4) discussions, including position navigation and timing radio frequency propagation and AI.
- U.S. and Sweden subject matter experts (SME) continued to engage in secure video teleconferences to discuss undersea warfare and unmanned undersea vehicle operation from a host platform and undersea electromagnetic ranges and signatures.
- Saab Kockums Stirling Engine FCT proposal was selected in August 2023 to explore solutions for USV platforms that will enhance range and capability in support of its Robust Unmanned Platform Power Systems.

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ICE-PPR

The International Cooperative Engagement Program for Polar Research (ICE-PPR) is a memorandum of understanding between the defense departments of seven countries — the U.S., Canada, Denmark, Sweden, Norway, Finland and New Zealand — that allows for joint research and information sharing between the countries. Working groups within ICE-PPR focus on different topics, including the Environment, Platforms, Human Performance and Situational Awareness.

Cool Conversation: Global Experts Meet At Naval Academy To Talk Sea Ice, Icebergs

Scientists and polar icebreaker operators from four countries recently convened at the United States Naval Academy in Annapolis, Maryland, to discuss collaboration on international research projects and share information about sea ice and icebergs. Norway, Denmark, Canada and the U.S. participated in fruitful discussions and future research planning at the ICE-PPR International Workshop for Sea Ice and Icebergs.

The International Cooperative Engagement Program for Polar Research (ICE-PPR) International Workshop for Sea Ice and Icebergs was held recently at the U.S. Naval Academy in Annapolis, Maryland. (Photo courtesy of ONR GLOBAL)

The workshop attendees focused on three areas: science and technology researchers who study data and create new algorithms or sensors; the centers that produce ice analysis products for mariners; and the operators themselves, personnel from the U.S. and Canadian Navies and Coast Guards who have operated ships in polar regions.

Other recent workshops included an infrastructure-focused workshop held in New Hampshire at the U.S. Army's Cold Regions Research and Engineering Lab and a polar water/wastewater-focused workshop held in Norway at NATO's Center of Excellence, Cold Weather Operations Center.

Environmental Evaluation: ONR Part Of Joint Effort To Deploy Data Buoys Across Arctic Ocean
In July 2023, the ONR partnered with the 144th Airlift Squadron of the Alaska Air National Guard to deploy five different types of weather buoys across more than 1,000 nautical miles of the Arctic Ocean.

The buoy air deployment supported the International Arctic Buoy Programme (IABP), a collaborative program comprising more than 32 different research and operational institutions from 10 different countries and four international agencies — including the International Cooperative Engagement Program for Polar Research (ICE-PPR), European Meteorological Network, World Climate Research Programme and World Meteorological Organization. ONR is an executive member of the IABP, contributing significantly to the acquisition and deployment of buoys in the Arctic.

Five types of buoys — Ice Trackers, Ice Balls, ICEXAIR, Air Expendable Ice Beacons and an experimental buoy — were deployed from a C-17. The Ice Trackers, Ice Balls, ICEXAIRs and experimental buoy were deployed directly onto the ice, while the AXIBs landed in cracks between the sea ice. The buoys have unique design features to help them survive the harsh environment.

Alaska Air National Guard loadmasters assigned to the 144th Airlift Squadron prepare to deploy an Air-Deployable Expendable Ice Buoy (AXIB) in the Arctic Ocean. (U.S. Air Force photo by Airman 1st Class Shelimar Rivera Rosado)

This effort emphasizes the great scientific and operational capabilities achieved through collaboration between U.S. DoD research professionals, academic professors and researchers. Such partnerships have many benefits, such as standardization, equipment sharing and eliminating unnecessary duplication of work. The cooperation also facilitates efficient and cost-effective polar research, development, test and evaluation projects.

NAVY FOREIGN COMPARATIVE TESTING

Commander Fleet Readiness Centers (COMFRC) has the need for advanced fleet repair technologies. The Autonomous System for Aircraft Material Maintenance System (ASAMM) project successfully tested an autonomous system for aircraft material maintenance that will be used for the refurbishment of on-aircraft metal components at the intermediate maintenance level (I-Level). (Photo courtesy of ONR GLOBAL)

The mission of the Navy Foreign Comparative Testing (FCT) Program, under ONR GLOBAL, is to find, assess and field world-class products with a high technology readiness level in order to satisfy valid defense requirements quickly and economically. Authorized by United States Code 2350a(g), the FCT Program provides the DoD with a unique acquisition tool that allows testing and evaluation of mature, foreign-developed technology to determine usefulness and feasibility of procurement for current and emerging requirements.

