

New Foam Technique Hailed in Refloating of Knox

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PEARL HARBOR — When the radar picket destroyer Frank Knox went aground in the South China Sea last summer, it made news stories around the country.

And when, 35 days later, she was finally freed from the coral bed on Pratas Reef, it again made news.

But not many of the details of the operation—one of the most intensive and dramatic salvage operations ever conducted in the Pacific—were made public. It took 35 days of torturous labor in the face of two tropical storms, and brought into use a new salvage technique which may have heralded a major breakthrough in future operations.

During those five weeks some 20 ships of the 7th Fleet participated in the operation.

KNOX RAN aground on the large, hard coral reef, 7½ miles southwest of Pratas Island at about 2 a.m. Pratas Island is controlled by Nationalist China and is located 165 miles southeast of Hong Kong and 240 miles southwest of Taiwan.

The salvage forces of the Pacific Fleet Service Force responded at once in an attempt to save the 21-year-old destroyer.

First to the scene were the salvage ship Grapple and the fleet tugs Cocopa and Munsee. They were joined by the auxiliary ocean tug Mahopac on the third day.

One set of beach gear, a heavy anchor secured by cable and chain, was laid to seaward from the stern of Knox. This prevented her from

being driven further aground or from breaching in the surf.

The first attempt to pull her free was made on the fourth day in the wake of tropical storm "Gilda." Recurring strong winds and high seas hampered salvage efforts and inflicted severe damage.

On the fifth day Rear Adm. Joseph W. Williams Jr., Commander Service Group 3 and Commander Task Force 73, arrived to act as on-scene commander.

THAT SAME day, 155 of Knox's crew not needed in the salvage effort, were transferred by helicopter to the attack carrier Midway. This left 63 men, five officers and 58 enlisted aboard.

Throughout the operation, help from Midway, the amphibious assault ship Iwo Jima and the combat stores ship Mars kept these men supplied with fresh food, hot meals and other staples.

In the days that followed, the salvage force was beefed up with the arrival of the salvage ship Conserver and fleet tug Sioux plus the submarine rescue ship Greenlet.

A period of intense activity followed which consisted of patching the hull, pumping out flooded compartments, strengthening in areas of localized weakness as well as strengthening the ship's main girder. Compressed air was used to de-water tanks. Explosives were used. Every possible effort which could contribute to successful refloating was undertaken.

Divers from the destroyer tender Prairie worked side by side with ServPac and SubPac divers throughout the operation. Prairie

also furnished repair services to permit Knox to continue operation of a portion of her main engineering plant.

VICE ADM. Paul P. Blackburn Jr., Commander of the 7th Fleet, visited the scene for a first-hand look at the salvage efforts on the seventh day.

Two more attempted pulls ended in failures, then on the 10th day, tropical storm "Harriet" struck. All ships but Iwo Jima, Conserver and Mars put to sea to evade the storm.

When "Harriet" subsided the next day, the salvage forces returned and went back to work. Once more standard salvage techniques including deflooding, removal of excess gear and fuel from Knox and the laying of additional beach gear, were employed.

All efforts failed. When the conventional deflooding proved fruitless, an experimental polyurethane foam was put to a test. The decision to use foam, made on the 15th day, came after extensive discussions between ComServPac, BuShips and industry.

The foam technique involves the insertion of a shotgun-like nozzle into a flooded compartment. Chemicals are forced in under pressure through the nozzle and, as they emerge, form a polyurethane foam similar to that used in packaging. The foam displaces the flood water in the compartment, and provides

buoyancy in the ratio of 20 to 1.

The use of this foam has been the subject of limited Navy investigation for the past year. Its use in connection with the successful salvage of Knox may constitute a new technique for submarine salvage.

ON THE 19th day the foam arrived by airlift. Navy divers entered, at some peril, the flooded forward compartments to fill them with the chemical compound.

As additional aids, demolition experts from Explosive Ordnance Disposal Unit 1, under the command of Lt. Comdr. C. K. Naylor, laid explosive charges around the keel to weaken the coral and reduce the ground reaction and collapsible pontoons were rigged under the bow.

It took nearly 80 tons of foam and the removal of 747 tons of equipment and liquid loading to lighten Knox enough before a successful pull could be made. The main deck also was strengthened as a precautionary measure so the ship wouldn't break in half upon refloating.

After the foaming started, 16 days elapsed before the ship was finally freed.

At high tide, shortly before dawn on the 35th day, Knox was successfully pulled free. The destroyer Cogswell (DD-651) played an important role in the successful pull. She created huge waves while making daring passes astern

of Knox at speeds of better than 32 knots. The waves produced enough movement in Knox to generate the successful pull.

Once off the reef, Knox was towed to Kaohsiung, Taiwan.

OVERALL responsibility for Pacific salvage operations is the responsibility of Commander Service Force, Rear Adm. Edwin B. Hooper.

Some of the Navy's top salvage experts, including Capt. W. L. Marshall, commanding officer of the Naval Ship Repair Facility, Guam, were on hand in an advisory capacity. Marshall is the Navy's senior salvage officer and is considered one of the foremost authorities on the subject.

Comdr. E. B. Mitchell, ComServPac Salvage Officer, served as the technical advisor to Hooper, and Lt. Comdr. J. H. Boyd, ComServGru 3 Staff, was the on-scene salvage officer. Comdr. W. F. Searle, Navy Supervisor of Salvage in BuShips, managed the command's support of the operation.

According to the salvage experts, the Knox operation demonstrated that organizations must be constantly alert to the adoption of new methods. In Knox's salvage, the use of cast-in-place foam for the first time contributed in large measure to its success.

One of the fortunate aspects of the whole operation was that there were no serious injuries.