

or shelter. Their rescue culminated a 2-day search by VXE-6 and RAF C-130 aircraft. A U.S. Navy weather/ice observer finally spotted the party from an RAF C-130 as it departed McMurdo for Christchurch.

In January, LC-130s moved cargo to Siple, Byrd, and Pole Stations and resupplied and recovered field parties, including the airdropping of supplies to the French traverse. With each of the VXE-6 planes returning to Christchurch for major maintenance inspections and minor repairs, January was essentially a two-plane operation on the continent. In spite of the shortage of planes, the aircrews, maintenance, and supply personnel kept the engines humming, and the squadron logged 788 hours in January.

On January 28, LC-130R no. 917 crashed and was destroyed at South Pole Station. No one was injured, but two-plane operations became a reality with the immense job of winter over resupply for Siple and redeployment scheduled for February. Resupply of Siple Station for winter over operations was completed on February 3; Pole, on February 13.

The second full season of UH-1N helicopter operations in Antarctica commenced on October 17 in support of U. S. and New Zealand programs in the dry valleys of southern Victoria Land. The four twin-turbine craft completed all missions, logging 941 flight-hours while lifting 2,247 passengers and 261 tons of cargo.

October UH-1N operations were slowed by an air-frame change in all four machines. (Two of the six UH-1Ns were not deployed in 1972-1973.) The major work in October was to open research stations at Lake Vanda and Lake Bonney and to move fuel to Marble Point for support of later helicopter operations in the dry valleys.

During November, the UH-1Ns supported projects at Capes Evans and Royds, Lake Chad, and the Koettlitz Glacier, in addition to continuing support in the dry valleys. In December and January, the helicopters continued their support of scientific projects in the McMurdo and dry valley areas. Significant achievements in January included support of volcanic research on top of Mount Erebus and the first ship-to-shore prepositioning of material for the Dry Valley Drilling Project. Operating from USNS *Mirfak* and USCGC *Northwind*, the helos carried 55 tons of supplies by undercarriage slings to Marble Point. Helicopter operations were completed on February 9 following the closing of Lake Vanda Station on February 8.

Seasonal redeployment to the United States was completed with the last LC-130 flight from McMurdo on February 24. Winds over 150 mph forced the squadron to launch from the airport at Dunedin, south of Christchurch, to gain the fuel reserves required for safe flying.

When the squadron returned to Quonset Point on February 28, the books recorded 630 flight hours in February for LC-130F nos. 319 and 320.

Ship operations, Deep Freeze 73

THOMAS W. KIRKPATRICK

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Planning for *Deep Freeze* ship operations in recent years has centered around Elliott Quay, the area of fast ice on the Winter Quarters Bay side of Hut Point at McMurdo Station. When first used in *Deep Freeze 64* this shelf of "permanent" ice extended far enough into deep water for two large ships to lie alongside simultaneously and discharge cargo directly onto trucks and trailers in a conventional, efficient fashion. In subsequent years, it became apparent that the edge of the fast ice was far from permanent; it tended to recede under a combination of wave erosion, relatively warm sea water in Winter Quarters Bay, and surface erosion from melt water runoff. More serious than the loss of cargo handling area was the reduced depth of water alongside.

In a 4-year period ending in *Deep Freeze 72*, a steel and timber facing totalling 464 feet in length was constructed to prevent further erosion and to maintain the desired vertical Quay face.

In March 1972 a series of severe storms drove high waves and large pieces of ice against this facing, breaking and bending most of the vertical 10-inch steel I beams and causing many of the steel-faced timber panels to fall out. The unprotected ice face behind the panels was extensively eroded, and the volcanic fill that had been held in place by the panels was deposited in the ship berths.

While the full extent of the damage would be concealed by sea ice and frozen spray until the middle of the *Deep Freeze 73* summer operating season, it was clear that both a long term engineering solution and an immediate fix were needed if cargo ships were to continue to enjoy the advantages previously offered by Winter Quarters Bay. Only the immediate fix is discussed here.

