Q&A: Ron Tremain, VP Maritime Domain Awareness, Saildrone Inc.

Ron Tremain, with two Saildrone systems in the background. The company offers its unmanned surface vessels in three different sizes. *SAILDRONE*

Ron Tremain hails from Sherwood, Oregon, and is the vice president of Maritime Domain Awareness for Saildrone Inc. Prior to coming aboard Saildrone, Tremain led the maritime business development team at Insitu and consulted on aviation programs at Boeing.

Tremain's history of maritime operational success is demonstrated by his 23-year career as one of the first elite U.S. Coast Guard rescue swimmers and by his strong track record of building some of the largest and most successful autonomous maritime programs, as evidenced by the highly successful U.S. Coast Guard ScanEagle program and his work protecting national security and battling illegal, unreported and unregulated fishing; piracy; and transnational organized crime in the U.S. government and international arenas.

Tremain responded to questions from Senior Editor Richard R. Burgess.

What is Saildrone?

TREMAIN: Saildrone is a company building and operating unmanned surface vehicles [USVs] that are powered primarily by solar energy, with wind being the primary propellent for the craft. Our founder, Richard Jenkins, has set a number of world records in the sailing industry before coming to the autonomy world, and he brought his technologies and his experience into creating a vehicle that has the capability to operate at long

range and long endurance with primarily solar and wind power.

We have three difference sizes of platforms: Our smallest is the 23-foot-long Explorer. Our medium size is the 33-foot-long Voyager. Our largest size is the 72-foot-long Surveyor. The carbon-fiber sail on each is more like a wing than a sail but is a sail that can be controlled mechanically and with the wind. Depending on which direction we want it to sail, the operator can make adjustments to increase the speed, decrease the speed, change course direction as needed. The largest USV, Surveyor, also has a diesel engine installed to augment the generator and to drive an underwater propeller as needed.

The speed of the Saildrones depends on the wind and on the size of the vessel. Surveyor can do at more than 9 knots, Voyager can do 7 knots plus and Explorer typically does up to 4 knots, but it can do 4 knots plus.

What kind of sensors equip Saildrones?

TREMAIN: For sensors, the USVs are fitted with an advanced sensor suite of atmospheric and oceanographic sensors, combined with MDA sensors such as AIS [Automatic Identification Systems], radar. Depending on the configuration, we have either four to 16 cameras that are pointing in a variety of directions but overlap 360-degree cameras to give a complete picture of the vehicle's surroundings. The USVs also can be fitted with towed arrays.

How is the data transmitted to the user?

TREMAIN: All data coming off a Saildrone is real-time and is on a secure network, so it is mission hardened ready for military applications. The data will be linked directly into systems like Minotaur, which is the mesh network for the U.S. Department of Homeland Security and other services. The advantage of that means that they don't have to have a standalone data feed for Saildrone. The data goes right into the existing architecture.

What are some of Saildrone's operations?

TREMAIN: It's important to note all three vessels are equipped to be at sea for six months or longer. So it's a real force multiplier and a game-changer to current operations, because it allows an autonomous vehicle to be at sea for extended periods of time and at extreme ranges. To put it into perspective, not long ago we launched USVs from our site base in Alameda, California, and they currently are conducting fisheries operations in the Bering Sea, tracking and surveying tagged king crabs for a fisheries consortium. We've done the same with other fisheries and government agencies. The government and fisheries can do a comparative analysis and determine the best recommendations for a particular fishery.

With respect to the Coast Guard, Voyager fits very well for their mission of countering illegal, unreported and un-regulated fishing [IUU], which has overtaken piracy as a maritime law enforcement problem. In addition to countering IUU fishing, USVs could conduct long-duration intelligence, surveillance and reconnaissance missions to enable narcotics interdictions.

Last year, we conducted an operational demonstration for the Coast Guard's District 14 in Hawaii, a very good showing of the capabilities and how we can inject into current operations. We also learned that there were some shortcomings, so we went back to the drawing board and created our middle-sized vessel, Voyager, our flagship for maritime domain operations. Our larger platform, Surveyor, was built for the mission of bathymetry, surveying the ocean floor. But all three USVs are basically utility vessels and can be configured as appropriate to customer needs based on space-weight-power requirements.

