A Newport News Shipbuilder’s Cruise to the Top of the World

The ice-breaking supertanker MANHATTAN made two exploratory passages through the Northwest Passage in 1969/1970. The purpose of those trips was to determine the practicability of utilizing that fabled waterway as a means of moving oil from Prudhoe Bay, Alaska, to the East Coast of the United States. Data acquired during the two frostbitten voyages indicated that the use of supertankers was not as economical as building a pipeline across Alaska. Ultimately, a consortium of oil companies built the Trans-Alaska pipeline and the MANHATTAN returned to more conventional duties.

One of the participants in the 1970 voyage was David Alan Lester, a Newport News Shipbuilding (NNS) structural engineer. A native of Tidewater, Virginia, and a 1967 graduate of Virginia Tech, Dave’s cruise to the top of the world was his first venture outside the United States. He kept a personal log book and took or otherwise obtained numerous eye-catching photos during the trip. Coupled with his still-vivid memories after four-plus decades, Dave Lester’s summarized sea story ranks right up there with other work-related yarns that many seasoned Newport News shipbuilders can…and do…so often spin.
**A Bit of Background:** Creation of the ice-breaking supertanker MANHATTAN to meet a very tight schedule required major and complex modifications to a conventional vessel that involved the cooperative efforts of several shipyards, including Newport News Shipbuilding. How that was accomplished in a remarkably short period of time is appended at the end of this telling of Dave’s Arctic Adventure.

His involvement came about because the head of NNS’ Hull Technical Department wanted someone, preferably a Naval Architect with a structural engineering background to go on the second voyage and observe how the ship performed and how her strengthened structure responded to the rigors of an arctic passage. The first trip had been made in the summer, when ice conditions were least severe. But the second was deliberately scheduled for a time of year when ice in the Northwest Passage was expected to be the most formidable.

Several Naval Architects at NNS declined to make the trip. As did Dave’s immediate supervisor, graduate apprentice, Clinton Dotson (Designer, Hull - 1959), who also was a University of Michigan graduate where he earned a degree in Naval Architecture. And so, an ‘invitation’ to sail onboard the MANHATTAN was extended to a young, bearded, unmarried and relatively inexperienced engineer. At the time, he felt, career-wise, that it was an ‘opportunity’ that he could not refuse.

By April 3, 1970, Dave had purchased the warmest clothing he could find, bid farewell to his family and friends, and had boarded the MANHATTAN; berthed at a shipyard pier in Newport News. At approximately 7:40 AM that morning, this huge and distinctly differently-looking vessel headed for sea, aided by the shipyard tug HUNTINGTON.
Learning and Logging: In addition to the ship’s operating personnel, Dave’s shipmates included another engineer from the shipyard’s Engine Technical Department and five members of NNS’ Ship Test Department, plus numerous observers from several oil companies and the United States Coast Guard. About a hundred men made that trip and were issued heavy parkas and other winter protective gear. After passing the Virginia Capes, maneuvering tests and speed trials at various power levels were performed.

Right away, a problem was noted. The vessel had been back-fitted with a hydraulic system that permitted the reasonably rapid transfer of ballast water from one amidships’ wing tank to a tank of similar size on the other side of the ship (and back again). The purpose of this addition was to allow the crew to ‘rock’ the MANHATTAN if trapped in thick ice.

While attempting to perform a ‘slow roll’ from one side to the other, the automated controls did not function properly, so manual control of the system had to be substituted. This provision to aid in the planned transit of arctic waters, coupled with the ship’s steam propulsion machinery, had earned her an interesting and unusual nickname during her first voyage to the Arctic.

During that first day at sea, Dave became acquainted with other equipment that had been installed to support the vessel’s mission. These included a large number of strain gauges and other instruments, whose readout could be recorded on state-of-the-art instruments in a van that had been secured just aft of the tanker’s midship superstructure. He also learned that one daily duty would be to sound 45 tanks of varying size and purpose and use the results to calculate the ship’s draft and trim condition. In addition, on occasion, Dave also participated in developing hull girder bending moment/stress calculations.

