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BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

SUBCOMMITTEE ON THE COAST GUARD AND MARITIME TRANSPORTATION

PREPARED STATEMENT OF MR. PATRICK LAHEY

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Mr. Chairman and members of the Committee, it is an honor to appear before you today and address concerns regarding the safety of human occupied vehicles (HOVs) or submersibles (subs) and to highlight the stark difference between the thoughtfully designed and carefully engineered machines created by Triton and other legitimate builders of certified HOVs in our small industry and the experimental craft built by OceanGate (OG), which should have never carried people.

My name is Patrick Lahey, and I am co-founder and CEO of Triton Submarines (Triton), a company with manufacturing facilities in Sebastian, Florida and Barcelona, Spain. During a career spanning 42 years in the underwater business, I have participated in the design, manufacturing, testing and operation of more than 60 HOVs. At Triton, I have overseen the development of our entire range of subs, including the Triton 36000/2 (36K/2), which is the first and only full ocean depth (FOD) rated HOV certified by an internationally recognized, and independent third-party classification society (DNV formerly DNV/GL). This remarkable craft provides safe daily access to the most extreme and least understood area of our ocean (the hadal zone, which lies between 6,000 and 11,000 meters or 20,000 – 36,000 feet), for the first time in history.

The Triton 36K2 was created during the same time frame as OG built Cyclops II (later renamed Titan). However, at Triton, we embrace certification as an essential deliverable for all our subs and we insisted on it as a requirement for the Triton 36K/2 too, despite the fact it made the project more difficult, time consuming and expensive. Certification is a key reason this unique craft was able to set records and accomplish more in the deepest and most remote areas of our oceans than any vehicle before it. Our goal at Triton was to create a new paradigm in ocean exploration and deliver an HOV that made it possible for people to safely make repeated dives to any place in the ocean and accomplish meaningful work, even at the most extreme depths.

I have had the privilege and good fortune to complete five dives in the Mariana Trench, including a certification dive in 2019 with DNV surveyor, Jonathan Struwe, during which we successfully completed the world's deepest ever salvage at 10,932 meters or 35,865 feet. The Triton 36K/2 has made 18 dives to FOD and more than 100 dives to depths below 6,000 meters since we delivered the sub in late 2018. For context, the deepest point in the Mariana Trench is almost three times the depth of RMS *Titanic*, which lies in 3,800 meters or 12,500 feet.

The Triton 36K/2 is a great validation of the accreditation process and underscores the critical importance of subjecting a HOV to a peer review. Rather than stifle innovation, the DNV principal engineer, Jonathan Struwe together with the considerable resources, capabilities and insights of the Underwater Technology Team at DNV were essential to our success.

Certification is the crucible in which responsible innovation in extreme environments is possible. Certification is not an impediment to innovation (as OG publicly stated) and the success of the Triton 36K/2 and development of this revolutionary HOV, is a direct result of our relationship with a classification society and clearly demonstrated the benefits of the accreditation process.

Unfortunately, HOVs have been the subject of a lot of negative press since the OG tragedy, which is unwarranted, particularly if people understood the facts. This tragic incident has brought into sharp focus the vast difference between an experimental craft such as the one built by OG, and the carefully designed, thoughtfully engineered, and thoroughly vetted machines created by legitimate builders in the HOV industry, which are subjected to an arduous, time consuming, necessarily thorough, and expensive accreditation process, implemented and overseen by internationally recognized and independent third-party classification societies, to ensure a HOV is safe and suitable for carrying human cargo.

The OG tragedy captivated public attention because of the notoriety of the dive site and of course the loss of human life, which play into people's worst fears about the sea and this type of craft. Most people mistakenly believe HOVs are wildly dangerous and unnecessary. At Triton, we have been pushing back against these myths and stereotypes for nearly two decades because they bear no resemblance to reality. The OG tragedy was an anomaly, an aberration and would never have happened if this ill-fated craft had been subjected to the certification process.

In fact, accredited or certified HOVs enjoy a 50+ year track record of perfect safety, making them the safest mode of transport in the world. People have no hesitation in jumping in a car and going for a drive or flying in an aircraft where the potential for an accident is thousands of times greater. In fact, in the last 50 years, tens of millions of people have safely enjoyed the thrilling experience of diving in a certified HOV, without a single fatality.

Many found the failure mode of the OG craft particularly shocking because it was without precedent but to those of us in the HOV business, the OG hull collapse was not a surprise. It was a predictable result of the pressure hull being made of a capricious material, which was not suitable for the intended application. The filament wound carbon fiber cylinder in the OG craft was degrading from the exposure to pressure associated with each dive or cyclic use.

OG created an 'acoustic monitoring system' for Cyclops II, which they described as innovative and a system all HOVs should use, but the requirement for such a system was an acknowledgement their filament wound carbon fiber cylinder was weakening on each successive dive and its capacity to resist the crushing pressure at 3,800 meters or 12,500 feet was diminishing over time and would continue to degrade until it failed, catastrophically and without warning. A properly designed and engineered HOV doesn't require an acoustic monitoring system because the health of the hull is fundamental and beyond question.

