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WELDER



Tom Kleindinst/WHOI

The changes made to upgrade *Alvin* also changed the sub's buoyancy. The engineers decided that to get the weight balance right, they had to move two cylindrical pressure cases—parts of the ballast system—from the back of *Alvin's* frame closer to the front, underneath the personnel sphere.

The pressure cases are 10 to 12 inches in diameter, and the holes in the sub's frame weren't big enough to fit them. The ends of the holes had to be enlarged. They were talking about having a special hole-saw custom-made, which would take months.

It was taking too much time trying to figure out how to do it. And I said, 'Well, why don't we just carve it out, you know? Give me a jigsaw, there's no time, let's just get this done.' I've known Bob McCabe, my supervisor, for about 30 years, and he knows my capabilities. He knows I have a very varied background in metals, and he was like, 'Yeah, go ahead.'

There was no easy way to do it. The only way was just all manually, very slow. You couldn't use a cutting torch, couldn't use a plasma cutter, because the titanium personnel sphere was right there next to me, and titanium becomes 'embrittled' above about 800 degrees Fahrenheit, if it isn't in a shielded gas environment.

We made steel templates for the hole enlargements and clamped them in place on the sub's frame. I cut around them

with a jigsaw with a metal-cutting blade, a rough cut. Then I trimmed the titanium back to the steel templates with a grinder—little by little by little.

I worked on my knees for about a week doing each side. In this picture, I'm on *Alvin's* starboard side, working on the second hole of four, two on each side of the frame. If you go over to the sub and look, you could never tell that they were hand-done. When they were done, the holes looked kind of like a dog bone or barbell.

I work with my hands. I've been in metals since high school. I studied to be a sculptor, ended up as a blacksmith, from a blacksmith to a horseshoer, from a horseshoer to building bridges.

Then I got hurt building bridges and said, 'I'm going to work on something I really love,' and I built America's Cup yachts for 20 years. That's where I met Bob McCabe. The yachts were the old 12-meter ones, made of aluminum. Then the 12-meters had gone away, and all the boats were fiberglass or carbon fiber. Bob was at WHOI then and said, 'Hey, you want to go back and do metal again?' So I came here 17 years ago. It's never been dull. The great thing about working here is that you never do the same job twice, it seems like. ▲