Dave utilized a couple of shipyard-issue, blue-lined yellow tablets to maintain a daily log of his activities and findings. All of his entries were meticulously printed by hand, and on several pages he included one or more engineering sketches to illustrate structural design features associated with conditions experienced.
By the end of the first day, Dave had quickly acclimated to being at sea, and concluded his log entries for April 3rd with the following sailor-like statement: “Weather was very good, clear sky, mild temperatures, smooth sailing.”

Dave augmented those thoughts with this image of the first sunset at sea he had ever experienced.

By their second day at sea, Dave and his sea-going associates had quickly settled into a routine round of duties that occasionally were modified to suit the needs of their mission. On a number of occasions, Dave joined the NNS test team in the instrument van, helping to record data, when asked to do so by the trip’s technical director. At other times, he inspected the various structural reinforcements internal to the vessel’s hull to look for signs of structural damage and/or instrumentation breakage or dislodgement.

Over the next few days, MANHATTAN steamed steadily northward. Several days outbound, as they approached the western side of Greenland, the weather got progressively colder and they began to see icebergs and bands of loose ice on the ocean’s surface.

Dave noted this new experience in his log and photographed the scene. One of his daily chores, in the company of a representative of Atlantic Richfield, soon proved unpleasant, as noted in this log entry of April 5th: “When we started to take the ullage [soundings] of the forty-five tanks, the wind was blowing at between 30 and 40 knots out of the north. The tanks on the fore deck forward of the bridge proved a challenge. Here the spray from the pounding of the high seas was coming over the sides of the deck.”
The results of their arduous efforts, exposed to the elements and later augmented by calculations, indicated that the ship was not at the proper draft to represent a loaded tanker attempting to transit the Northwest Passage. More importantly, the ship needed to be ballasted down by several feet in order to place the heavily reinforced ice belt that girded her forebody at a lower elevation where it could best protect the ship.

After consulting with the ship’s captain, it was decided to further ballast down the MANHATTAN to a median draft of 51 feet, 6 inches, with a three foot trim aft. This required taking on an additional 35,000 tons of sea water ballast, judiciously placed in the various tanks to achieve the desired draft and trim.

By April 10th, Dave was seeing ice continuously. His log indicates that most of the ice consisted of large chucks, but he also saw and photographed several magnificent icebergs. He also noted that they expected to soon run into pack ice and could begin conducting three tests; to wit:

- Running continuously through shallow ice
- Ramming into heavier ice
- Evaluating the ship’s maneuvering capability in all types of ice

The next day, an ice field that was estimated to be eighteen inches thick was encountered. Dave noted that afternoon the ambient air temperature only reached six degrees Fahrenheit and a twenty mph wind resulted in a chill factor of minus 35 degrees F. After successfully conducting a continuous run test, the MANHATTAN hove to and many of the ship’s company took the opportunity to go onto the ice.

Including Dave… “The ice seemed solid as a concrete sidewalk. There was also a four-to-six inch cover of snow on the ice. It was a pretty novel experience and we took lots of pictures of the ship and our ice party.”
**Crossing the Arctic Circle:** On Sunday, April 12th, Dave and a number of his novice shipmates experienced what he had been told two days previously would be ‘quite a festive occasion’. Following are his log entries about that event: “King Rex, the Queen, Davy Jones, the Royal Baby and several other dignitaries came aboard to officially initiate all bluenoses into their arctic realm. The initiation ceremony consisted of a wet or cold swat on the bottom (your choice) and then everyone had to kiss the Royal Baby’s belly. A 300-pound seaman played the part of the Royal Baby, and he had hot barbeque sauce smeared all over his rolling stomach. Afterwards, each Bluenose got a royal document from King Rex stating that he had crossed the Arctic Circle.”

By then, the MANHATTAN was completely surrounded by what appeared to be an unending field of unbroken ice. An icebreaker, which had been assigned by the Canadian government to escort the tanker, was often needed to help the much larger ship make any headway.

