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ENGINEER ASSISTANT, PILOT-IN-TRAINING



Matt Barton/WHOI

“The new *Alvin* has five windows. It has three up toward the front that are 7 inches across on the inside (and 17 inches across outside), and two smaller ones off to either side that are 5 inches in diameter on the inside (and 12 inches across outside). These are considerably larger than the windows we had before.

The larger sides of the windows face out to the ocean, so that as *Alvin* goes deeper and is subjected to greater pressure, the windows will be forced inward against the titanium hull. That strengthens the seal between the window and hull.

The windows are acrylic, a type of plastic. At a test facility in Texas, the windows were subjected to a test pressure of over 12,000 pounds per square inch. This translates to about 680 tons of force on the small windows, and over 1,300 tons on the larger ones. That is almost twice the pressure *Alvin* will experience at its current maximum operating depth of 4,500 meters (about 15,000 feet). Eventually, *Alvin* will be rated for dives to 6,500 meters, or a little over 21,000 feet.

When we receive each window from the manufacturer via the test facility, we check its dimensions to make sure that the window has not changed shape under all that pressure. We also perform a visual inspection on the windows to make sure there are no inclusions (like particles or foreign objects) or voids (like bubbles) that might have crept into the acrylic during

manufacture, and which could compromise the integrity of the windows under pressure.

In this photo, I am performing a visual inspection on one of our smaller windows. Working in the dark with a bright, handheld light placed at different positions and angles allows us to see the quality of the window in detail throughout its thickness. Fortunately, this window passed inspection and will soon be keeping the observers and pilots inside *Alvin* safe and sound, while giving them an enlarged and crystal-clear view of the ocean depths around them.

I joined the *Alvin* Group in May of 2011, after the submarine had begun the current overhaul and upgrade process. As a mechanical technician, I work to rebuild, test, and integrate the components of all of *Alvin*'s various mechanical systems—the variable ballast system that modulates the submarine's weight during a dive, the hydraulic system that drives our manipulators and tools, the thrusters that we use to move around the terrain of the ocean floor, and so on. It's a lengthy process that involves a lot of rebuilding, testing, and installing components like relief valves, check valves, pipes, hoses, solenoids ... and oh yeah, windows.

Once the upgraded *Alvin* was fully reassembled and under way again, I officially moved into the pilot-in-training program and began the process of becoming an *Alvin* pilot. All of which is, to be honest, already a dream come true. ▲