SBIR/STTR Topics and Awards Search

Pioneer Sea Glider

Pioneer Astronautics

Total Award: $748,947.00

Component: DARPA	**Solicitation:** 03.1
Topic Number: SB031-021	**Proposal Number**: D2-0367
Year: 2003	**Program Type**: SBIR Phase II
DUNS: 120561456	**CAGE code**: 1PDX5
Year Founded: 1996	**Website**: http://www.pioneerastro.com

Benefit: Near-term commercialization centers on military applications including deployment of sensors, unmanned survey vehicles, or personnel. Other military applications include quiet torpedos. Closely following are potential non-military research applications. Larger capacity, greater range, or improved reliability could enhance the use of gliders for oceanographic research and eventually low-cost long range underwater transport. A potential commercial sea glider market for SCUBA divers also offers great promise.

Technical Abstract: The proposed Pioneer Sea Glider is a new method for underwater transport of equipment and personnel over long distances in a quiet manner. A unique buoyancy control system is based on the conversion of liquid nitrous oxide to a mixture of gaseous nitrogen and oxygen. This nitrous-oxide-derived buoyancy gas can also provide breathing air and heat for crews and is based on technology developed and patented by Pioneer Astronautics for long-duration space flight, SCUBA, and terrestrial rescue operations. Because one volume of nitrous oxide gas dissociates to 1.5 volumes of nitrogen plus oxygen, buoyancy gas mass requirements are reduced by one-third compared to those required for other gases. In the proposed Phase 2, a sea glider bouyancy engine capable of propelling an 1100 liter displacement sea glider operating at depths of up to 1000 ft will be developed and tested at pioneer Astronautics, and then integrated with a Scripp sea glider vehicle for testing at sea.

Keywords: Sea glider, nitrous oxide, bouyancy engine, underwater propulsion

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Topic Title: Sea Glider Transport Vehicle

Topic Objective: Design and develop an underwater vehicle that uses buoyancy control and vehicle lift to drag as the primary means of propulsion for the transport of equipment, supplies, sensors, weapons, and personnel in a silent and efficient manner.

Topic Description: Soaring birds inspired man's first successful attempts at winged flight. It is well understood that gliding flight in the atmosphere can be achieved with the conversion of potential energy into work to offset vehicle drag. In addition, aircraft can gain energy from updrafts, currents, and winds that in turn can be used at work to offset drag. In a similar manner, sea mammals and fish are known to sometimes glide in water by trading potential energy into work against drag. In the case of an airplane, potential energy is in the form of altitude. A gliding airplane trades off altitude to propel itself forward. In the case of a sea mammal, the animal allows its buoyancy to decrease. This causes it to sink and glide forward. If we think of sea creatures as underwater flying vehicles they can inspire us to think of underwater gliding craft. Underwater gliders should be able to fly in the oceans just like airplanes fly in the atmosphere. In the same manner, sea gliders can convert potential energy by sinking into the deeps just like a gliding airplane gives up altitude to propel itself forward. A sea glider should be able to use the ocean's current, up flows and tides to gain energy for continued flight. But liquid flight has an advantage over atmospheric flight; a sea glider that has reached a great deep can reverse its buoyancy and glide upwards. A sea glider can glide both downwards and upwards to continue its glide indefinitely as long as it continues to cycle its buoyancy. The concept of sea gliders has been successfully demonstrated for long duration flight of oceanographic sensors. The project hopes to broaden the application of the mode of underwater propulsion to the transport of equipment, supplies, sensors, weapons, and personnel. Sea gliders hold the potential for efficient transport under water for long distances in a very quiet and passive manner. There are a number of both military and commercial applications that could benefit from this form of transportation.

Topic Phase I: Systems studies to identify requirements for potential applications and performance studies to size concepts and identify technology and design requirements. In this early phase a number of vehicle concepts will be described and at least one simple proof of concept model will be demonstrated.

Topic Phase II: A target application will be identified. A proof of concept model for this application will be designed and constructed for limited demonstration. This model need only be sized and constructed in a manner that provides a realistic demonstration that will justify future investment.

Topic Phase III: There are a number of military and commercial applications for this class of vehicle. In the military sector a sea glider transport would allow a submarine to deploy an unmanned aerial vehicle (UAV), a sensor platform, and personnel by launching a sea glider. A sea glide could travel a considerable distance from the submarine, silently, before it deploys its payload. By deploying a payload at great distances from the submarine, the unknown location or presence of the submarine's can be maintained. In the commercial sector, sea gliders can transport equipment and personnel to locations that have harsh surface conditions. The oceanographic community has already targeted sea gliders as an effective way to collect data over wide expanses of the oceans.

Topic Keywords: Submarine, Glider