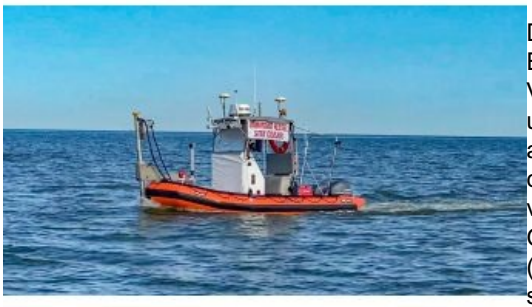
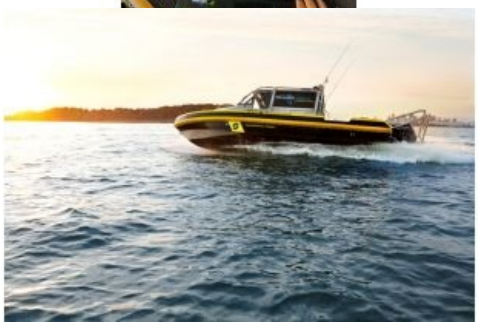
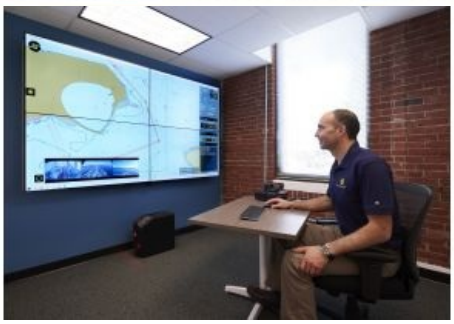
SEA MACHINES AUTONOMY ENABLES DEA MARINE SERVICES TO INCREASE OPERATIONAL PRODUCTIVITY

More Data with Less Effort and Risk







DEA Marine Services, a division of David Evans and Associates, Inc. (DEA), of Vancouver, Wash., has invested in and utilized Sea Machines Robotics' autonomous command and remote helm control system aboard DEA survey vessels to more efficiently fulfil a National Oceanic and Atmospheric Administration (NOAA) contract to survey more than 60 square nautical miles of the West Galveston Bay. Approximately 15% of the total survey mileage was acquired autonomously. The Texas survey, a prototype mission for unmanned operations, posed numerous challenges to marine surveyors, including a large geographic area, variable shallows, numerous obstructions and unpredictable sea conditions. For DEA, Sea Machines' innovative technology increased the operational productivity of the vessels involved.

Integration and Installation

Following the installation of the SM300 aboard an existing DEA survey vessel in November 2020, DEA completed sea trials and began operations in Galveston Bay, the area designated by the US Coast Guard for unmanned vessel operations for the project. This SM300 system allowed the survey vessel *Sigsbee* to operate as a daughter craft and provided DEA with new capabilities that increased the vessel's value.

The SM300 comes equipped with an on-board, ruggedized computer powered by TALOS technology ('the brain') that allows operators to plan, track and record missions using Electronic Navigation Chart (ENC) information. Although not integrated for this survey, the system missions can consider and interpret data from radar, AIS, GPS, ENCs and more to help operators execute highly efficient, predictable and safe routes.

A view from the bridge of the mothership: an on-board operator sets the flanking offset distance of the daughter craft Sigsbee (shown) using the Sea Machines SM300 as it autonomously surveys West Galveston Bay. (Photo credit: DEA)

DEA also installed a wireless network to enable crew aboard the manned vessel to command and control the survey PC and instrumentation aboard the *Sigsbee*. Working with Hypack, the unmanned vessel coverage was displayed with the manned vessel coverage, and lines started and stopped in sync with the Hypack software. DEA network specialists also installed a remote access capability aboard all vessels to enable DEA lead hydrographers to control PCs and instrumentation from anywhere with internet access.

More Data Collection, Less Risk and Effort

With the Sea Machines technology integrated aboard *Sigsbee*, DEA was able to start executing autonomous missions in reduced crew or unmanned configurations from a nearby support boat. To meet the unique needs of the NOAA project requirements, DEA chose to integrate its command station aboard a second, larger vessel that would serve as the mothercraft for the mission with the *Sigsbee* collaboratively following.

“Having the flexibility to operate a survey vessel manned or unmanned offered tremendous versatility in the conduct of a tough survey. In open waters, the *Sigsbee* would run unmanned, collaboratively following and thereby widening the swath of the manned vessel in the shallow waters of Galveston Bay. In tight quarters around structures, the *Sigsbee* served as a manned platform that could run at shallower depths and was more manoeuvrable than the larger vessel,” said DEA Marine Services’ senior vice president and director Jon Dasler, PE, PLS, CH.

Sea Machines-enabled autonomous vessel Sigsbee conducts survey missions seven days per week, effectively doubling the conventional productivity. (Photo credit: DEA)

Sea Machines technology enhances the value of hydrographic survey operations through wireless remote control via an industrial-grade belt pack. This capability gives the freedom to command and control vessels and on-board payloads – such as winches, sonar and other equipment – from any location on or off the vessel, from a line-of-site position up to a kilometre away. The belt pack is used to manually command the vessel when not in autonomous mode and is of particular value during launch and retrieval processes.

