Submission form for Ocean-Shot Concepts-Round 2

Response ID:43 Data

1. (untitled)

1. Ocean-Shot Contact Information: *Note - This information will be shared with the National Committee for the Ocean Decade in order to receive feedback. It will also be made publicly available if the Ocean-Shot concept is accepted into the Ocean-Shot Directory.

Primary Contact Name (First & Last) : Bart Kemper
Organization : Kemper Engineering Services
Email address : bkemper@kempereng.com

2. Ocean-Shot Title

The Alexander: A revolutionary submersible research platform

3. Author(s): *Please list contributors to the submitted Ocean-Shot concept with first and last names in the order you wish them to be referenced for *potential* use in the Ocean-Shot Directory. Examples can be found here:

Bart Kemper, Krista Kemper, Veda Thipparthi, Ana Escobar, Quinton Moore, Linda Cross, Amy Pinner

4. Ocean-Shot Directory Summary (Please provide a short introduction/description of the Ocean-Shot concept for *potential* use in the Ocean-Shot Directory, 100 word limit. Examples can be found here.):

A novel research submersible that can either anchor to a shallow bottom or free-float beneath the waves. It is launched and recovered by a tender vessel, allowing it to operate world-wide. It's designed for a small operational crew to support teams conducting research and collaboration. A moon pool allows for diving as well as the use of ROVs and AUVs. Common spaces are modular to allow for different configurations to support the mission at hand. Unlike smaller submersibles, this will allow scientists, community leaders, artists, and others share the experience and work together, trading off operational depth for personnel capacity.

5. Abstract (describe hypothesis, scientific and/or technological objective, 200 word limit):

Develop a transportable submersible habitat, limited to SCUBA depth, with three crewed cylinders connected side-by-side that can be launched and recovered from a tender vessel. Named after Alexander the Great for his reputed walking on the sea bottom using an inverted boat, this habitat will have a shallow "landing gear" mode, allowing divers to work without decompressing. It will also "free float" with limited stabilization thrusters while the tender vessel remains at a distance to prevent typical motorized interference with wildlife. This allows scientists and others to make sustained subsurface observations, such as "riding the Gulf Stream." In addition to hull-mounted and towed sensor arrays taking data, the moon pool will allow for the launch and recovery of Autonomous or Remotely operated Underwater Vehicles when not supporting diving. Maximum mission duration is 30 days, with detailed cleaning and maintenance performed by the tender ship to avoid the challenges permanent underwater habitats must overcome. Passive power generation by water turbines will augment battery storage. Modular internal design will allow for different types of activities and missions. Minimum training by non-operations crew will allow community leaders, artists, students, and others to join the scientists and learn from each other.

6. Please select the challenges (no more than 3) that are most relevant to your concept (Expanded reference below):

Challenge 2: Understand the effects of multiple stressors on ocean ecosystems, and develop solutions to monitor, protect, manage and restore ecosystems and their biodiversity under changing environmental, social and climate conditions.
Challenge 3: Generate knowledge, support innovation, and develop solutions to optimize the role of the ocean in sustainably feeding the world's population under changing environmental, social and climate conditions.
Challenge 4: Generate knowledge, support innovation, and develop solutions for equitable and sustainable development of the ocean economy under changing environmental, social and climate conditions.

7. Describe how your Ocean-Shot addresses the selected challenges (150 word limit).

The ability to either free-float with currents or be stationary for several weeks will give researchers direct observations that

could not have otherwise. Coupled with the use of sensors, divers, ROVs, and AUVs, the platform can serve as an underwater base camp to conduct primary research, collect data over time, or serve as a "work camp" to install underwater infrastructure for Blue Economy innovations, such as kelp farms. Because it can be repurposed for different missions, such as trading diving support for ROV support, and can be transported by its tender vessel, the Alexander can be used to respond to new situations where they occur. It can gather data ranging from fragile localized littoral areas to the open ocean's currents, whether it's for mapping, pollutant sampling, biodiversity inventories, or supporting equipment testing and development.

8. Vision and potential transformative impact (200 word limit):

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9. Realizable, with connections to existing U.S. scientific infrastructure, technology development, and public-private partnerships (150 word limit):

Kemper Engineering has many connections in the marine and subsea industries and research groups. We are sponsoring members of the Marine Technology Society's (MTS) Manned Underwater Vehicle (MUV) group. Our company includes four members of the ASME Pressure Vessels For Human Occupancy (PVHO) codes & standards, which writes the engineering codes for diving systems and submersibles. Our lead engineer is a member of the Society of Naval Architects and Marine Engineers (SNAME) and is one of the authors updating the 1990 Submersible Vehicle Systems Design reference into a four-volume set including crewed and uncrewed systems. We have consulted with Triton Submarines on several matters related to their submarine development. We regularly work with Woods Hole Oceanographic Institute (WHOI) regarding subsea technology issues and have been contracted by WHOI to go on site to assist in troubleshooting submersible-related equipment. Our work in specialty fabrication firmly grounds us in current PVHO technology.

10. Scientific/technological sectors engaged outside of traditional ocean sciences (100 word limit):

The increasing use of autonomous systems and Artificial Intelligence can be leveraged using this platform. This platform will allow for real-time data processing and autonomous system management. It can also support the study of littoral ecospheres, a complex and dynamic region that is often understudied in many nations. It could also be the key enabler for establishing undersea infrastructure by acting as a submerged working platform by reducing the logistic overhead for commercial divers while making use of Remotely Operated Vehicles (ROVs) to enhance operating efficiency and safety.

11. Opportunities for international participation and collaboration (100 word limit):

The concept is a research platform similar to boats like DSV ALVIN, only with more non-crew capacity making it more like the International Space Station. The limited duration of missions will allow teams to rotate in a manner similar to the ISS. The flexibility to "free float" at depth with limited thrusters as well as to set down in shallow water means it can be transported by the tender to any region and any nation to provide a powerful research platform to support local needs as well as global needs. Open work space allows for flexible and collaborative research planning.

12. Develops global capacity and encourages the development of the next generation of ocean scientists (100 word limit):

The very idea a "regular person" can go to space is inspirational. One of the uses for this research platform is to bring the next generation into the ocean in a way only dreamed of before. This goes beyond inspiring the next generation of scientists – it can be a pivotal experience for any young professional. If we do not inspire the next generation of politicians, engineers, entrepreneurs, and artists, society as a whole will not be moved to make the ocean the priority it must be. The platform's mobile nature will help develop connections between advantaged and disadvantaged communities.

2. Thank You!

Thank You Email

Jul 01, 2021 16:09:44 Success: Email Sent to: bkemper@kempereng.com