Each day, progress diminished. On April 13th, the ice-breaking supertanker only moved 45 miles further northward over a 24-hour period. Heavy ice ridges were often encountered, and the ship had to frequently back down in order to build up sufficient forward speed to break through and achieve any progress at all.

Darkness was not a problem; at least not with respect to shipboard operations. The sun rose at 3:30 AM and complete darkness did not occur until late in the evening. Dave noted in his log that sleeping became difficult under those conditions. But he also indicated that the all-white scenery was spectacular, with huge icebergs often visible at a great distance. One of them Dave estimated to tower about 200 feet above the water and using the ‘one-seventh’ rule for measuring icebergs, its underwater mass must have been gargantuan.

**A Bad Day:** On Tuesday morning, April 14th, one of the NNS test personnel aboard the MANHATTAN received a terse radio message that his only child had died at school that day. Understandably upset, he was flown by the helicopter carried on the ship to Greenland where arrangements were made to transport him home as quickly as possible. The mood on the ship, as reflected by Dave’s log entries for that day, was somber.

Later that day, the MANHATTAN tried to punch through a heavy pressure ice ridge that had stopped the ship. The surrounding ice was estimated to only be about five feet thick, but the ship was essentially wedged into the pressure ridge, which extended well below the pack ice. Consequently, the vessel was unable to move under its own power.
The roll system did not help. Turning fire hoses on the surrounding ice only resulted in creating enough slippage for the vessel to move forward about six feet. The Canadian icebreaker moved in close the next day and freed the MANHATTAN. The noon temperature reading on that day was minus four degrees F.

A few days later, a polar bear and her two care-free cubs were sighted crossing the ice ahead of the ship. As the ice-breaking supertanker slowly passed by, the mother stood on her hind legs and defiantly raised her front paws towards the amused onlookers.

On the evening of April 18th, following a day of slow advancement through an ice field three to four feet thick, the Canadian icebreaker 'rafted up' with the MANHATTAN, allowing the crews of both ships to visit back and forth. During the night, the icebreaker’s fuel oil supply was replenished from the tanker.

One of Dave’s log entries that day prophetically foretold of the eventual decision not to attempt to transport oil from Alaska to the East Coast of the United States by tanker: “If the ice gets much worse than it is now, it is going to take an extremely long time to complete our mission. Everyone is surprised that the ice is giving us this much trouble, and it seems that the winter ice is a great deal tougher than summer ice that had been weakened by warmer temperatures.”

**Future Design Considerations:** The process of ramming into strong ice ridges, then backing down in order to gather momentum and then repeating such attempts in order to advance led to a similar conclusion regarding the MANHATTAN’s modified design. Simply put; she needed more power for arctic service. The onboard observers and crew members concluded that her 43,000 shaft horsepower, for a vessel her size in ice-bound waters, needed to be at least doubled; maybe increased to as much as 200,000 SHP to facilitate a reasonable transit time under winter conditions.

Of equal concern was her decidedly inadequate astern power for such service. Her twin turbines could only produce about 15,000 SHP when going astern, which proved to be inadequate to extract the huge vessel when it became stuck after ramming into stubborn ice ridges. The ad hoc design committee onboard the MANHATTAN concluded that she needed much more astern power and considered the Canadian icebreaker’s propulsion plant a better design. That vessel had electric propulsion motors, which provided the capability to generate as much astern SHP as when going forward.

**Airborne and on the Ice:** On April 22nd, Dave and several others took off from the helicopter pad that had been mounted at the extreme stern of the ship for what he described as ‘general reconnaissance purposes’. After finding an area big and flat enough to set down, they exited the aircraft and set up equipment to take core samples from the ice.
Within sight of the ship, and in a place where the ice appeared to be of a consistent thickness, they drilled through four and a half feet of ice. The samples extracted indicated the ice was very ‘tough’, and Dave mused in his log notes that the ice even further north might prove to be too much for the MANHATTAN.

This activity was repeated numerous times later in the voyage. On each such trip, one of the men was designated to watch for polar bears, and was furnished with a rifle. Dave was assigned this duty once, and later laughed when recalling how he doubted his ability to even come close to hitting a charging polar bear with a bolt action rifle.