FCT is an important program for building relationships with our partner nations, leveraging research and technology, and enhancing our competitive edge. We conduct regular engagements with 20 different partner nations. Through these engagements, the team annually reviews over 25 technology proposals of potential interest to the DoD.

Focus areas include:

- Autonomy/AI
- C5ISR/Naval Space
- Directed Energy and Kinetic Systems
- Human and Biological Systems
- Manufacturing
- Materials/Electronics
- Naval Aerospace
- Naval Engineering
- Ocean, Atmosphere and Space
- Power and Energy
- Undersea Systems

NAVAIR COMFRC endorsed the ASAMM demonstration and evaluation of the Australian based system to assess the capability of performing automated on-aircraft repairs in a field environment. (Photo courtesy of ONR GLOBAL)

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Results and Achievements

Of the more than 2000 FCT projects that successfully completed testing, nearly 1600 (80%) transitioned to Navy and Marine Corps acquisition Programs of Record thus:

- Reducing life cycle or procurement costs
- Eliminating unnecessary duplication of research, development, test, and evaluation
- Rapidly fielding quality military equipment
- Enhancing standardization and interoperability
- Promoting competition by qualifying alternative sources
- Improving the United States military industrial base

FCT endorses technology proposals that align with 18 targeted areas addressing recurring naval challenges, and ensuring the right investments are made with limited resources to best advance warfighting capability now and for the future.

Interesting Events/Programs/Projects

The Autonomous System for Aircraft Material Maintenance System (ASAMM)
Commander Fleet Readiness Centers (COMFRC) has the need for advanced fleet repair technologies. This project successfully tested an autonomous system for aircraft material maintenance that will be used for the refurbishment of on-aircraft metal components at the intermediate maintenance level (I-Level). This technology is built on proven cold spray metallization technology and an Australian built autonomous system that had been proven on Royal Australian Navy aircraft, to provide the rapid insertion of autonomous repair systems into the DoD. NAVAIR COMFRC endorsed the demonstration and evaluation of the Australian based system

(ASAMM photos courtesy of ONR GLOBAL)

(ASAMM photos courtesy of ONR GLOBAL)

to assess the capability of performing automated on-aircraft repairs in a field environment. VRC Metalsystems was put on contract via a current Small Business Innovative Research (SBIR) contract vehicle due to their business relationship with Rosebank Engineering/RUAG Australia.

Intelligent-Unmanned Ground Vehicle

The U.S. Marine Corps will test and evaluate an Intelligent-Unmanned Ground Vehicle (UGV) from Hanwha Aerospace, a South Korean company.

The FCT project intends to demonstrate and evaluate Hanwha Aerospace's Autonomous and Robotic Intelligent Off-road Navigation (ARION) Small Multi-purpose Equipment Transport (SMET) vehicle for USMC contested logistics operations in the littorals. The ARION SMET is an advanced autonomous ground vehicle, with Artificial Intelligence and Machine Learning (AI/ML). ARION SMET is a 2-ton, 6x6, electric-powered UGV. It has begun pilot operations with Republic of Korea Army units and is at a technology readiness level of six (6). The FCT project lead is David Keeler, an advanced technology integrator for Logistics Combat Elements Systems at Marine Corps System Command (MCSC).

In December 2023, a joint USMC/USA team put Hanwha's ARION SMET UGV through several tests. Testing will focus on unmanned operations in support of contested logistics in a littoral environment. The UGV will be used to support warfighters in a variety of terrains and environments. Operations will be conducted for such contested logistics missions as resupply, casualty evacuation (CASEVAC), and manned-unmanned teaming (MUM-T) operations.

Acoustic Modem Evaluation (SAME)

In 2020, the Office of the Secretary of Defense (OSD) Comparative Technology Office selected the Naval Information Warfare Center Pacific (NIWC PAC) to conduct a FCT project titled Software-defined Acoustic Modem Evaluation (SAME). The SAME FCT project is focused on evaluating the capabilities of commercial-off-the-shelf software-defined acoustic modems developed by non-US companies and assessing whether they can meet the operational needs of the US Navy.

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Acoustic modems have traditionally been designed as black-box systems with limited reconfiguration options. Modem manufactures have focused on developing smaller, low-power modems featuring advanced, specialized signal processing algorithms to deal with the challenges of undersea acoustic propagation. Recently, manufacturers have begun to add reconfiguration options to some acoustic modems that allow the user to modify modem configuration parameters, and in some cases to reprogram the entire modem, and these modems are the focus of the SAME project.

Earlier this year, the SAME project successfully completed testing in which the capabilities of the modems were tested in laboratory and controlled in-water environments, as well as open waters of San Diego California bay. Based on the results, a down selection was made and a family of modems was chosen for further testing in the final phase of the project. These systems have potential to advance the existing capabilities of underwater acoustic communications and networking by dynamic reconfiguration of the systems through software, allowing for versatile modulation schemes and signal processing techniques.

