2019 INNOVATORS SHOWCASE, FLASH TALKS, IN-WATER DEMONSTRATIONS – Company Briefs

The MARINER program of the **Advanced Research Projects Agency-Energy (ARPA-E)** seeks to develop tools that will enable the United States to become a global leader in the production of marine biomass. Macroalgae "mariculture" cannot as yet achieve the scale, efficiency and production cost necessary to support a seaweed-to-fuels industry. MARINER projects are pursuing technologies capable of providing economically viable, renewable biomass for energy applications without the need for land, fresh water, and synthetic fertilizers. Such technologies include integrated cultivation and harvesting systems, advanced component technologies, computational modeling tools, aquatic monitoring tools, and advanced breeding and genetic tools. Successful technologies would help greatly reduce the capital and operational expenses related to macroalgae production and make it competitive with terrestrial biomass feedstocks. ARPA-E advances high-potential, high-impact energy technologies that are too early for private-sector investment. ARPA-E empowers America's energy researchers with funding, technical assistance, and market readiness. Its programs focus on solving energy challenges to radically improve U.S. economic prosperity, national security, and environmental sustainability. Since 2009, ARPA-E has provided approximately $2 billion in R&D funding for more than 800 potentially transformational energy technology projects. *Krish Doraiswamy,* krishna.doraiswamy@hq.doe.gov, https://arpa-e.energy.gov/

Aquabotix is leading the way in designing micro-sized, swarming unmanned surface and underwater systems for a broad range of defense and commercial applications that are focused on keeping the operator out of harm's way. SwarmDiverTM is a micro-sized, hybrid unmanned surface and underwater vehicle. This system is highly versatile and can fulfil multiple missions. These vehicles are specifically designed for autonomous missions in shallow water to the surf zone. Their ultra-portability allows deployment and recovery manually or autonomously from manned or unmanned platforms, or the dock or shoreline. An intuitive user interface provides autonomous mission planning, real time swarm or individual vehicle control. A single operator can plan, launch and control a swarm of up to 100 vehicles. Inherent redundancy provided by the multi-vehicle swarm significantly increases the probability of mission success. SwarmDiver is an ideal tool for hydrographic surveys, mine countermeasures, harbor management, port security, water sampling, escape and evasion diversion as well as many other types of synoptic data collection and reconnaissance missions. When on the surface the Swarm Diver wirelessly transmits data back to the operator for real time mission analysis, providing situational awareness that enables operational assessments to be made without waiting for vehicle recovery and lengthy data download. *Ian Estaphan Owen,* ian.owen@aquabotix.com, www.aquabotix.com

BAE Systems, Inc. and its 33,600 people are part of a global defense, aerospace and security company with 85,800 employees worldwide. We deliver products and services for air, land, sea and space, as well as advanced electronics, security, information technology solutions, and customer support and services. Our dedication shows in everything we create and deliver—from advanced electronic systems to cyber operations and intelligence analysis, from combat vehicles to naval weapons, and from ship maintenance and modernization to vehicle upgrades and services. We push the limits of possibility to provide a critical advantage to our customers where it counts. *Paco Santana*, jose.santana@baesystems.com, www.baesystems.com

C-2 Innovations is a Massachusetts based engineering firm that has developed an amphibious bottom-crawler that is designed to operate throughout the littoral. Operating in either autonomous, tethered or RF control mode the Sea Ox or smaller Sea Otter collect data to support survey, environmental and defense users. Vehicles can be fitted with a variety of environmental, oceanographic, hydrographic, benthic and industry specific sensors. Installations have included: side scan, CTD, magnetometers, acoustic releases, vibracores, penetrometers, video and photographic imagery - standalone guest sensors can easily be attached in the field or workshop integrated. The vehicle low profile and high stability allows them to penetrate the surf zone with up to 6 ft wave height and collect data independent of sea state and weather, providing more days on task. One customer has had a Sea Otter in use for four years now, and recently ordered a second vehicle. This year the larger Sea Ox has moved from concept to the hands of end users in the USA and UK. C-2 Innovations is proud to be at WHOI CMR and looks forward to continuing our support to ocean science. *Nick Townley,* info@c--2iinc.com, www.c-2innovations.com

