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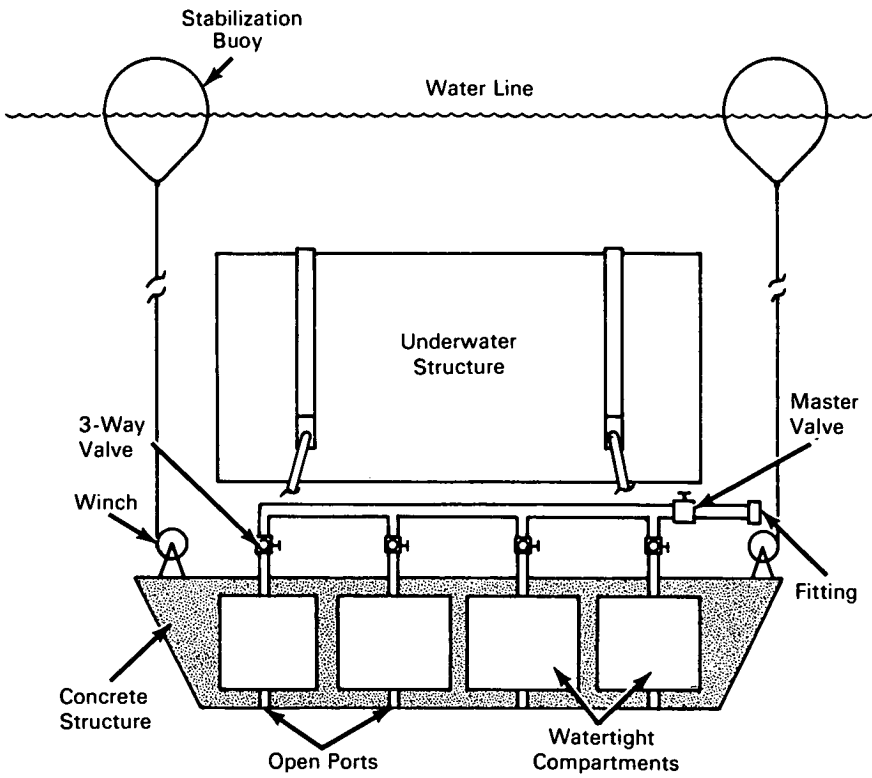
Ballast Barge Concept for Underwater Structures



Underwater habitation experiments have shown that transportation of the structure, placing it in the water, transportation of the required ballast, and the placement of ballast on the structure at sea are difficult and expensive. The cost of lead ballast alone may exceed the cost of a habitable structure by a factor of two or more. A ballast barge concept should be relatively low cost, easily operated, and readily supported from small surface vessels.

A possible configuration of the ballast barge, as shown, is intended to show only the principle of operation rather than any exact form. The shaded lower portion of the figure is a reinforced concrete structure partitioned into a number of watertight compartments. Each compartment is connected through an air line to a 3-way valve for venting and connection to a compressed air manifold. A master valve is inserted between the manifold and fitting which is used to connect the manifold to a flexible air line (not shown). Each compartment is provided with an open port in the bottom, through which sea water is admitted and expelled. The underwater structure is

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mounted by fittings to transmit buoyant and ballast forces to restraining straps or netting while the underwater structure is submerged. Because of the open ports, it is impossible to develop large differential pressures between the inside and outside of the chambers, thus eliminating the requirement for constructing the chambers as pressure vessels.

In port, the ballast barge can be submerged (with or without an underwater structure loaded) for convenience and protection from storms by simply flooding the watertight compartments. To transport the underwater structure, the submerged ballast barge is raised by displacing water from its compartments with compressed air and towing it to the desired location.

When the desired location is reached, air is permitted to escape through the 3-way valves until the ballast barge sinks and becomes supported by the positively buoyant underwater structure. If this is an ambient pressure structure, a compressed air supply must be connected to it to maintain adequate internal pressure to prevent flooding during descent. Additional air is permitted to escape from the ballast barge and is displaced by water. Divers operate the valves to trim the ballast barge for leveling and to control the rate of descent. During this operation the compressed air line must be connected to maintain the water level in the compartments for a controlled rate of descent. Additional control and stability are provided by cables and winches at each end of the barge connected to stabilization buoys which may be removed or replaced with smaller marker buoys after the barge reaches bottom.

Note:

This development is in conceptual stage only, and, as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.

Patent status:

No patent action is contemplated by NASA.

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