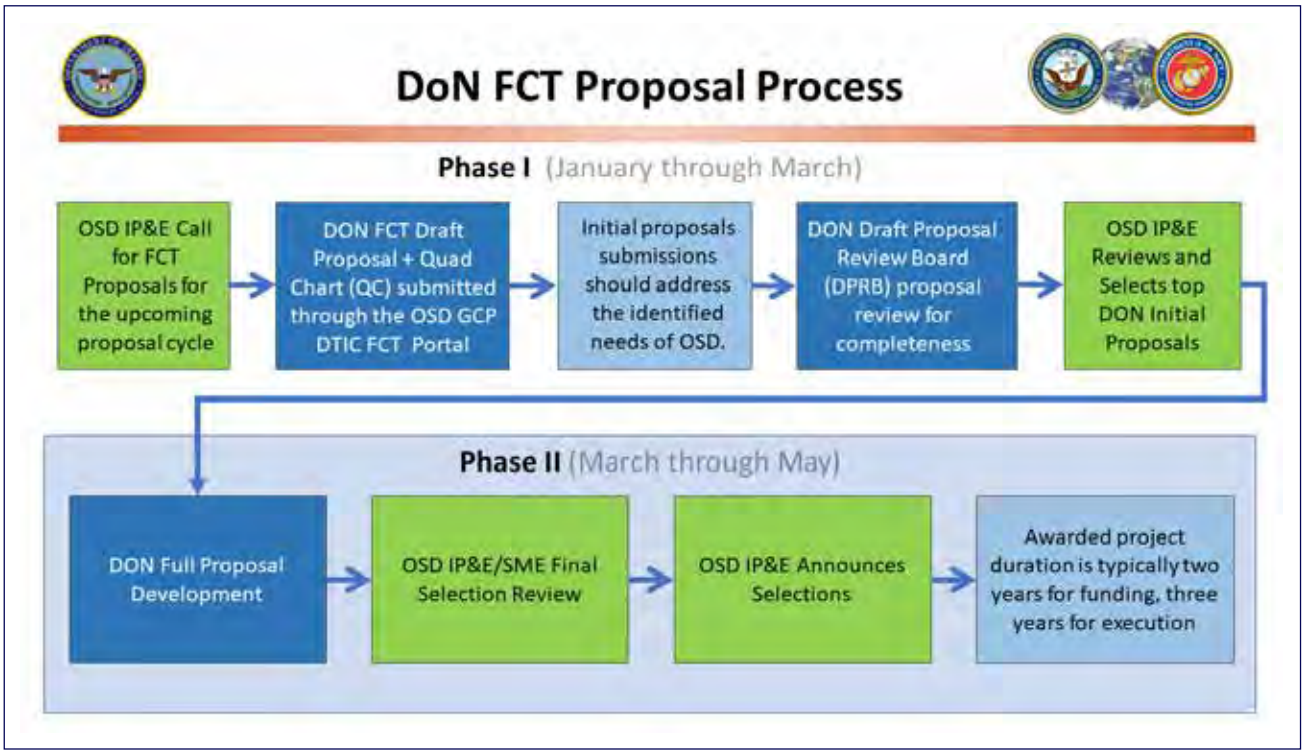
Fast Inshore Attack Craft (FIAC) Asymmetric Force Engagement
This FCT project tests the capability of the South Korea 2.75 inch Poniard rockets enabling the shooter to more efficiently & effectively engage large numbers of targets within a swarm at tactically significant ranges. In October of 2019, the rockets were successfully tested in South Korea from the ground launcher and now they have been successfully tested with a prototype marinized launcher integrated with a USV operating on the water.

Fast Inshore Attack Craft fitted with 2.75 inch Poniard rockets. (Photos courtesy of South Korea and ONR GLOBAL)

In October 2023, Poniard proved operational efficacy during the U.S. Fourth Fleet Hybrid Fleet Campaign event in Key West, Florida. It was the first live fire event with unmanned systems by the U.S. Fourth Fleet resulting in 6/6 target boats destroyed. There will be three additional experimentation events in 2024.

Interested in making a proposal?

The FCT proposal process starts with the identification of an item or an innovative technology that may have potential to provide a solution for an identified need or to satisfy a documented requirement.



