



Human Occupied Vehicle *Alvin*



WHOI operates the U.S. Navy-owned Deep Submergence Vehicle *Alvin* for the national oceanographic community. Built in 1964 as one of the world's first deep-ocean submersibles, *Alvin* has made more than 4,400 dives. It can reach nearly 63 percent of the global ocean floor.

The sub's most famous exploits include locating a lost hydrogen bomb in the Mediterranean Sea in 1966, exploring the first known hydrothermal vent sites in the 1970s, and surveying the wreck of RMS Titanic in 1986.

Alvin carries two scientists and a pilot as deep as 4,500 meters (about three miles) and each dive lasts six to ten hours. Using six reversible thrusters, *Alvin* can hover, maneuver in rugged topography, or rest on the sea floor. Diving and surfacing is done by simple gravity and buoyancy —water ballast and expendable steel weights sink the sub, and that extra weight is dropped when the researchers need to rise back up to the surface.

The sub is equipped with still and video cameras, and scientists can also view the environment through three 30-centimeter (12-inch) viewports. Because there is no light in the deep, the

submersible must carry quartz iodide and metal halide lights to illuminate the seafloor. *Alvin* has two robotic arms that can manipulate instruments, and its basket can carry up to 680 kilograms (1,500 pounds) of tools and seafloor samples.

Though it is the world's oldest research submersible, *Alvin* remains state-of-the-art due to numerous reconstructions made over the years. (For instance, a new robotic arm was installed in 2006.) The sub is completely disassembled every three to five years so engineers can inspect every last bolt, filter, pump, valve, circuit, tube, wire, light, and battery—all of which have been replaced at least once in the sub's lifetime.

The sub is named for Allyn Vine, a WHOI engineer and geophysicist who helped pioneer deep submergence research and technology.