Efforts focused on finding a means to hold the cargo ships in safe water depths off Elliott Quay while transferring their cargoes ashore to solid fast ice beyond the reach of the ships' booms. The use of an oceangoing barge, towed to McMurdo to act as a large fender and later to be removed, appeared feasible at first, but Military Sealift Command officials suggested USNS *Mirfak* (T-AK-271) as a more cost-effective alternative. This 266-foot dry cargo vessel, a sister of USNS *Eltanin*, was built from the keel up for work in ice. With large hatches, a 30-ton jumbo boom, good freeze and chill cargo stowage, and a pair of 36-foot LCVP landing craft,

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she proved amazingly versatile, yet her draft was only 18 feet compared to 24 feet for USNS *Private John R. Towle*.

Planning proceeded on the basis that *Mirfak* could be berthed somewhere in Winter Quarters Bay where her booms could reach ashore. If required, the larger *Towle* would berth outboard of *Mirfak*, and cargo would be handled across *Mirfak's* decks.

Admittedly slow and cumbersome, this plan had the added drawback of not providing for heavy lifts of over 30 tons. Fortunately, there would not be many of these.

Mirfak, in the original planning, would also serve to hold off the 620-foot tanker USNS *Maumee* (T-AO-149), expected to draw over 30 feet upon her arrival at McMurdo Station.

It is expensive to use one ship as a camel or fender for another. If schedules slip, as they seem to do in the Antarctic, it becomes very expensive. Having planned for the worst, we now hoped for the best, which arrived in the person of Radm. George Reider, CEC, USNR-R.

Rear Admiral Reider, along with engineers from the Atlantic Division of the Naval Facilities Engineering Command, visited McMurdo Station in December 1972 and not only conceived a means of repairing two of the least damaged sections of Elliott Quay, but was instrumental in sending down a crew of reserve Seabees to head up the job.

Under the leadership of swc Nick Sukunda and swc Dan Price, these professional, heavy construction steelworkers, working with only the materials at hand and backed up by whatever casual labor force could be spared from other projects, created two piers, which were actually 70- and 60-foot reconstructed sections of the original Elliott Quay, extending 5 to 10 feet farther out into Winter Quarters Bay than before.

These piers were the determining factor that permitted first *Mirfak*, then *Towle* as more debris was removed from the bottom, to come directly alongside to discharge cargo. It was necessary to hold *Towle's* stern off with a 28- by 42-foot pontoon, over which cargo from number five hatch was worked using a shore crane, and later necessary to shift *Towle* forward to offload heavy cargo from number four hatch directly onto pier one, the pier nearer to the head of Winter Quarters Bay, but these were minor inconveniences.

The construction of the two piers, the clearing of steel debris from the immediate water area, and the underwater surveying of the ship berths would not have been possible without the availability of qualified divers from UCT-1, NMCB-71 and USCGC *Northwind*.

Working in -1.7°C . water under the direction of Ltjg. E. H. Potter III of *Northwind*, the divers made possible the removal of steel members that would have prevented the ships from berthing alongside, cleared obstructions in the way of piles being driven into the bot-

tom, and checked the cargo ships' underwater bodies immediately after berthing.

The success of dry cargo operations at McMurdo enabled *Mirfak* to depart ahead of schedule enroute to Palmer Station, requiring other means to hold *Maumee* clear. One steel pontoon was located just in from the shore fuel manifold near Scott's Hut, with heavy bundles of 8 by 12 inch timbers to hold it an additional 8 feet off shore and these bundles in turn bearing on four steel pilings at the ice edge, to keep them clear of the deeply undercut portion of the ice face at the water's edge.

The second pontoon had been cut down to fit *Mirfak's* main hatch; it would be carried to Palmer Station to enable the ship to use the small station dock, normally used by the 125-foot research trawler *Hero*.

In lieu of a second pontoon, the test section of the man-made "ice wharf" that had been built by the *Deep Freeze 72* winter-over crew was placed against Pier Two, with a cluster of seven huge tire assemblies from surplus "rolling wheel" fuel transporters to cushion the ice-to-steel contact. The strength remaining in this rather small piece of artificial saline ice was conjectural, but it showed no signs of breaking up during *Maumee's* stay.

