

**SVC Summary report:  
*Alvin* ergonomics  
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**1. Introduction**

The new *Alvin* sphere is markedly larger than the old sphere, and hosts an all new vehicle interface, life support system and observer “accommodations.” The ergonomics of the personnel sphere have been the subject of discussion for over three years, during which time input was solicited from the community and ideas were incorporated into the current design. Here we provide a brief summary of the sphere’s ergonomics, along with some suggestions for future improvements.

**2. Seating and viewports**

As in the older *Alvin*, the sphere can accommodate three persons, typically one pilot and two scientist observers. Seating in the upgraded vehicle, however, is much more accommodating. The sub has been equipped with thick foam mats that provide a variety of comfortable seating positions for people of different shapes and sizes. Those on the smaller side found the seating to be quite comfortable, and felt comfortable sitting nestled between their forward and side viewport. In that position, they were able to stretch their legs out into the middle of the sphere, and still be able to quickly turn between the viewports as well as the video monitor, which sits aft of the side viewport roughly above the CO2 scrubbers. Larger observers also found the sphere to be far more comfortable, and found that the added room becomes quite apparent after being in the sphere for a couple of hours.

The forward viewports are spectacular. Most observers were delighted with the overlap between the pilot’s and observers’ viewports. Observers also commented on the spectacular field of view that one has when they sit up close to the viewport. The side viewports were also appreciated by some observers, though they are the same size as the viewports in the old *Alvin*.

Larger persons, however, tend to sit in a position that covers the side viewports. This is uncomfortable unless the viewport is covered with the foam mat (the *Alvin* ops personnel had the foresight to provide a foam mat to cover this side viewport). Thus, larger persons tended not to use the side viewport that often. This is fine when the vehicle is working away from hydrothermal vents, but may be problematic when working in more challenging areas (note that the windows all have temperature monitors, which is beneficial in alleviating this concern). Also, larger persons found that the Velcro strips that held the mat sections together would be oriented such that they came undone. The hook fasteners would sometimes snag on the observer’s clothes. This can be remedied by re-orienting the Velcro so that a person sliding around on the mat does not inadvertently uncouple the strips.

It should also be noted that some larger observers found that they could stand up behind the pilot during the dive, and observe operations over the pilot’s shoulder for a few

minutes. They found this to be a comfortable way to stretch during the course of the dive, and the pilot did not find it obtrusive. This also opened up the observer's viewport for use by the pilot.

One other issue is the pilot's seat, which does not seem to be best for the pilots (though this really is in their purview).

### **3. Video monitors**

The position of the video monitors is suboptimal as it forces the observer to choose between watching the video monitor and looking out the viewport. In the former scenario, *Alvin* is being used as an ROV, which is suboptimal. If the observer is solely looking out the viewport and not paying attention to the monitor, then the best video feed may not be recorded. There was consensus among the SVC participants that the monitors should be moved to above the viewports (or adjacent to the viewports). Also, the controller that allows the observers to cycle the video feed, to start/stop recording, and to change the iris and gain, is a bit rudimentary. While it's on a long cable, which is advantageous in many ways, observers reported that they sat on the controller at some time during the dive, and in so doing changed the settings inadvertently. The design of this controller should be revisited. One option is to place a protective cover over the buttons and knobs to prevent them from being unintentionally switched.

### **4. Lighting**

The lighting in the sphere is much improved. Each observer has the option of working under red or white LED lighting, with a range of intensities. The light is on a gooseneck, which enables observers to position them where it's most practical. Some observers found the position of the light to be somewhat awkward, but by and large all agreed that it was much improved. It would be of value to have a small LED flashlight located near the seats as well, velcroed to the speedrail that is above each observer. This can be done without adhesive Velcro, to avoid any NAVSEA issues.

### **5. Condensation**

The condensation in the sphere seems to be more prominent than in the past. It is unclear why this is so, but there are a number of easy remedies. The pilots might consider taking a few cloth towels to blot off the condensation off the hatch during ascent. Also, if practical, it might be nice to consider how to reduce the condensation around the seating areas. Some observers reported that their socks were quite wet by the end of the dive.

### **6. Emergency oxygen supplies**

The oxygen bottles take up a substantial portion of the sphere's aft volume. They are not terribly intrusive, but are very inconvenient. Larger observers might knock their knees

or shins on the valve handles. Also, the regulators protrude into the cabin space a bit, and observers can knock their head on them while repositioning within the sphere.

## **7. Accessories and storage space**

The sphere needs some attention with respect to the organization and inclusion of accessories. Audio recorders and cameras, for example, should be stored somewhere near the observers. It would be wonderful if a digital tablet could be included for note taking. Such subtle improvements would make for a more efficient dive.