

# HYCAT Autonomous Surface Vehicle

## Frequently Asked Questions (FAQs)

Whether you're interested in buying a HYCAT Autonomous Surface Vehicle or are just curious about how a HYCAT works, we have some answers for you.

### **Q - What is the difference between an Autonomous Surface Vehicle (ASV) and an Unmanned Surface Vehicle (USV)?**

**A** - USV stands for Unmanned Surface Vehicle. Basically the overlaying category, it's a generic term for unmanned vessel. So a remote controlled vehicle is a USV. An Autonomous surface vehicle (ASV) is a subcategory of the USV. It's basically an autonomous version of an unmanned surface vessel.



### **Q - Why is this a better solution than putting a guy on a jon boat to collect the data?**

**A** - An ASV's not always the best solution for where you're surveying. If you're surveying somewhere where there's a boat ramp and there's depth, and you already have an asset, and you can hang a sensor over the side, ASV can't cost-effectively compete with that solution.

But for most use cases, the ASV is the better solution because there's many times where the boat ramps are wet, you wanna be able to get into shallow areas, or you wanna double your coverage by using a force multiplier. Those are the main use cases for an ASV versus a traditional manned asset. There's also times where a manned asset just can't get into the places that it can to collect data or to launch a recovery that you can with an ASV.

### **Q - What is the YSI HYCAT?**

**A** - HYCAT is a multiparameter man portable survey ASV designed specifically to give surveyors access to data in remote areas that has previously been difficult, expensive, or impossible to acquire. YSI HYCAT has mature autonomy— It can operate without man in the loop.

### **Q - Who can benefit from the HYCAT? Is this a vehicle that can be used in more than one industry?**

**A** - The HYCAT can be used in Water quality studies, Source water volumetric calculations, Pollutant identification and mapping, Habitat mapping, General bathymetry, Forensics/search and rescue, and more!

### **Q - Is there anywhere that it cannot be used?**

**A** - HYCAT should not be operated in currents that exceed 6 kts and sea states that exceed Sea state 2. Best safe practices for small unmanned systems detail they should not be operated at ranges beyond which the

operator can maintain visual contact of the vessel. Telemetry range is 1.5 Km. (cellular, and sat coms can be made available.)

### **Q - How many people does it take to deploy the HYCAT? And how long will it continuously operate?**

**A** - One unique attribute of it is we designed it to be man-portable. So if you're carrying it as if it's loaded in the back of a pickup truck or a van, it would take two people. But we also offer a launch recovery cart for it which can be put on a small trailer or the back of a flatbed. And then one operator can usually watch and cover the vehicle on their own.

And in terms of endurance, a fully loaded HYCAT has the following endurance:

- a. 8.5 hours @ 2 knots
- b. 6.0 hours @ 3 knots
- c. 2.8 hours @ 4 knots

### **Q - What sensors are integrated into this system?**

**A** - The base boat can accommodate an ADCP (Sontek M9), multiparameter water quality sonde (YSI EXO 2), sidescan sonar (BluePrint SubSea Starfish 453), and L1/L2 RTK GNSS (Hemisphere AtlasLink) receiver simultaneously. Any configuration of these sensors can be installed at any time. Because of this the one HYCAT platform is a perfect solution for habitat mapping, stream gauging, cartography, port inspections, infrastructure inspection, search and rescue, disaster response, volumetric studies, and contamination studies.



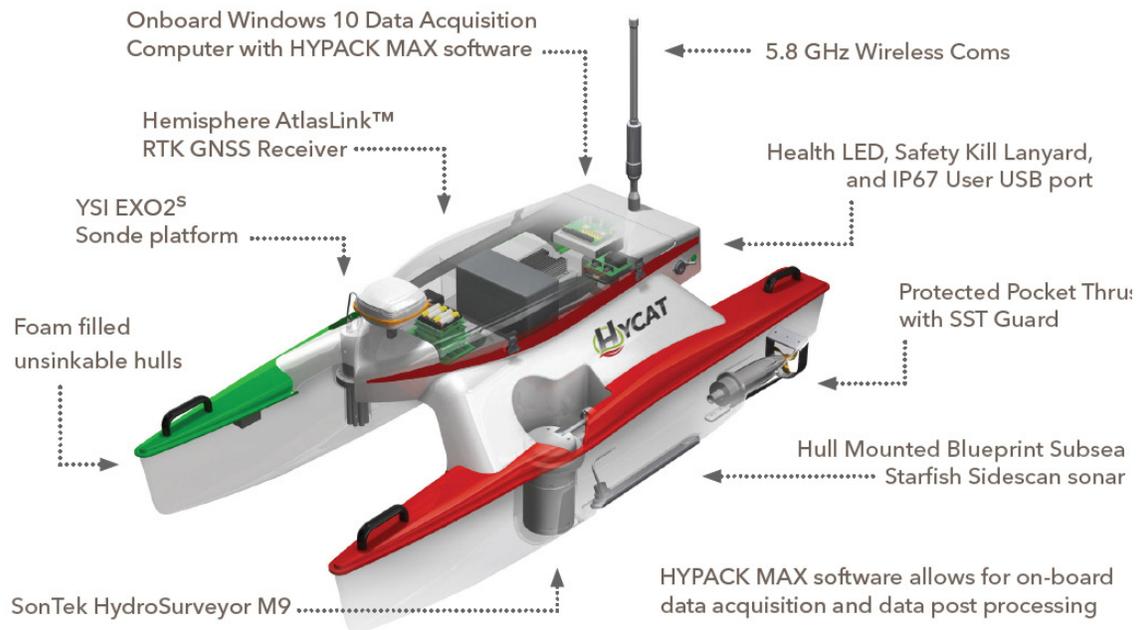
The base HYCAT includes:

- = HYCAT Vehicle Assembly
- = Camera (forward looking real-time)
- = Thrusters (protected and pocketed with SST guard)
- = Data Acquisition Computer (DAC)
- = 5.8GHz Wireless communications
- = Garmin 19x GPS
- = Base Station with receiving antenna/modem with computer

### **Q - Are we able to swap out these sensors for either instruments that I own rather than the ones that are specified or other third-party instruments?**

**A** - We can, but the base boat is specifically designed around the ADCP (Sontek M9), multiparameter water quality sonde (YSI EXO 2), sidescan sonar (BluePrint SubSea Starfish 453), and L1/L2 RTK GNSS (Hemisphere AtlasLink). If individual customers have a solution they need, then we can work with them to integrate whatever systems they need.

### **Q - How many software packages does it take to effectively run the HYCAT? And how**



### difficult is it to run? Do we provide training on that?

**A** - Only one software is required. The main interface is HYPACK, and HYPACK does require training for those who don't know it. The main purpose of the training is to understand how to acquire and post, process that data with it. Survey planning is relatively simple with HYPACK and the vehicle operation is also very straightforward.

### Q - What is different about the HYCAT compared to other ASV/USV on the market?

Several attributes put HYCAT in a league of its own:

1. HYCAT has dedicated ASV driver for HYPACK. This increases the safety and intuitiveness of HYCAT because there is only one interface for the system. Map based survey plans can be created and executed in real time. All acquired data can also be queried and visualized in Realtime via the same interface. This simplifies training, and reduces the overhead associated with learning how to operate this system.
2. HYCAT has an onboard Windows PC dedicated to data acquisition. This is a major advantage over systems that stream data shoreside or to the cloud. The onboard computer allows HYCAT to continue following survey lines and collecting data even in the event of a drop in communications to the shore side operator. HYCAT is impacted by breaks in the communication link. In the event communications are interrupted during a survey conducted by a streaming USV the transmitted data will be lost, and surveyors will later need to create new survey lines to later fill in the data gaps. (Please note that while HYCAT data is stored onboard it can be visualized, edited, and even post processed in real time via the Operator Shore side system.)
3. As a truly robotic system, HYCAT has many fail safes and health monitoring that allows it to continually adjust its behaviors and report its status. Such parameters protections include but are not limited to, electronics temperatures, motor temperatures, system current, motor currents, under voltage, over voltage, GPS data quality, heading data quality, communications link quality, Real time battery capacity, sensor on/off status, etc.

4. Safety Features. HYCAT has anti grounding capability, exit boundary fault monitoring, automatic return to user defined recovery position, Station keeping, and acquired hydrographic data quality monitoring (verify this HYPACK).
5. HYCAT has the right hull shape. Unlike mono-hulls, HYCAT is a catamaran specially designed to be efficient at survey speeds of 3-4 knots. HYCAT sensors are seamlessly integrated into the hulls. This reduces drag created by the sensors and allows HYCAT to offer best in class endurance, and approximately an 8 knot top speed with an ADCP, multiparameter water quality sonde, and side scan sonar deployed simultaneously. HYCAT has a tall surface presence which allows it to remain efficient in elevated sea states. Catamarans are inherently more stable in pitch and roll than mono-hulls. This important when conducting surveys with sonar.
6. HYCAT has pocket thrusters and an extremely shallow draft (.5'). This allows HYCAT to be intentionally or unintentionally run aground, without fear of damaging a thruster. This also allow HYCAT to safely operate in extremely shallow uncharted waters.
7. Foam filled hulls make HYCAT unsinkable.
8. Size. HYCAT can be lifted easily by (2) people, and fit in the bed of any standard size pickup truck, or SUV. No boat ramp, or hand dolly is required to launch this vessel.

### Q - How much does the HYCAT cost?

**A** - The cost of a HYCAT will range from the cost of the base boat to the cost of a fully loaded HYCAT. Variation in pricing are dependent on the particular configurations that you're looking. If there is customization, the price will be determined by the type of sensor selected and the amount of labor to modify / integrate. Please request a quote from your Local Sales Representative.

There is often an implied significant price difference between an unmanned vehicle and an autonomous vehicle. Although HYCAT is an autonomous vehicle, it still can be operated as an unmanned or a remote controlled vehicle. So this vehicle, although in the classification of an autonomous surface vehicle, it still can perform as an unmanned or a remote controlled vehicle as well. We can operate the HYCAT both ways. The main benefit of an ASV versus a USV is that there is automated functions that make it safer to use and more intuitive. With the HYCAT you can take the operator out of the picture. HYCAT is self-aware.

### Q - Can I rent a HYCAT?

**A** - Currently we do not have a HYCAT available to Rent. In the future we are working on an option to potentially rent and another option to have YSI Integrated Systems and Services provide a "survey as a service". Timing has not been established, but look for updates and information on our website [YSI.com/systems](http://YSI.com/systems).

### Q - When will the HYCAT be available? And what is the lead time we're looking to get a HYCAT?

**A** - The HYCAT is currently available for purchase and we are accepting purchase order now. Typical lead time for the HYCAT will be 6 to 8 weeks. Please contact your local sales representative to get an accurate lead time.



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