A capricious material that degrades in performance and efficacy from normal use, is unacceptable as a pressure boundary for an HOV. If the OG sub had been subjected to any kind of peer review, this fact alone would have disqualified it from certification. OG dismissed certification because they claimed their craft was so cutting edge and innovative the classification societies wouldn't understand it, but the reality is the OG craft could not be classed and there were many other design features, which would not have complied with the classification society requirements

Triton and every legitimate manufacturer in our small industry would not endorse the use of an 'experimental' HOV. Instead, these companies exclusively manufacture HOVs, which are fully certified and accredited by independent third-party classification societies.

Certification begins with a review of our initial design assumptions and ideas, which includes Finite Element Analysis (FEA), calculations, etc. The process continues through to the selection, independent analysis, and approval of all materials, which must be procured from qualified vendors, and the conformance of these materials to the dimensional tolerances stipulated in our reviewed and approved drawings. Approved and tested materials are then fashioned into assemblies, which are subjected to additional testing and validation requirements as stipulated by the class society.

Certification requires the involvement of a surveyor during the commissioning process of a HOV, which includes witnessing factory, harbor, and sea acceptance trials and continues through to delivery and the qualification of all personnel who are responsible for operating and maintaining it. Certification is required for the lifetime of the sub and is an on-going process where continued compliance is validated by regularly scheduled surveys, inspections of paperwork and testing as required and witnessed by an attending surveyor representing the classification society.

Every Triton sub is designed, manufactured, tested, and operated in compliance with the rules of an internationally recognized classification society (DNV, ABS, etc.). These rules have evolved over many decades and been influenced by the experiences gleaned from a wide variety of operating environments (industrial, recreational, scientific etc.).

The accreditation of a HOV is like that undertaken by the FAA for an aircraft. There are hundreds of pages of safety compliance criteria. Triton subs meet the requirements of numerous other authorities, including Flag State Registries, Pressure Vehicles for Human Occupancy (PVHO) rules, and International Maritime Organization (IMO) Guidelines for the Design, Construction and Operation of Passenger Submersible Craft.

There must be a simple requirement applied to all HOVs. Either they are certified and can carry people safely, or they are not. Either a HOV complies with the rigorous design, engineering, validation, testing protocols, annual and special periodical survey, and inspection requirements of a third-party and independent classification society (such as DNV and ABS), or it does not. If it does not, it should not carry people, period. If we stick to this simple rule, tragedies like the OG disaster can and will be prevented.

I have spent most of my adult life going to sea and diving in certified and accredited HOVs. The ocean is a magnificent but unforgiving environment. Being at sea and diving in subs requires an understanding and an awareness of the extreme forces at work and demands the humility and respect of anyone who intends to work and play in this space while ensuring the occupants of a HOV remain safe.

To date, Triton has designed, manufactured, and sold dozens of subs. Every Triton remains in class, certified to the original depth and in the hands of a client with whom we enjoy a mutually beneficial and on-going relationship. The after sales service and technical support relationship is essential to ensuring a HOV performs as expected and is being operated and maintained in accordance with both the classification society requirements and those of the manufacturer.

We are fortunate indeed to have inherited the wisdom and collective experience of generations of engineers, designers, and operations personnel who preceded us. The cornerstone of any product intended to carry people into the deep sea is that it must be simple to operate, easy to maintain, reliable and most of all safe.

At Triton, the culture of safety is foundational. In contrast to the OG approach of ostracizing those who called attention to safety concerns, we adhere to the "see something, say something" model, where anyone can and should raise a safety concern at any time and for any reason. Everyone knows we look out for each other and take the responsibility of building equipment capable of safely transporting people thousands of feet into the deep sea personally. Everyone benefits when everyone contributes towards a shared culture of safety.

If a person wants to dive beneath the surface in a HOV, they have a reasonable expectation the craft they are in meets some type of recognized standard of safety. The predatory and unscrupulous practice of selling unsuspecting people a seat in an experimental HOV and calling them "mission specialists" or "crew" to skirt the rules or avoid regulations is unacceptable and must be stopped. If certification with a recognized classification society is made a requirement for any HOV being used for these types of commercial operations, future tragedies can be avoided.

At Triton, we're proud to create magical machines that allow people to explore the most beautiful but least understood area of our planet. Our clients undertake ambitious and inspiring science, film making and exploration missions in the deep sea. Their notable achievements are a great source of pride and further validation of the importance of continued exploration of the deep sea with HOVs.

I conclude with the simple wisdom that sunlight is the best disinfectant. Transparency in all facets of safety is critical to building confidence and maintaining the enviable and unprecedented track record of safety classed HOVs still enjoy today. The role of the certification agencies is paramount to the development of safe HOVs. These agencies grade our work. They demand a design be proven, not just postulated, and rigorously tested before any people ever dive in it. I have every reason to believe that adherence to this simple rule will permit exploration of our ocean for decades to come, safely. At Triton we recognize the deep sea is no place for compromise.

Thank you.