Saildrones have conducted the first eastbound and westbound crossings of the Atlantic Ocean. They have tracked fish in the North Sea, surveyed ocean eddies off Africa and air-sea heat

transfer over the Gulf of Mexico and discovered a shipwreck in the gulf. They have sailed up to and into bands of Arctic sea ice.

Explorer has done several missions worldwide to include circumnavigating Antarctica and then returning to Alameda, a journey of over 12,000 miles and 196 days. It has been used for many years now to conduct fishery surveys, bathymetry, NOAA [National Oceanic and Atmospheric Administration] operations, and other science and oceanographic operations. It's been quite successful.

Saildrones have been used by NOAA and a university to study great white sharks between California and Hawaii, resulting in a lot of new knowledge about them. We're also conducting a lot of weather operations, providing real-time weather data feeds from every hour from each vessel to NOAA and to the National Weather Service. Most weather patterns develop over the ocean and are tracked by satellite, but lacking are data on water salinity and temperature, etc. Now, we're able to provide real-time, accurate reports of weather conditions wherever Saildrones are deployed.

A Saildrone Explorer in action. *SAILDRONE*
What business model does Saildrone use?

TREMAIN: A customer could either make an acquisition outright or lease services. COCO [contractor owned, contractor operated] services has been our primary source of revenue. We provide the service and maintain the equipment thereby affording government agencies. As with UAVs, the services model is working quite well for the government because they can avoid the high cost of hiring additional personnel or pose additional risk to personnel at sea.

Customers typically pay by the day for USV services, because we provide 24/7 surveillance and a 24/7 data feed from the

Saildrone. That's a real advantage compared with UAVs where customers pay for so many hours per day.

Can you deploy Saildrones to launch from remote sites?

TREMAIN: It depends on the geographic location, the operation, its duration and what is most cost effective. We can transport out to the location, but for many operations, we launch from Alameda, sail to the destination, conduct operations and recover back. We'll repair on site as needed and continue the operation. With the current king crab mission, we deemed it appropriate to launch from Alameda and sail them north. For other missions in Alaska, it made best sense to transport them to Dutch Harbor for launch.

How many Saildrones do you have in inventory now? Does your company build or procure them?

TREMAIN: We have about a hundred, based in a hangar at the former Naval Air Station Alameda, which also is the location of our data center. Incoming data arriving via satellite can also be shared to government networks, for example the Customs and Border Protection [CBP] Caribbean Air Marine Operations Center in San Juan, Puerto Rico, or the Air and Marine Operations Center in Riverside, California. That allows CBP and all DHS agencies to take that information, inject it into their architecture and then make an educated decision on where, when and how to operate.

We currently manufacture all of our platforms. We did have some assistance on building Surveyor. But the company has gotten to the size where the number of platforms deploying is so great that we most likely will have to outsource some of the keels and such to shipbuilders. It's a good problem to have.

Where do you see Saildrone potentially fitting in Coast Guard operations?

TREMAIN: The Coast Guard is planning for the next 20 years on how to bring autonomy into their operations. Their ScanEagle program is up and running and doing a great job. The Coast Guard stood up a UxS program office last year to build their long-term unmanned system and autonomy strategy for the next 20-25 years.

The Coast Guard always has been a little budget-challenged, priding itself with doing more with less. Providing capabilities like Saildrone allows them to do more with less. It's a cost-effective solution that provides critical data so they can better make decisions and can better prosecute the missions and more effectively use their personnel. We look forward to doing more work with the Coast Guard and the other branches of the military going forward. I think the Coast Guard is really going to cross-pollinate their autonomous capabilities — their surface assets with their air assets.

An example: Saildrones conducting surveillance in a particular area can find friendly and unfriendly targets and provide that real-time data back to the Coast Guard. An aircraft like a Volansi vertical takeoff and landing UAV may be conducting a shore based coastal patrol, may be able to intercept and surveil the target of interest, while ScanEagle UAVs continue conducting ship-launched patrols. In theory, the USV and UAV will have the capability to talk to each other, forming a mesh network that expands the search horizon thereby allowing the UAV to track that target well after the Saildrone picked it up as a hot target. Being able to do that and other autonomous operations, I think is going to really increase the effec-tiveness of the Coast Guard.

For search and rescue, if Saildrones track a ship that is in a particular area and then that vessel sinks, having a patrolling Volansi UAV drop a small raft or a data marker buoy to the survivors then ascend to provide safe overwatch while the Coast Guard helicopter or cutter comes out to make the rescue.