Multiple survey vessels can also utilize Sea Machines’ collaborative autonomy behaviour, which allows two or more vessels to mirror one another’s course, heading and speed for a force multiplier effect. Autonomy also improves vessel-tracking precision over planned survey lines to reduce cross-track error and excessive data overlap. Pairing manned mother vessels with unmanned daughter craft, as DEA has done, reduces crew expenses and maximizes production during favourable weather windows with fewer crew, and minimizes the number of staff on weather days.

But the value of today’s autonomous technology does not stop when the mission ends. When operations cease, mariners have access to archived mission data. This data can inform operators on ways to improve work on the water or can be repurposed as plug-and-play inputs for future projects.

Crews who use autonomous systems report greater job satisfaction due to the technology’s ability to shift recurring and repetitive tasks from manual to automated operations, allowing the mariners to focus on higher-level work. Sea Machines also helps to reduce operator fatigue, a major casualty factor in marine incidents during night-time operations, repetitive or tedious work, and challenging sea states. The company’s technology also offers automated obstacle detection and collision avoidance capabilities to reduce the risk of dangerous and costly incidents on the water.

“It’s clear that adding autonomy to workboats and survey craft can reduce operational costs significantly via increased on-water productivity time, fine course control, reduced crew changes and, in some cases, lowered crew expenses,” said Sea Machines’ Phil Bourque, director, business development. “The mitigated risk at sea speaks for itself in terms of keeping crews safe and vessels in operation.”

“Part of the peace of mind in using Sea Machines is in its flexibility. We have the power to decide when to operate in crewed or unmanned configurations, based on individual circumstances,” said Dasler. “It also means that the crew can override autonomous operations at any time and resume them when appropriate. This feature is one way in which we ensure work continuity in constantly changing marine conditions.”

One of Sea Machinesâ€™ autonomous test boats Lightning, outfitted with the SM300 autonomous command and control system. (Credit: David Shopper/Sea Machines)

600 Autonomous Miles Surveyed

Sigsbee hit the water in November 2020 and began autonomously executing survey routes in the bay. Since then, DEA operators located aboard the mothership have commanded the autonomous *Sigsbee* as it conducts survey missions seven days per week during favourable weather, amplifying the conventional productivity of this type of survey.

“*Sigsbee* has increased coverage by operating without an on-board crew, while collaboratively following another DEA-staffed hydrographic survey vessel, which serves as the mothership. The goal has been to cover the bay’s large and shallow survey areas more efficiently than traditional, crewed survey vessel operations and to minimize staff in the field during the pandemic,” said Dasler.

By March 2021, the Sea Machines-enabled survey craft had navigated more than 600 nautical miles autonomously, providing accurate and precise data in a highly efficient manner for a significant portion of the project area.

“Deploying the SM300 system for this mission has allowed DEA to conduct marine surveys with improved predictability, speed of data collection and at-sea safety,” said Bourque. “Sea Machines is pleased to support DEA and NOAA during this critical mission and others like it in the future.”

Intelligent Technology on the Horizon

The marine industry is on the cusp of even larger changes due to this surge of technological innovation. The next wave of progress will include artificial intelligence (AI)-powered perception systems that will provide advanced situational awareness for unmanned and optionally manned applications. Such technology will add to the existing picture of a vessel’s surrounding domain using conventional sensors, by including new capabilities to detect and classify traffic and obstacles using data from real-time image processing.

The main advantage of advanced perception and situational awareness technologies is the reduced risk of uncontrolled incidents,

accidents and delays that impact schedules and reduce operators' bottom lines. These incidents are traditionally caused by limitations in conventional vessel instruments and the perception limitations of human operators.

Sea Machines is now trialling its AI-powered perception and situational awareness technology aboard an A.P. Moeller-Maersk new-build VISTULA ice-class container ship in Denmark. The project has been significant not only to Sea Machines and Maersk, but also to the larger maritime industry as the installation marks the first time that computer vision, Lidar and perception software have been utilized aboard a container vessel to augment and upgrade transit operations.

A Sea Machines employee manages and monitors an autonomous vessel at sea from a shore-based remote command station. (Credit: David Shopper/Sea Machines)

Autonomy Is the Future, Today

Autonomous control and intelligent perception systems are differentiators for hydrographic surveyors. Vessel operators who offer these efficiencies and technology-based solutions will define themselves as forward-thinking, relevant and highly competitive.

"DEA is committed to the advancement of technology and being on the leading edge," said Dasler. "We see autonomy as the future of hydrography and have enjoyed working with Sea Machines and additional software vendors for continued improvements in autonomous operations and the use of artificial intelligence in data processing. We look forward to expanding the use of the *Sigsbee*, now outfitted with the SM300 system, on future projects."

It's up to all of us in the industry, whether we are vessel owners, surveyors or mariners, to recognize the value that modern technology brings to operations by way of increased productivity, predictability and safety. Those who capitalize on today's available technology will reap the greatest benefits as others in the industry play catch-up in the coming months and years.

Learn more:

www.sea-machines.com

www.deamarine.com