Project Report Format

Project Name: Diego Garcia Fleet Moorings Project

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Organizations/People Involved: CHESDIV FPO-1: Ed Spencer, Lead; LCDR Ed Morris, OIC, LCDR Mike Praskiewicz, Larry Mendlow, others; NCEL, PWC San Diego, PWC Subic Bay, UCT-2, OCP SEACON and St. Juliens Creek (OCEI), Combat Camera Crew, Tracor Marine.

Date: Planning through 1980, project in theater October 1980 through May 1981

Project Summary: On 31 March, 1980, the Chesapeake Division, Naval Facilities Engineering Command, was tasked to provide engineering and construction support for the design, procurement and installation of eleven fleet moorings in the lagoon at Diego Garcia, British Indian Ocean Territories. Diego Garcia is a coral atoll found in the Chagas Archipelago chain of islands in the middle of the Indian Ocean approximately 7 degrees below the equator. These moorings were urgently required by the Commander-in-Chief, Pacific Fleet, and installation was completed 17 March, 1981. Due to the extremely rapid response required, maximum use was made of existing Navy inventories of chain and other mooring materials stockpiled on both coasts of the United States as well as at various overseas locations. Mooring designs and installation procedures were tailored to make use of these on-hand materials as well as anchoring methods previously shown to be satisfactory for the coralline seafloor found at Diego Garcia.

The propellent embedment anchor *(*PEA*)* developed by the Naval Civil Engineering Laboratory was selected for use with these moorings due to its proven success on three previous buoy installation projects in the Diego Garcia lagoon. Traditional drag weight anchors were not determined to be the best choice for long term anchoring of moorings in the lagoon's coralline seafloor. The eleven moorings as designed by the Chesapeake Division's Ocean Engineering and Construction Project Office (FPO-1) required the use of seventeen mooring buoys and 88 legs of chain. Due to the need to satisfy given environmental design criteria using propellent embedment anchors, no "off-the-shelf" traditional mooring designs were found to be satisfactory. Therefore, original mooring designs were prepared utilizing a factor of safety of three. These moorings further required a design life of five years as heavy maintenance of moorings at this remote site is quite difficult. Annual diver inspections will be made to ensure mooring capacities remain satisfactory

The 88 successful propellent embedment anchors installed provided designed holding capacities of 100,000 pounds each (28 anchors) and 150,000 lb each (60 anchors) at a cost of only $10K - $15K for expendable materials per anchor using a total package for each anchor shot that had a deck load of less-than 15,000 Ib. Each anchor was load tested vertically to its full design load.

SEACON was towed from St. Juliens Creek, Norfolk to Diego Garcia and back representing the longest distance the ship had to be transported for any of FPO-1 projects. SEACON was considered the only construction vessel suitable to install these moorings.

The eleven moorings were designed to meet the following requirements:

- Six (6) Cargo Free Swinging moorings, designed to support up to a Maine Class Roll-On/Roll-Off ship, 685 ft in length and displacing approximately 34,000 tons;
- One (1) Tender Free-Swinging mooring, designed to support up to a large fleet tender, 644 ft in length, displacing approximately 24,000 tons, with either three submarines or two destroyers alongside;
- Three (3) Cargo BOW/Stern moorings, designed to support a cargo ship approximately 520 ft in length and displacing up to 22,000 tons;
- One (1) Four-Point Tender mooring, designed to support a large fleet tender, 644 ft in length, displacing approximately 24,000 tons, with 5-7 ships alongside;

All moorings were designed to withstand 40 kts constant wind (peaking to 56 kts), 1.5 kts current and five ft waves simultaneously from the same direction. To meet these requirements, the eleven moorings required installation of seventeen buoys and supporting structure as follows:

- Six (6) 14 ft diameter peg-top buoys held by 45 ft of 2 in riser chain connected via a ground ring to three legs of 2 in. chain, 6 shots (90 ft) long per leg with each leg connected to 170 ft of 2-inch diameter wire rope and a 100,000 lb propellent embedment anchor.
- One (1) 16 ft diameter buoy connected to four equalized pairs of 22 inch and 2-inch chain, 4 shots long per individual leg, with each leg (8 total) connected to 170 ft of 24-inch diameter wire rope and a 150,000 Ib propellent embedment anchor.
- Six (6) 16 ft diameter buoys, each connected to (a) three equalized pairs of 22 inch and 2-inch chain, 42 shots long per individual leg, with each leg (6 total) connected to 170 ft of 2-inch diameter wire rope and a 150,000 Ib propellent embedment anchor, and (b) a backstay leg consisting of six shots of 2-inch chain connected to 170 ft of 2-inch diameter wire rope and a 100,000 Ib propellent embedment anchor.
- Four (4) 16 ft diameter buoy's each connected to: (a) four legs of 22 inch and 2-inch chain five shots long equalized by pairs to a shot of 3 3/4 inch chain which is further equalized to provide single connection to a tension rod assembly located in the center of the buoy (each) of the four chain legs is connected to 170 ft of 2 1/4 inch diameter wire rope and a 150,000 Ib propellent embedment anchor, and (b) a backstay leg consisting of two shots 2 in. chain connected to 50 ft of 2 inch diameter wire rope and a 100,000 Ib propellent embedment anchor.

Project Report Link: No DTIC report but a paper (OTC-4176) on the project was presented by Ed Morris at the 14th Annual Offshore Technology Conference in Houston Texas, May 3-6, 1982.