Proposals are made through the Office of the Secretary of Defense (OSD) Google Cloud Platform (GCP) Defense Technical Information Center (DTIC) portal. Submissions should address an OSD focus area, add value to the Joint force, or meet a service-specific need. In addition to a proposal, submitters are required to submit a quad chart on the proposed test item. For more information, contact Arthur Webb, department head, Foreign Comparative Testing: arthur.a.webb4.civ@us.navy.mil.

LONDON TECH BRIDGE

HMS Diamond end user engagement for virtual Reality (VR). The LTB was able to conduct end user demos with a purchased Commercial Off The Shelf (COTS) Remote VR Bridge simulator from Kilo called VASCO. The LTB discovered VASCO during one of our Tea and Tech industry events looking to provide a solution for a sailor request. (Photo courtesy of ONR GLOBAL)

The London Tech Bridge (LTB) is a collaboration between the U.S. Navy (USN) and Royal Navy (RN) to foster connectivity, agility and innovation under the broader ambition of delivering combined sea-power. It supports dialogue, joint investment, and cooperative development between two navies as they endeavor to advance from interoperability to interchangeability. Set in central London's booming technology hub, spanning academia, industry and government, it is ideally positioned to harness technology faster for Sailors and Marines.

Delivering Combined Sea-power, signed by the Chief of Naval Operations, the Commandant of the Marine Corps and the Royal Navy First Sealord in October 2023, is the charter that underpins the close transatlantic relationship between the Royal Navy and Department of the Navy (DoN). The agreement enhances maritime power for the benefit of both nations through underwater, littoral and carrier operations with the ultimate goal of moving fleets and forces from interoperability to interchangeability.

The First Sea Lord of the Royal Navy (Admiral Sir Ben Key, left) and Leading Air Engineering Technician Jason Jackson (RN, right) are trying out Kognitiv Spark Augmented Reality (AR) goggles in July 2023. These AR goggles allow sustainers to overlay images and reference materials on real-world systems to more effectively maintain and repair naval systems. (Photo courtesy of ONR GLOBAL)

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Highlights and Accomplishments From 2023

The U.S. Chief of Naval Research, along with the Royal Navy Director of Development, signed a Joint Statement of Intent, June 1, 2023, formalizing the LTB. The statement documents the objectives and ongoing aims for the U.S./U.K. naval partnership to support interchangeability, shared technologies and solutions to bolster the security and safety of our nations and allies.

Building the Network

- Hosted an "Access to Allied Private Capital" event for AUKUS – a trilateral partnership made up of Australia, the U.K. and the U.S. featured at the Aerospace, Defence, Security & Space (ADS) industry engagement event, London
- Gained an additional 800 LinkedIn followers for London Tech Bridge
- Conducted monthly Tea & Tech events aimed at building connections between innovative industries and naval programs in need of their technology
- Engaged with six trade organizations with a combined reach of more than 10k companies
- Conducted end user feedback events at Royal Airforce (RAF) Lossiemouth, HMS President, HMS Diamond, NAS Jacksonville, USS George H.W. Bush, Mariner Skills Training Center Norfolk, HMNB Faslane, and U.K. Special Forces
- Conducted engagements with 412 industry, 52 academia, and 175 government entities

AUKUS Pillar 2 Innovation Working Group Meeting. (Photo courtesy of ONR GLOBAL)

Key Leader Engagement at the London Tech Bridge

- Second Permanent Secretary of U.K. Ministry of Defence (MOD), Laurence Lee
- Director of U.K. MOD Innovation, John Ridge
- USMC Combat Development Command, Brig. Gen. Mark Clingan
- Program Executive Officer for Unmanned Aviation and Strike Weapons, Rear Adm. Stephen Tedford
- Senator, Republic of Chile, Kenneth Pugh
- Director, NATO Centre for Maritime Research and Experimentation, Catherine Warner
- USMC Chief Engineer, Tim Gramp and USMC Systems Command Technology Officer (SYSCOM CTO), Luis Velazquez

ADS London presenting at Industry Engagement Event. (Photo courtesy of ONR GLOBAL)

- Naval Sea Systems Command CTO, Carmelo Fontan
- Head of NATO Defence Innovation Accelerator for the North Atlantic Challenges Team, Cynthia Shaw
- Various members of the Joint Staff, U.S. Embassy, and congressional delegations

Innovation Pipeline and Handoffs to Naval Programs

- Demo and transition of VR (virtual reality) Bridge Simulator (see below)
- N*Sight Proof of Value Demonstrator — "Google Lens" like capability for helicopter parts and maintenance information
- P-8A problem sourcing workshops with U.S. Navy and RAF
- Conducted technology scouting for multiple fleet problem sets, including Pacific Fleet Transloading, NRSW (Navy Region Southwest) San Clemente Island austere water production, and Naval Facilities Engineering and Expeditionary Warfare Center surf-zone object detection.

