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The invention of manned submersibles is directly connected to the spirit of human innovation and exploration. As an industry, the Manned Underwater Vehicle (MUV) umbrella extends over a fantastic spectrum of underwater vessels; from ambient pressure (wet) vehicles with no effective pressure hulls offering amazing ranges of shapes and sizes, to atmospheric vehicles ranging from homemade private projects to deep ocean exploration vehicles and submarines.

Although the commercialization of MUVs is nowhere near the scale of ROVs or AUVs today, it is certain to play a role in future human underwater activity. With that in mind, as MUVs continue to increase their footprint in maritime navigation, they cannot do so through new technology and concepts alone. Their deployment will be impacted by the suitability of local, national and international navigation protocols. Our current protocols are over twenty years old, outdated and not comprehensive enough for industry requirements. True, there are any number of Class society rules for MUV design, construction and fabrication but they generally do not include references for MUV Operations Standards. So, in October 2015, the ASME opened the floor to operational protocols and an ASME PVHO sub-committee has taken-on to explore the issues. The ASME subcommittee objective will be to establish a consensus standard on industry best practices. Through this effort, the goal is to make submersibles easier to deploy, based on recommended standards that can be maintained worldwide as a general navigation circular with better terminology. Why bother? Besides the fact that the system is broken, Homeland Security's increased concerns of ill-intent means that government regulation for submersibles is in the offing, and we aim to be ahead of that curve.

MUV's most notable public presence is through deep ocean research vehicles on the international stage. The U.S. has led this technology with the ALVIN submersible since 1964, with France, Russia and Japan leading deep expeditions for the past 25 years. At the forefront of recent MUV development is China with its 7,000 m rated JIAOLONG submersible, plus many new MUV developments including university research endeavors seeking full ocean depth capabilities. Japan held the historical record for the deepest research submersible (SHINKAI 6500) and deep ocean

research remains central to Japan's ocean research. From the commercial sector, there are more than a dozen manufacturers worldwide offering private, luxury/leisure, commercial, tourism and security applications. Large multi-passenger (40-60) vehicles have catered to a well-regulated tourism industry for 30 years. Today, we are experiencing the evolution of a dynamic industry of smaller vehicles, with 1-6 passengers and diving capabilities ranging from 100 to 1,000+ m. These will continue to push deeper as commercial companies cater to a growing luxury market and a trend of privately funded ocean research assets capable of navigating around the globe.

Viewed through the lens of national security, especially in the U.S., the MUV industry has been fortunate, operating for decades in a generally unregulated environment. The question is, what will the next 10-20 years bring? In 1968, the Coast Guard initiated the Underwater Safety Project (USP) which proposed legislation to regulate all nonmilitary submersibles regardless of size, service, or number of passengers. The legislation failed and the MUV industry lives! Today, the political climate might yield a different outcome. The situation is compounded by the activities of many different groups, largely operating as unregulated recreational vehicles. These largely remain on the US Coast Guard radar as an undefined concern. Then there are submersibles for nefarious uses, with clearly defined concerns.

Next Steps? Engaging industry members to work together! We welcome your participation at the first working group session at UI2016 for the MTS MUV annual meeting, in New Orleans 23-25 February, and to attend the next ASME PVHO-1 Meeting in Ventura, California from 8-10 March. We plan to use the U.S. Coast Guard NVIC 5-93 navigation circular as a respected framework to begin our consensus standard. The net result: First, produce an internationally contributed reference to establish MUV operations standards for the various sectors of the MUV industry that could be acceptable to the US Coast Guard, as well as other nations. Second, provide the global insurance industry with a better baseline for underwriting MUV operators. You can follow our progress on the web site, [www.mtsmuv.org](http://www.mtsmuv.org). Our efforts will keep us on the forefront of innovation, cooperation, and research and diving in rivers, lakes and oceans around the world.