Palmer Station cargo operations

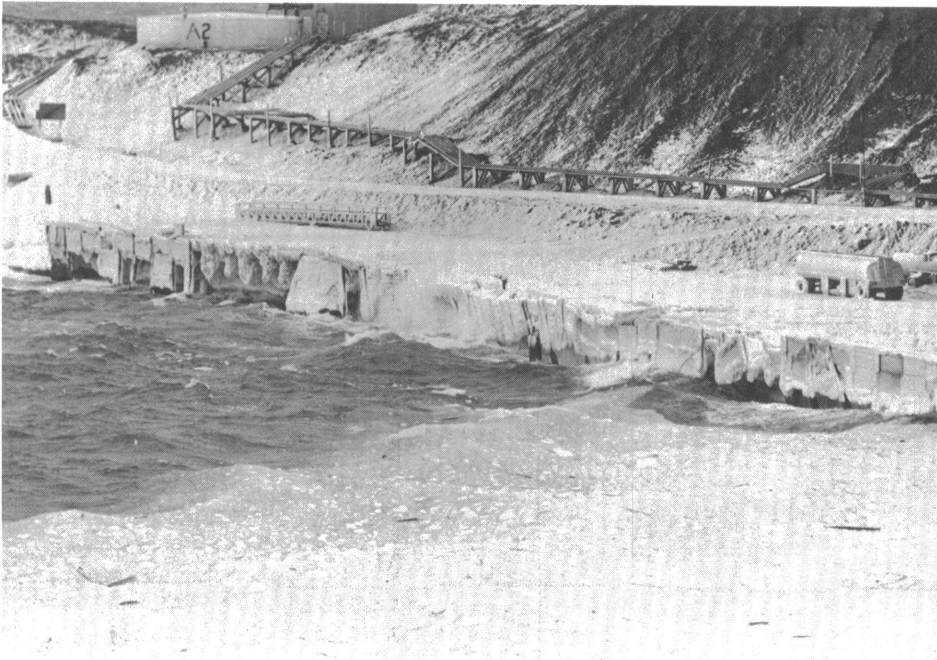
For the first time, no large cargo ship visited Palmer Station. *Northwind* made an early season call to relieve the crew and furnish 100,000 gallons of fuel, but all other requirements were furnished by *Mirfak*, including a normal season's supply of fuel.

The ship's ability to come alongside the station dock, using the pontoon carried from McMurdo Station as a camel, simplified operations and removed the need for the additional landing craft (LCM-6 model), boat crews, and cargo handlers formerly used. The 20- by 28-foot pontoon was moored nearby for possible future use.

Two pieces of equipment intended for retrograde to Davisville, a rock crusher and a 955 forklift, were too heavy for the station crane to lift down to the pontoon where *Mirfak* could reach them. Captain Couch planned to retrieve these pieces of cargo by warping *Mirfak's* bow in closer to the beach after all cargo for the station was offloaded and making the lifts directly from the beach with ships gear. This plan was foiled because of bad weather, and the equipment remains at Palmer Station.

Icebreaker employment

USCGC *Northwind* (WAGB-282) departed Seattle on October 30, 1972, and proceeded down the west coast of South America to Punta Arenas, Chile arriving on December 1. Arriving at Palmer Station on December 4, the ship remained for 4 days while the new crew relieved the *Deep Freeze 72* veterans. *Northwind* provided fuel, priority cargo, and a variety of repair assistance to the station during her stay before skirting the



March 1973 storm damage to Elliott Quay, McMurdo Station.

U.S. Navy

ice pack to arrive at the edge of the fast ice off McMurdo on December 22.

USCGC *Glacier* (WAGB-4) joined *Northwind* on December 23. Breaking of the channel through 11 miles of bay ice in to Hut Point took less than 2 days, with the icebreakers employing a dual-ship "railroad track" technique. This unusually rapid break-in was offset by the lack of favorable winds to clear the channel.

