**Showcasing the DNR: World’s first freshwater test site for ‘smart ships’ launched in Lake Superior**

**By RACHEL COALE**

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**Editor’s Note:** Michael Beaulac of the Michigan Office of the Great Lakes and Dr. Guy Meadows of Michigan Technological University contributed to this story.

The spectacular rugged scenery, isolated Lake Superior shore, and quaint mining towns of northern Michigan’s Keweenaw Peninsula can make visitors feel like they’ve taken a step back in time.

However, with a recent dedication at the Great Lakes Research Center in Houghton, something new is on the way – a hub for the development of futuristic, state-of-the-art ‘Smart ship’ technologies.

The new Marine Autonomy Research Site (MARS) will serve as the world’s first freshwater location for testing unmanned (autonomous) surface and underwater vessels for operation in Great Lakes and U.S. coastal waters.

The dedication drew representatives from Gov. Rick Snyder’s office, the Conference of Great Lakes and St. Lawrence Governors and Premiers, Great Lakes shipping companies, legislators, the U.S. Coast Guard and Transport Canada, and local dignitaries interested in learning how the site is expected to benefit Great Lakes science, research and industry.

The Michigan Office of the Great Lakes – an office within the Michigan Department of Natural Resources that supports efforts to protect, restore and sustain Michigan’s waters and Great Lakes communities – assisted with development of the testing site.

“This innovative technology will help researchers develop integrated systems to collect data and inform Great Lakes management decisions,” said Jon Allan, director of the Office of the Great Lakes.

**Technology demonstrated**

The launch ceremony featured a demonstration highlighting advanced autonomous technology on the Portage Canal. A small surface vessel captured the contours of the bottom of the canal (bathymetric profile), and an autonomous buoy was demonstrated capable of maintaining position and moving itself when needed.

Additional unmanned surface and subsurface vehicles were on display.

The MARS project test site will be managed by Michigan Technological University, which plays an integral role in Great Lakes research on lake ecology, fish biology and ecosystem change.

The testing area extends within a 30-mile radius of the university’s waterfront campus, where the Great Lakes Research Center is located.

“Shipping will look different in 25 years, largely because of the work done here,” said David Naftzger, executive director of the Conference of Great Lakes and St. Lawrence Governors and Premiers.

The area already is served by the university’s high-accuracy, real-time, GPS survey system, its fleet of crewed research vessels and a licensed mariner, along with all U.S. Coast Guard testing requirements for monitoring and verifying vehicle location and performance.

The Coast Guard’s Duluth-based Marine Safety Unit is working with Michigan Tech MARS researchers on developing interim guidelines and protocols for the unmanned vehicle deployment and testing.

Testing will include the viability of vehicle sensors, anti-collision capabilities, shore monitoring, and vehicle-to-base-station communications.

**Looking to the future**

University researchers envision unmanned surface and underwater vessels being used to augment manned research ships to transport remote-sensing technology, collect sonar and video imagery, deploy under frozen Great Lakes waters to gather winter samples and venture to sites unsafe for humans.

While the types of autonomous vessels to be tested at the MARS site could include larger vessels, they will initially be research- and survey-grade boats and underwater drones less than 33 feet in length overall. Examples of typical, unmanned, survey-grade surface vessels include the [ASV Global “Co-Worker”](https://www.asvglobal.com/product/c-worker-5/) and the [Liquid Robotics “Wave Glider.”](https://www.liquid-robotics.com/wave-glider/overview/)

Other testing could involve autonomous underwater vehicles monitoring structures such as pipeline for their integrity, identifying shipwrecks, like those found at the Thunder Bay National Marine Sanctuary and the Keweenaw Underwater Preserve, or mapping bottom substrate and recovering evidence when working with the Michigan State Police. An example of a typical unmanned underwater vehicle is the [OceanServer, IVER3](http://iver-auv.com/iver3S.html).

Regardless of the vessel size or type tested, much of the autonomous technology, such as anti-collision software, sensors and sensor fusion is expected to be similar and applicable to a wide spectrum of unmanned vessels and vehicles.

Therefore, the lessons learned will be transferrable to others who want the knowledge.

“This center put us on the cutting edge,” said U.S. Rep. Jack Bergman. “And if you’re not on the cutting edge, you’re behind.”

In its [2017 Michigan State of the Great Lakes Report](https://www.michigan.gov/documents/deq/2017_State_of_the_Great_Lakes_Report_Michigan_OGL_609330_7.pdf), the Office of the Great Lakes published an article noting that, “scientists in the upper Great Lakes, and Lake Superior in particular, currently lack the capabilities for real-time science observations during early- and late-winter periods, a large and critical portion of the annual thermal cycle.”