C.A. Goudey & Associates aims at developing purpose-designed and purpose-built systems to work on the ocean. We see unmanned systems looking very different than the vessels that have taken us to sea in the past. By identifying key tasks and starting with a blank sheet, we see unconventional systems doing offshore tasks more efficiently and economically than simply adding autonomy to previously manned systems. We are developing the Drone Tug, a small vessel designed for ultra-high-efficiency towing. At 17' long and powered by a 12kW diesel generator, its two 8-foot-diameter propellers generates seven time the bollard pull of a comparably powered vessel. *Clifford Goudey, cliffgoudey@gmail.com*

Coastal Capitalization Consulting Group is a Series Delaware Limited Liability Company. The group is a consortium of industry leaders, seasoned executives, and business experts with technical backgrounds to assist good innovation and technology in moving from the laboratory to the marketplace. As the adage goes, it takes 'money to make money.' Whether you are starting a new business or enhancing an existing commercial endeavor, the most challenging task encountered is raising an adequate amount of capital to fund your project until it becomes sustainable. As a team, we counsel our clients on a variety of private capital solutions, including but not limited to seed, angel, venture capital stage, and private equity funding. We custom package our services with a unique and specialized approach to help capitalize companies given their specific needs. We specifically aid our clients in removing barriers that make any investment within their company unappealing to investors. Our team works to perfect your business plan, placement memorandum, business case, investor pitch, presentation, develop strategic plans and financially viable models, ensure organizational structure, develop a monetization plan, and create viable exit strategies that will capture the attention of potential investors for your stage of funding. *Dr. Michael Flynn,* MFlynn@SBHighlandVentures.com, www.SBHighlandVentures.org

Dive Technologies, formed in 2018 by Bill Lebo, Sam Russo, and Jerry Sgobbo, is rapidly designing and manufacturing a commercial large displacement autonomous underwater vehicle (AUV). Dive Technologies is a veteran-owned small business with over 50 years of combined experience in the development and operation of AUVs and related marine, automation, and defense systems. Dive Technologies is designing a lost cost, long endurance, deep-water, large displacement AUV that is simple, versatile, and highly reliable. This platform will be used to integrate proven, commercially available components, leverage open source technologies, and provide simple space, weight, and power interfaces to easily integrate current and future payloads. As such, the Dive AUV, coined "DIVE-LD," serves as a truly payload agnostic platform, which fills a major market gap for the warfighter and commercial industries alike. Given the large form factor and open architecture, the Dive AUV will also serve as an excellent platform for future technology insertions. The core platform will support future improvements in energy, communications, propulsion, navigation, and payload capability. For defense and commercial markets, a large displacement, deep-water rated AUV will provide the most economical solution to meet ever-evolving future mission needs. *Jerry Sgobbo,* jerry@divetechnologies.com, divetechnologies.com

Draper engineers design, develop and deploy advanced technology solutions for the world's most difficult and important problems. Draper combines mission planning, PN&T, situational awareness, and novel GN&C designs to develop and deploy autonomous platforms for ground, air, sea and undersea needs. These systems range in complexity from human-in-the-loop to systems that operate without any human intervention. Draper continues to advance the field of autonomy through research in the areas of mission planning, sensing and perception, mobility, learning, real-time performance evaluation and human trust in autonomous systems. Through its Human-Centered Solutions capability, Draper enables accomplishment of users' most critical missions by seamlessly integrating technology into a user's workflow. Draper has deep skills in the design, development, and deployment of systems to support cognition and collaboration across human-human and human-autonomous teams. Draper has developed cyber capabilities to assess software vulnerabilities and capabilities to secure electronics systems. Additionally, Draper has demonstrated secure networks featuring over-the-air keying to realize cryptographically encoded, high-bandwidth communications. Together, these provide robust security solutions to guard critical embedded systems against cyber, reverse engineering, and other attacks and ensure that critical information can be protected. *Joel Parry,* jparry@draper.com, www.draper.com