Glacier departed for the Weddell Sea on 29 December, but ice continued to clog the channel and require *Northwind's* attention until January 10, 1973 when it was finally blown clear. *Northwind* then turned her attention to station chores—surveying Winter Quarters Bay, lending the assistance of her divers and skilled welders to the pier reconstruction effort, escorting *Mirfak* into Winter Quarters Bay, and refloating the two large pontoons from their winter berth at the head of the bay.

Next, the icebreaker escorted *Mirfak* within 16 miles of Marble Point, across McMurdo Sound, for a coordinated ship/helicopter cargo lift in cooperation with U.S. Navy VXE-6 helicopters, after which the ship departed to rendezvous with the deep sea drilling ship *Glomar Challenger* near Scott Island on January 26.

The escort of *Glomar Challenger* on her first venture into the Antarctic was successful and uneventful for *Northwind*. Relieved by USCGC *Burton Island* (WAGB-283) on February 9, *Northwind* returned to McMurdo Station to assist in the ticklish operation of berthing *Maumee*.

Having refuelled from *Maumee*, *Northwind* would normally have followed her out of the Ross Sea for a well-earned rest, but the annual ice runway refused to

break up and go out to sea on its own, posing the problem of an uneven, second-year ice runway in *Deep Freeze 74*.

Northwind remained to break up the ice runway, completing this final task on February 23. The wind failed to blow the broken ice out of McMurdo Sound, however, and it appears that repositioning of the runway will be required next year.

Northwind departed for New Zealand, calling at Campbell Island on the way. Her arrival at Lyttelton on March 4 marked the end of 94 days under Task Force 43, the ship's second consecutive *Deep Freeze* deployment and the fourth season in the Antarctic for her veteran skipper, Captain N. C. Venzke, USCG.

USCGC *Glacier* departed Long Beach, California, November 15, 1972, after a brief in-port period and proceeded directly to McMurdo Station via New Zealand, touching at Hallett Station by helicopter enroute.

Observers at McMurdo had no difficulty distinguishing the two icebreakers at a distance; *Glacier* had eschewed the traditional white Coast Guard hull color in favor of a bright red. Designed to help helicopter pilots, this color scheme proved effective and will be extended to the rest of the icebreaker fleet.

Upon completion of the channel break-in, *Glacier* departed for Punta Arenas, Chile, to refuel and take on board her Weddell Sea scientific party. Fuelling at Puerto Percy, an offshore fuel terminal, is never easy, but *Glacier* encountered more than her share of troubles with high winds and leaks in the fuel facility's underwater pipeline. She left on January 18 with 16 scientists for a multidisciplinary cruise in the Weddell Sea,

normally one of the better places to stay out of in Antarctica. However, this year ice conditions were good to very good.

The highlight of the voyage was the recovery of two current meters in the vicinity of 70°S, 40°W., set from *Glacier* in 1968 by a party from the University of Bergen. Earlier recovery attempts had been thwarted by severe ice conditions. When recovered, the meters were in excellent condition.

The big icebreaker continued south, reaching the vicinity of Argentina's Belgrano Station on February 11. Captain W. E. West, USCG, commanding officer visited this station and the British station at Halley Bay, before heading north to open water. *Glacier* returned to her homeport via the west coast of South America.

USCGC *Burton Island* (WAGB-283) arrived in New Zealand on December 24 following a late-season arctic commitment. Scheduled departure on January 1 was delayed by engine repairs until January 9 when the ship departed enroute the Oates Coast area (west of Cape Adare) to support a seal census. Scientific work proceeded more quickly than had been forecast and was completed between January 16 and 29.

The closing of Hallett Station made it desirable to bring out as much station equipment as possible by ship. *Burton Island* retrograded 20 tons of cargo from the station to McMurdo before relieving *Northwind* on February 9 for the remaining portion of the escort of *Glomar Challenger*. This escort was not so uneventful as the early portion. In attempting to deflect three small icebergs from interfering with drilling operations, *Burton Island* suffered damage to the half-inch steel plating area above her inch and five-eighths ice armor belt when one of the bergs rolled against the icebreaker's bow. This damage did not interfere with the remainder of the operation, however, nor was *Glomar Challenger* forced to abandon her drill site.