Samples usually are collected by scientists in small watercraft, but Lake Superior’s harsh winters and ice can make research both difficult and dangerous. Unmanned vehicles can help close a significant gap in knowledge and reduce the costs of human-led expeditions.

**Coalition achievement**

The dedication is a key victory for the newly-formed [Smart Ships Coalition](http://www.smartshipscoalition.org) of the Great Lakes and St. Lawrence. The coalition, established by resolution of the governors and premiers of the Great Lakes St. Lawrence in October 2017, is the region’s group for those involved in research, commercialization activities, workforce development, and regulatory matters pertaining to maritime autonomy and related automation technologies.

The coalition unites scientists, policy makers, resource managers, innovators, navigators and educators who share a common interest in the advancement and application of autonomous technologies operated in marine environments.

The organization’s web page notes that “in marine applications … the state of adoption for autonomous technologies is lagging that of air and ground operations.”

The Smart ships Coalition plans to bring marine technology up to speed.

**Prime location**

The waters near the Keweenaw Peninsula, including seasonally “Arctic-like conditions,” make the new Marine Autonomy Research Site an ideal testing ground for developing expertise, platforms and equipment that can withstand extreme Great Lakes and oceanic conditions.

This area also allows the technology to be tested where it will not interfere with commercial shipping or recreational boating.

Michigan’s manufacturing expertise and abundance of working waterfronts also position the state for success at the forefront of this new arena. Autonomous technologies have the potential to accelerate new developments in many industries.

The Great Lakes Commission reports that the shipping industry in the Great Lakes-St. Lawrence system supports about 120,000 jobs. Science and engineering account for about 40,000 jobs, and manufacturing employs nearly one million people.

Autonomous vehicles have many potential applications to accelerate progress and create new jobs for Great Lakes scientific research and in shipping, manufacturing and maritime industries.

**Plan for action**

Coinciding with the MARS test bed launch, the region’s governors and premiers released a [Smart Ships Action Plan](http://www.gsgp.org/media/2083/gsgp_smart-ships-action-plan.pdf). The plan includes policy actions for the federal governments, states and provinces and industry to help the region become a leader in this rapidly growing sector.

Smart ships represent a major leap forward in maritime technology. The regional Smart Ships Coalition will be working to implement the action plan and further establish the region as a global center of excellence for smart-ship technologies.

“The opening of the Marine Autonomy Research Site at Michigan Tech is another important step for our region and will help accelerate our work to create the needed policies and regulations for smart ships,” Allan said.

Learn more about work to support healthy Great Lakes waters and communities from the [Office of the Great Lakes](http://www.michigan.govv/ogl), and explore Michigan Technological University’s role in Great Lakes science with its [Great Lakes Research Center.](https://www.mtu.edu/greatlakes/)

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**/Note to editors:** Contact: Mike Beaulac 517-284-6701 or [John Pepin](mailto:pepinj@michigan.gov), Showcasing the DNR series editor, at 906-226-1352. Accompanying photos are available below for download and media use. Suggested captions follow. Credit: Michigan Department of Natural Resources, unless otherwise noted.

[**Allan:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059427/Allan.jpg) Jon Allan, director of Michigan’s Office of the Great Lakes, talks at the Aug. 10 dedication ceremony at the Great Lakes Research Center in Houghton.

**[ASV:](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059428/ASV.jpg)** ASV Global’s “Co-Worker 5” vessel is shown being launched. (ASV Global photo)

[**Bergman:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059429/Bergman.jpg) U.S. Rep. Jack Bergman makes remarks at the Aug. 10 dedication ceremony at the Great Lakes Research Center in Houghton.

[**Demonstration:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059430/Demonstration.jpg) A modified jet ski cruises past an autonomous buoy that is holding station. Michigan Technological University officials required the presence of a human on the jet ski for safety purposes, although the man was not driving it.

[**Glider:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059431/Glider.jpg) The Liquid Robotics “Wave Glider” is shown from underwater. (Liquid Robotics photo)

[**MARS Map:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059432/MARS%2BMap.jpg) A map of the Keweenaw Peninsula showing the Marine Autonomy Research Site (MARS) boundary centered on Michigan Technological University in Houghton.

[**Meadows:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059433/Meadows.jpg) Dr. Guy Meadows, director of the Great Lakes Research Center in Houghton, speaks during the Aug. 10 dedication at the center in Houghton.

[**Monitors:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059434/Monitors.jpg) These monitors show the forward-facing view taken from a set of cameras mounted on the autonomous surface vehicle being demonstrated on the Portage Canal.

[**Vehicle:**](https://content.govdelivery.com/attachments/MIDNR/2018/08/22/file_attachments/1059435/Vehicle.jpg) A jet ski that has been modified by Michigan Technological University to operate autonomously is shown. The watercraft is part of a Defense Advances Research Projects Agency project to test this particular hull configuration in waves at scale.**/**