Engineered Syntactic Systems, (ESS), is a global leader in high-performance buoyancy solutions for subsea and oceanographic environments. We are exclusively focused on the design, engineering and manufacturing of superior quality syntactic foam. We offer a range of products and services for use in water depths ranging from several hundred meters to the bottom of the Mariana Trench. Our products are available in a broad range of densities and can be purchased in a variety of standard or custom shapes, finishes, and sizes. We also fabricate syntactic and composite/syntactic structures and assemblies for complete turnkey solutions. We offer products in areas where the unique properties of syntactics offer tailored solutions to challenging environments, such as aerospace, energy absorption, flame retardancy, dielectric applications and insulation. *Thomas Murray,* tmurray@esyntactic.com, www.esyntactic.com

HydroComp, Inc. is an engineering consultancy in Durham NH offering software tools and engineering services for hydrodynamics, propulsion system simulation, and propulsor analysis and design. Celebrating 35 years in business, HydroComp has served some 1200 customer and clients in over 65 countries in the areas of applied hydrodynamics, empirical modeling of marine performance, propulsor design, and software development. HydroComp is noted for its "best-of-breed" design tools for propulsion system simulation, vehicle resistance and flow, propulsor hydrodynamics, as well as its particular expertise in propeller design, manufacture, and inspection. The technical team at HydroComp is led by Donald MacPherson, HydroComp's Technical Director. Author of over 50 technical papers and articles, he is a Fellow of the Society of Naval Architects and Marine Engineers (SNAME) as well as member of its H-8 Propulsor Hydrodynamics and EC-14 Underwater

Noise panels. Mr. MacPherson has a personal passion for propeller design, leading HydroComp's active consulting services and product development for the ROV/AUV/ASV community. Over 100 companies have products that incorporate one of HydroComp's designs, from propulsors for submersible vehicles of many types and missions to novel multi-element propulsors designed to meet a very specific duty with the highest efficiency. *Donald MacPherson*, donald.macpherson@hydrocompinc.com, www.hydrocompinc.com

L3Harris OceanServer is a leading manufacturer of man-portable Autonomous Underwater Vehicles (AUVs) used globally for military applications, sensor development, general survey work, sub-surface security and research. Our modern platform, the Iver AUV, is a state-of-the-art open system that can be launched and operated from shore, a small RHIB or any vessel of opportunity. Over the last 15 years, OceanServer has shipped more than 300 Iver vehicles to customers worldwide. The Iver family of UUVs is used in missions including: mine countermeasures (MCM), hydrography, intelligence, surveillance and reconnaissance (ISR), environmental monitoring, anti-sub warfare, research, survey and search and recovery. Built with battlespace understanding and leading-edge technology, the Iver family of vehicles is capable, modular, reliable and field proven. OceanServer is now part of the Unmanned Maritime Systems Division of the recently merged L3Harris Technologies Corporation. With $17 billion in annual revenue, 50,000 employees, 20,000 engineers and scientists, customers in 130 countries and 400 locations worldwide, the new, agile technology innovator provides end-to-end solutions for advanced defense and commercial applications including the maritime domain. *Bob Anderson*, robert.b.anderson@l3harris.com, www.ocean-server.com, www.l3harris.com

Manna Fish Farms is an innovative pioneering finfish company, paving the way for offshore aquaculture in the United States. In addition to open ocean farming, Manna will also research IMTA (Integrated Multi-trophic Aquaculture), participating in timely study of macroalgae (kelp) and shellfish (sea scallops, oysters, mussels, and clams). Manna Fish Farms will use world proven submersible cage and automated feed technologies to grow local, wild species finfish and shellfish off shore in Florida and New York. Manna Fish Farms will utilize the patented StormSafe Submersible cages to grow striped bass, black sea bass or steelhead trout in submerged pens 8 miles off the south shore of Eastern Long Island in New York State, in water depths of approximately 150 feet. The submerged cages provide a natural and safe environment for finfish to grow. Each cage contains approximately 1.7 million gallons of flowing water at any given moment. Manna will utilize the StormSafe Submersible cages off Pensacola Florida in the Gulf of Mexico, to grow red drum, tripletail or Almaco Jack in submerged pens 23 miles offshore, in depths of approximately 150 feet. Operating with transparency and responsibility, Manna Fish Farms, Inc. is leading open ocean aquaculture development in the United States. *Donna Lanzetta*, donna@mannafishfarms.com, www.mannafishfarms.com