On a second flight that day, they discovered an area just ahead of the ship that appeared suitable for continuous operation and relatively easy maneuvering. Returning to the ship, Dave was introduced to a technique known as ‘the barrel test’. The helicopter crew placed an empty oil drum barrel on the ice about a mile ahead of the ship. The MANHATTAN then steamed towards the barrel, with the intent of coming alongside it; simulating docking in an icy harbor. But while attempting to accomplish this presumably simple feat, the ship got stuck; surrounded by huge outcroppings of ice.

With the help of the Canadians, the tanker was freed the next day and resumed her slow progress northward along the coast of Greenland. By April 25th the MAHATTAN had turned northwest to cross Baffin Bay. On many occasions the Canadian icebreaker had to clear a path astern of the MANHATTAN in order to provide enough room for her to safely back down, then accelerate and ram the ice with sufficient force to make any progress. Dave noted in his log that the general consensus of his shipmates was that any future ice-breaking tanker should have a bow designed to ride up and crush the ice, like conventional icebreakers, rather than trying to ram though using brute force.

In addition, Dave and others onboard that had structural expertise worried about the integrity of the ship’s bow, after being subjected to repeated and deliberate collisions with thick and surprisingly strong ice under what they worried might be potential brittle fracture conditions for the steel hull. They had been informed that a hole had been punched in the vessel’s side beneath the reinforced ice belt during her first attempt at a Northwest Passage, so their concern was more than merely academic.
On several occasions, while performing his daily tank sounding duties, Dave entered the heavily reinforced forepeak area to visually inspect for any signs of structural damage. Inadequate lighting and the close-spaced structural members that had been added made those inspection trips difficult, not to mention the fact that part of the ship was unheated.

Dave marveled at the sheer size of the reinforcements: “The stiffeners appeared to be sixty inches deep. The webs were probably one-half inch thick and the flanges were about ten inches wide and three-quarters of an inch thick. They appeared to be spaced on about twenty-four inch centers. Moving around in that area was very difficult.”

**Politics on Ice:** On April 27th, then-President Nixon’s brother and three Humble Oil officials visited the ship, arriving by helicopter from Thule, Greenland. To accommodate these visitors, Dave and the other fellows from NNS were moved out of a comfortable bunk room in the midships deck house to a less convenient location in the aft deckhouse.

A few days later, the VIP’s left the ship. Not only did Dave not even get to meet the President’s brother, he also didn’t get to move back into his former quarters. Instead, that space remained unoccupied, except when used by visiting executives from the several oil companies that had sponsored the exploration.

**Analyst in the Arctic:** As the ship moved slowly further westward, Dave spent some time studying the manner in which ship’s bow interacted with the ice. He made observations while the ship moved through the ice field by braving the elements; standing somewhat precariously on a platform that extended several feet outboard from the ship’s starboard side near the bow.

From that unusual vantage point, he had an unobstructed view of the ship’s hull moving slowly through the frigid waters and crushing or pushing aside relatively thin ice. At other times, when the ship was stopped, he and others went down onto the ice and inspected the bow just above the water/ice interface to determine if there were any external signs of damage resulting from the repeated ice ramming.
Dave utilized long arctic days to ponder his observations. He developed a series of conclusions and thoughts about future designs, which he reduced to writing, filling several pages of his yellow tablet log. He included multiple cross-sectional sketches, illustrating the characteristics exhibited by ice that had been broken up as it moved along the sides of the MANHATTAN. Dave also provided, for possible future use, design sketches of what he thought would constitute a better design for the bow of an ice-breaking supertanker. All good stuff, but apparently never realized in any future design of an improved successor to the MANHATTAN.

**Painfully Slow Progress:** By May 3rd, the MANHATTAN had finally crossed Baffin Bay and had reached the 77th latitude. Stymied attempts to approach the Northwest Passage, proper, resulted in the conclusion that it would be impractical to schedule transits of that passage on a year-around basis by oil-laden tankers. Scenes like this one underscored that determination.