London Tech Bridge took the Kilo Vasco Remote VR Bridge Simulator onboard the USS George H. W. Bush (CVN-77) for an end user demo and feedback session! (Photo courtesy of ONR GLOBAL)

Delivering Solutions to the Fleet: Vasco Untethered VR Ship's Bridge Simulator

In 2023, the LTB took on a franchise effort to bring untethered VR ship's bridge simulators to the U.S. and Royal Navies. Meeting an ONR Tech Solutions sailor request, the LTB discovered a U.K. company offering such a capability to the yachting industry. Working with the company, Kilo Solutions Ltd., a commercial off-the-shelf (COTS) closed, local area network (LAN) system was purchased for demonstration and evaluation. After hours of use and feedback from qualified fleet sailors and a NAWC Training Systems Division technical review of the product, the LTB produced a report satisfying concerns and identifying opportunities for use of the product. Following the LTB report with Navy adaptation requirements identified, ONR GLOBAL's TechSolutions released a solicitation for a variant of the Untethered VR Ship's Bridge Trainer

A group photo of the 1710 squadron visit in Portsmouth. (Photo courtesy of ONR GLOBAL)

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for the U.S. Navy's carrier and destroyer class of ships. Additionally, the Royal Navy has procured their own COTS product from Vasco for longer term experimentation.

Group photo at a Scotland Castle photo during the Aerospace, Defence, Security & Space (ADS) industry engagement event. (Photo courtesy of ONR GLOBAL)

Vision and Plans for Next CY

The LTB will continue to grow its presence as a matchmaker and valued partner in the U.K. technological ecosystem. It will produce connections that lead to solutions for Sailors and Marines while working on a number of different fronts within its Energy Framework and Immersive Technologies portfolio. Along with larger events — including being featured at the brand new Global Underwater Hub Bristol and the Farnborough Air Show — the LTB will continue a series of academic and industry engagements, and end-user experiences across the U.K. The 2023 successes of LTB, leveraging the expertise of the greater ONR GLOBAL team, will continue to lean forward in 2024 and plans to expand its capacity even further with the help of DoN reservist support.

Technology Focus Areas for 2024

- Immersive Technologies
- Autonomous Systems
- Novel Power and Energy
- Workforce of the Future
- Maintenance and Sustainment

Tea &Tech

Through its Tea and Tech event, the London Tech Bridge engages on a regular basis — usually once a month — with potential industry partners to explore possible solutions to problems identified by U.S. Sailors and Marines, and the Royal Navy.

The London Tech Bridge aims to find commercially available technology that could be used or adapted for use by Sailors, Marines and Royal Navy. Industry engagements, like Tea and Tech, are meant to uncover the cutting-edge of industry innovation and build the connections that will link those commercial applications with the naval programs in need of the technology. The advantage of commercially-available technology is that private companies have already invested in their own research and development.

Most of the companies that are invited to Tea and Tech are based in the U.K., although other European-based companies as well as U.S. companies may be approached. Co-director Jeffrey Brewer co-director London Tech Bridge, said Tea and Tech brings in innovative companies in a rapid-fire format.

"Companies have a limited time to make their pitches, and we have subject matter experts from both navies on hand to ask questions and provide feedback," he said. "In general, we endeavor to reach small, innovative companies and non-traditional defense contractors, who may not have established relationships with DoD and MoD programs."

Because of the London Tech Bridge, those links are being made between the DoN and private industry, which may have something to offer the warfighter but have not yet had the opportunity to pitch their innovations.

Links

Check out our LinkedIn site
Learn more about our program and our recent activities.

Contact the London Tech Bridge

Closing Thoughts from the ONR GLOBAL Technical Director

I'm grateful and honored to be a part of ONR GLOBAL. As you browsed through just some of last year's accomplishments highlighted in our Prospectus, you may have been struck by how broadly ONR GLOBAL engages individuals and organizations across scientific fields and levels of technology maturity – from bench scientists to operators, and small businesses to senior political and military leaders. ONR GLOBAL is a leading catalyst for innovation and technology the world over. I like to say we "discover and connect."

But we cannot advance our naval capabilities, and those of our Nation's allies, without the help of our international partners. I have seen creative ideas and novel scientific approaches in the smallest places. Revolutionary technology requires multidisciplinary collaboration. Only together can we drive technical innovation. We actively seek the best and brightest minds across the globe in all fields of science and engineering. We invite you to partner with us!

If you, your research or business team are interested in collaborating with ONR GLOBAL, please send us an email: ONRG.ContactUs@mail.mil. We welcome your input!

Respectfully,
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