Upon completion of drilling operations on 19 February the two ships parted company, *Burton Island* proceeding to close out Hallett Station enroute to New Zealand where she arrived February 26.

Icebreaker helicopter operations

The two HH-52A helicopters carried by each icebreaker to provide ice reconnaissance and logistics capability have neither the range nor the load capacity of the UH-1N twin-turbine helicopters operated by VXE-6. They do have an amphibious hull, permitting over-water flights denied to the UH-1N. This capability was exploited in several science projects.

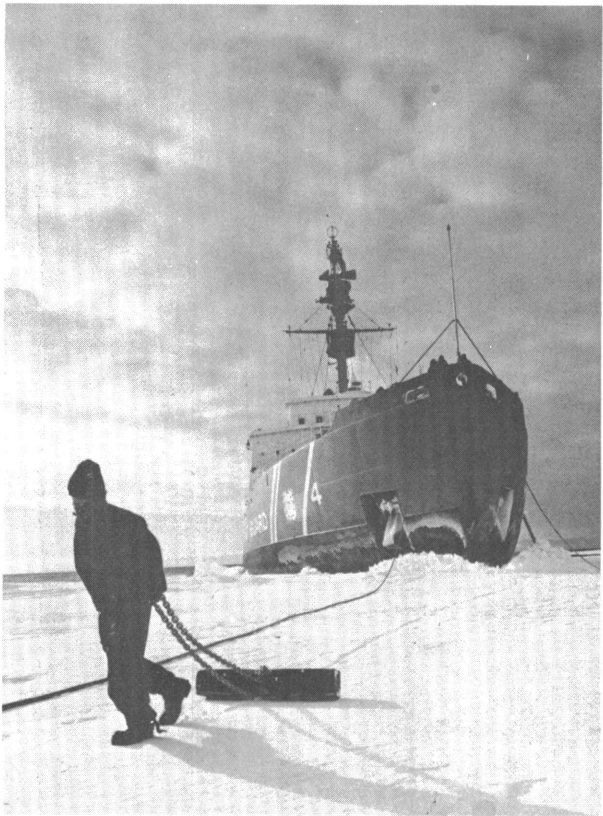
A seal survey from *Burton Island* involved 12 over-ice surveys ranging from 145°E. eastward to the Baleny Islands and south along the Victoria Land coast to Coulman Island; 103 flight-hours were dedicated to this survey. Seal collection and blood sampling was

done concurrently with the census. Flight-hours strictly attributable to this event totaled 5.1, but many of the seal survey flights also accomplished work for this event.

Burton Island used 2.4 helicopter flight-hours during her escort of *Glomar Challenger* and 4.3 for the establishment of a French EOLE transponder on a tabular iceberg, for a subtotal of 114.8 science-oriented flight hours of the 156 total hours flown south of New Zealand.

During her brief stay at Palmer station, *Northwind's* helicopters flew 27 hours in support of a film team and a survey of the status and population dynamics of seals. In McMurdo Sound, her helicopters flew 46.1 hours in support of an overwater aeromagnetic survey connected with the Dry Valley Drilling Project. *Northwind* also established an EOLE transponder and flew ice reconnaissance missions for *Glomar Challenger*. Total helicopter flights between departure from Seattle and arrival in New Zealand amounted to 196.2 hours.

USCGC *Glacier* helicopters supported a study of birds in the antarctic ice pack from McMurdo Station through departure from the Weddell Sea, and also study of the laminar structure in bottom water in the Weddell Sea. The collection of eight species of antarctic birds on the last science support flight into the South Orkney



U.S. Navy
USCGC *Glacier* being moored to fast ice along the Filchner Ice Shelf. The seaman is hauling a deadman anchor.

Islands was a highlight of the effort. The bottom water study involved the use of sophisticated equipment such as expendable bathythermographs, usually placed from an oceanographic ship. Deploying this sensitive equipment from a helicopter presented many problems of electrical interference, most of which were overcome in the field.