MassMEP creates economic impact by transforming manufacturing enterprises and the manufacturing ecosystem. This is achieved through providing operational excellence, workforce development strategies and innovative growth initiatives, enhanced through leveraging strategic public/private relationships. We believe that there's some element to a manufacturers business – whether it's finding inefficiencies, strengthening internal processes or unlocking growth – that can extend the firm beyond its current limitations. *Joe Griffin,* joeg@massmep.org, www.massmep.org

nU-Boats LLC is pioneering the development of a transformative array of autonomous underwater vehicles of radical design and construction based on advanced coated composite fabrics, incompressible liquid syntactic foam and pressure-tolerant subsystems throughout. Platforms range from extremely large (>100m LOA), fully-autonomous, diesel-electric submarine "motherships" to more conventional-sized, battery-powered AUVs, as well as "biomimetic" designs capable of in situ energy harvesting supporting extreme mission range, duration and payloads. *Kevin Ulmer,* ulmer@nU-Boats.com www.nU-Boats.com

Ocean Exchange, a US-based 501c3 with international scope, is an important part of the ecosystem for innovative start-ups to support healthy oceans, resilient coastlines, ocean shipping and the overall blue economy. Largely supported by private funds, but with strong collaboration with the public and academic sectors, Ocean Exchange provides $210,000 of non-dilutive awards each year via a competitive process. Prior winners include the Wave Glider autonomous vehicle by Liquid Robotics (US), Minesto tidal energy generator (Sweden), Atlas Energy Systems thermionic energy converter previously incubated at Argonne NL Chain Reactions Innovation Program (US), Ecosubsea robotic for in-port cleaning of ship bottoms (Sweden), Coral Vita sustainable coral farming (Bahamas) and others of similar significance. In addition to the awards, Ocean Exchange connects the award applicants to impactful parties in post event activities to help advance the adoption of the innovative solutions. Several former finalists in the Ocean Exchange process will be featured in an upcoming special edition of the Marine Technology Society Journal showcasing blue economy innovation. Major sponsors of Ocean Exchange are Wallenius Wilhelmsen, Gulfstream Aerospace, Marine Research Hub South Florida, Oceaneering, Irene Reynolds Schier, and the Littlejohn Family Foundation. The 2019 awards competition will take place in Fort Lauderdale, FL October 28-30. *Millicent Pitts,* Millicent.pitts@oceanexchange.org, www.oceanexchange.org

Polaris Contract Manufacturing, Inc is an electronic contract manufacturer with 30+ years' experience producing mission critical CCA's/PCB's and box builds. We are located in Marion, MA with a 40,000 sq. ft. facility specializing in servicing the A/D, Oceanographic, Robotics, Medical and DoD markets. Polaris is a wholly owned subsidiary of LM. Our DoD Experience includes production for U.S. Navy, U.S Army, U.S. Airforce and the Missile Defense Agency.
Polaris CM is a non-traditional-large business with NAC and UTIC OTA consortiums.
Polaris is a customer centric organization and our heritage goes back to 1958 and we continue to operate with the philosophy that has made us successful for many years "We never forget who we are working for, the customer."

Polaris Manufacturing services include: SMT, Thru Hole, Flex, Prototypes; Box build and sub assembly; DFM/DFT; ESS/Halt/HASS Testing; Potting; DoD cleared facility for classified production; Sourcing/Obsolescence/Program Management

Polaris Core capabilities/certifications: 30+ years manufacturing to military specs and the underwater environment.; DFT (design for test) Engineering if requested; ICT, Functional Testing are core capabilities; Nordson Dage automated x-ray with oblique angle. Mirtec Optical Inspection. Flying Probe; ISO 9001:2015, AS9100:2016, ISO 13485:2016 IPC-610-A- 610 Class 2 & 3. ITAR Registered

