



## FDM Enables Direct Digital Manufacturing of On-Whale Tracking Device

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– Bob McCabe, Woods Hole Oceanographic Institute

Woods Hole Oceanographic Institute (WHOI), renowned for its role in the discovery of the Titanic, continues on its mission of research at the frontiers of ocean science. In its quest to understand ecological interactions and ecosystem function, the organization has developed a system for continuous, 3D tracking of earth’s largest mammals.

From the ocean’s surface to nearly a mile down, WHOI built acoustic tracking systems that monitor the movements of whales. A key component is a transmitter secured on the backs of the research subjects. Relaying information to detection buoys, the device houses sensitive instruments that report global position and depth.

On-whale tracking devices provide a difficult manufacturing challenge. Accuracy is critical because the enclosure is built in two halves and is held together only through a snap-fit. Mechanical strength is critical because the shell protects the instruments inside against mechanical shock. Enclosures for on-whale tracking devices were machined from plastic in the past but this was expensive because it required large amounts of skilled manpower and machine time.

“In the past, when we built the enclosures for whale trackers on CNC machines, we had to keep the geometry simple because complex shapes would greatly increase manufacturing costs,” says WHOI Supervising Engineer Bob McCabe. “Then we heard about FDM and its ability to produce polycarbonate or ABS parts with the strength and accuracy of molded or machined plastics.”

WHOI engineers used an acoustic design program to optimize the shape of the enclosure. While in the past they have had to simplify shapes, in this case they were able to use the ideal acoustic design.

“When we designed the latest on-whale enclosure we were able produce a much more streamlined shape that provides better acoustic performance and produces less drag by taking advantage of the design freedom that FDM offers.”

Engineers also integrated mounts for all of the instruments in the enclosure. In the past they had to make separate mounting hardware and screw or glue it to



*Image 1: Whale with tracking device mounted on back.*

*Image 2: The tracking device is held together with snap fits and must be accurate and durable.*



Image 3: The tracker stays water-tight at high pressures one mile below the ocean surface.

the enclosure. The ability to integrate the mounts in the enclosure significantly reduces the cost of the tracking device.

“The accuracy, strength, and design freedom provided by FDM has helped us improve the performance and reduced the cost of many of our products,” says McCabe. “The Stratasys FDM system produces parts with the strength and accuracy to survive and provide data while as deep as a mile beneath the Atlantic Ocean.”

While FDM allowed production of a cost-effective, optimized design, there were other advantages. Attached to a whale, the tracker’s enclosure had to protect against mechanical shock and withstand the pressures of the deep. Its snap-fit design also needed tight accuracy to ensure that the enclosure remained sealed. “[For additive fabrication processes] only FDM can provide the mechanical strength and accuracy needed for production of on-whale trackers,” says McCabe.

For more information about Stratasys systems and materials, contact your representative at +1 888.480.3548 or visit [www.stratasys.com](http://www.stratasys.com)

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