Glacier was not able, after numerous attempts, to locate a suitable iceberg on which to emplace the third EOLE transponder. Science support accounted for 79.7 of 218.4 total hours flown.

Cargo ship operations

While cargo operations at McMurdo Station have been covered, other contributions of the Military Sealift Command ships deserve to be highlighted. In the absence of sufficient end-of-season air transport, Captain C. D. Henry and the officers and crew of USNS *Towle* made room for 143 passengers from McMurdo to New Zealand. Though the ship was extremely crowded, all hands cooperated to make this a harmonious and, under the circumstances, enjoyable passage.

Towle's arrival at McMurdo appeared likely to be delayed when she encountered and was stopped by dense pack ice north of Ross Island. *Northwind* was required to be elsewhere with *Glomar Challenger* and that left *Mirfak* for possible assistance. Doubts were expressed as the little ship headed out, but *Mirfak* worked her way in to *Towle* and led the larger ship into Winter Quarters Bay later the same day.

To ease the task of placing the tanker *Maumee* precisely in her planned berth, the harbormaster of Lyttelton, New Zealand, Captain D. Holden, made his services as pilot available. His extremely skillful contribution minimized the hazard inherent in this operation.

Artificial ice wharf construction

The interest aroused by this project and the number of misconceptions that have arisen concerning it warrant mention. The original concept was to create a large, free-floating ice floe by pumping seawater into an enclosure in shallow pours, allowing each pour to freeze solid before proceeding.

In the test section, the *Deep Freeze 73* "ice cube," an attempt was planned to support the artificial floe from the edge of the natural, permanent ice forming the shore of Winter Quarters Bay. If this attempt were successful in halting the relative motion of the two masses of ice, then it was felt that the tidal crack would heal, and the ideal of extending the solid ice face out to deep water would be attained.

In practice, the attempt was not made because of difficulties in freeing the ice cube from the surrounding sea ice and because, as reconstruction exceeded expectations, it became clear that the space occupied by the test section would be needed for the ships. The

"ice cube" remained a free floating object and was moved from place to place as required.

No fresh water was used in the ice wharf. On advice from the Naval Civil Engineering Laboratory at Port Hueneme, California, seawater as near freezing temperature as possible was used to minimize distortion of the structure as the water froze solid. When completed, the "ice cube" was 15 feet thick. The line between the original sea ice and the artificially formed ice was visible in a coring and confirmed that no appreciable erosion had occurred on the underside of the test section.

The top of the ice wharf was insulated with a 6-inch layer of hay, two precious air cargo pallet positions having been given over to this unusual burden. Held down by mattresses, this layer effectively prevented loss of thickness from radiant heat. Erosion on the vertical faces was minimized by the 1-inch thick lumber of the formwork, so long as the ice cube was held in the quiet water at the head of Winter Quarters Bay. When it was nearer Hut Point in readiness for the arrival of *Maumee* and subjected to the chop created by 30-knot winds, ablation was significant, but not sufficient to detract from the performance of the small test section as a fender. No crushing or deterioration was observed. Having served its purpose, the ice cube was released to float out to sea.

Planning for *Deep Freeze 74* includes a much larger ice wharf, over 600 feet long, centered on a point midway between the two piers at Elliott Quay and extending 200 feet out into Winter Quarters Bay. A final thickness of 30 feet is hoped for, and construction is underway by the winterover party at McMurdo Station.

Construction report, *Deep Freeze 73*

J. M. STEVENS

U.S. Naval Support Force, Antarctica

On September 7, 1972, the U.S. Naval Support Force, Antarctica, and the subordinate Antarctic Support Activities were consolidated. Tasks formerly assigned to the assistant chief of staff for civil engineering, Task Force 43, were transferred to the public works department of the support force. A construction division was formed in the public works department. The public works officer assumed the additional title of resident officer in charge of construction in Antarctica and received managerial responsibility for construction projects and construction planning. The billets of the public works officer and the assistant were upgraded one

Lieutenant Commander Stevens, CEC, U.S. Navy, is public works officer for the support force.