Dennis Vetrano, dennis.vetrano@lmco.com, www.lockheedmartin.com/polaris

Salve Regina University is the host of the Blue Innovation Symposium, January 14-16, 2020. The Symposium is the premier event in New England for connecting the marine technology industry for education, networking, and facilitating partnership opportunities. Last year's symposium brought together over 250 participants and 35 corporate sponsors from leading-edge marine technology companies, research institutions, and key stakeholders of the blue tech economy for programming aimed at providing an overview of current industry trends, and a showcase of start-up companies to discuss their new technologies. Salve Regina University offers a variety of graduate and continuing programs, including 13 master's degree programs with options for concentrations, including an MBA and a M.S. in Innovation Management, a doctoral program in humanities, and a fully online Ph.D. in International Relations. Many programs also provide options for four-course graduate certificates. Our programs feature small classes led by faculty with real-world experience and the opportunity to take courses on campus in Newport, at the Center for Adult Education in Warwick or online. Each program provides unique and individualized opportunities for personal growth, interaction with experienced faculty members and ethical development. *Tobias Stapleton,* tobias.stapleton@salve.edu, www.salve.edu/grad

Sea Machines Robotics is a forward-looking, autonomous technology company that specializes in advanced modular control technology. Specialized in Sensor fusion, Collaborative following, Situational Awareness, and predictive behaviors for collision avoidance going on workboats, large commercial ships & defense surface vessels. Based in Boston and Hamburg Germany operating globally, the company is driven by a crew of mariners, engineers, coders and autonomy scientists. *Warren Freda,* wfreda@sea-machines.com, www.sea-machines.com

SeaTrac Systems, Inc., manufactures, sells, and leases versatile, persistent, solar powered autonomous surface vessels. Founded by seasoned MIT naval architect/ocean engineers, and located in Marblehead, MA, SeaTrac makes the SP-48, a 4.8-meter monohulled solar powered autonomous surface vehicle, perfect for real-time ocean observation, data collection, intelligence, surveillance and reconnaissance missions. Built to operate in all marine environments—from near shore to open ocean—the SP-48 has an efficient self-righting hull and electric motor that frees it from reliance on wind or waves for propulsion. With a large battery and payload capacity, and a trailer or crane straightforward launch and recovery options, the SP-48 is a flexible maritime platform for a wide variety of commercial, defense, and scientific applications. Autonomy functions include programmable course navigation with real-time on the fly changes, waypoint settings, station keeping and Automatic Identification System (AIS) vessel detection and avoidance. The SP-48 platform is sensor agnostic and has ample power to support a wide variety of third-party instrumentation such as ADCPs, acoustic modems, acoustic positioning systems (USBL, LBL), acoustic hydrophones, side scan sonars, multibeam sonars, sub-bottom profilers, inertial navigation systems, motion reference units and water quality measurement systems. Custom sensor integrations available. *Alessandra Bianchi,* abianchi@seatrac.com, www.seatrac.com

Suburban Marine develops novel solutions to underwater exploration, bringing cutting edge aerospace technology to the marine market. Suburban Marine is skilled in autonomous system design and integration, and can provide full stack, custom solutions to your problems. *Matt Moldovan,* matt.moldovan@suburbanmarine.io, suburbanmarine.io

Teledyne Marine is an organization comprised of 23 leading-edge undersea technology brands that have been assembled by Teledyne Technologies Inc. Through acquisitions and collaboration, Teledyne Marine has evolved into an industry powerhouse, providing the widest breadth of marine technology in the industry, now available through a single supplier. Teledyne Marine's technology verticals include: seismic technology; subsea and surface vehicles; interconnect and cable solutions; imaging technology; and subsea and surface sensors and instrumentation. The focus of our demonstration at WHOI's CMR event will be Teledyne Benthos' underwater acoustic technology. Teledyne Benthos designs and manufactures a wide range of rugged, reliable oceanographic instrumentation and sensor solutions for the marine environments. Product lines include: acoustic releases, acoustic modems, and acoustic positioning systems; hydrophones; glass flotation spheres and instrument housings; towed survey platforms; and locating devices. *Carl Mancuso,* carl.mancuso@teledyne.com, www.teledynemarine.com

WWF has been protecting the future of nature for nearly 60 years. The world's leading conservation organization, WWF works in 100 countries and is supported by more than one million members in the United States and close to five million globally. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature. *Paul Dobbins,* Paul.dobbins@wwfus.org, www.wwfus.org