It was at this point that a decision was made to proceed no further westward. Instead, it was decided that the MANHATTAN would set a course for a body of water on the north coast of Baffin Island named Pond [originally Pond’s] Inlet. This was a protected area that was believed to be a good spot for further testing. It was also the location of an Eskimo village by the same name where trip sponsors had all along planned for the MANHATTAN to pay a goodwill visit.

A few days later, both the tanker and the Canadian icebreaker became stuck for several hours. This condition was later aggravated when steady winds estimated to be thirty miles-per-hour, hit the MANHATTAN broadside with amazing force and moved that massive vessel like it was a toy. Pushed sideways, she began to crush and break up the ice along her starboard side, which then began to pile up. It was, as Dave recorded, an awesome display of nature’s force. When that event occurred, the Canadian ship was several miles away. It took them until the next day to reach the MANHATTAN and move around the tanker, breaking up the ice so that she could get underway again.

For the next several days the ice-breaking duo made relatively slow progress, alternately running into huge pressure ridges and then thinning ice and, at times, even open water when nearing the rocky eastern shore of the uppermost region of Baffin Island. By May 9th, the two vessels were approximately forty miles from the Eskimo community of Pond Inlet.
A Native Visitation: That evening, the MANHATTAN received visitors from Pond Inlet, which Dave described in his log, as follows: “Five Eskimos and the village’s school teacher, a Dane who had married an Eskimo girl, came onboard. They traveled on skidoos and came a distance of about 34 miles. The Eskimos were quite short with dark features, rather flat noses and short necks.

“They spent the night with us, and the next day built an igloo off our starboard bow. It only took them 35 minutes, and they said they could construct one in 15 minutes if they worked hard. The igloo was about seven feet in diameter and six feet tall. They used saws to cut blocks of frozen snow that measured roughly two feet long by one foot wide. Each block had a thickness of about six inches and weighed an estimated 35 pounds. We were surprised to learn that they build igloos using a spiral pattern and taper the blocks so that no slippage can occur due to gravity.”

Dave was impressed by this practical design, and included these sketches in his log book, to further indicate how the blocks for the igloo were arranged; far different from the general perception of an igloo’s structure.

After their visitors left, the two ships resumed their efforts to move closer to Pond Inlet. For days they only managed to make a few miles progress each twenty-four hour period, often getting stuck in increasingly thicker ice. On May 13th, Dave noted in his log that they had to continuously ram their way, but only moved forward 100-150 feet at a time.

Damage Aft: On May 15th, it was discovered that the stern shell plating and stiffeners on the port side had been damaged in way of a void space just above the aft peak tank. This area of the ship’s structure had not been strengthened during her conversion and repeated backing into thick ice had apparently caused an unexpected structural failure.

Close inspection of the damage required dumping tons of salt water ballast in order to reduce the vessel’s draft, aft, and allow entry into the void. The sketch on the right, one of several which Dave made after gaining access to the damaged area, reflects the situation.
Later during the trip, in open water, Dave had the opportunity to externally view the damaged area; depicted here. Coupled with the increased difficulty in making progress, this complication resulted in a decision by the ranking oil company representative onboard to curtail further attempts to approach Pond Inlet. It was decided that those who wished to do so would be given the opportunity to visit the nearby Eskimo village the next day. Then, the ship would start heading homeward, performing final testing along the way.

**Liberty:** May 16th was declared to be ‘Liberty Day’ onboard the MANHATTAN. All of those embarked were flown in several small groups by helicopter to spend a couple of hours ashore in Pond Inlet. It was the first time in six weeks that any of them had been able to stand on dry land, and some had minor problems adjusting with their ‘sea legs’. Exploring the village didn’t take much time, Dave reported, but he did take a number of photos, indicative of the conditions the 350 residents there had to endure.

He also took pessimistic note of the depressed economic conditions in Pond Inlet, and of the natives’ large dependence on welfare furnished by the Canadian government. Nevertheless, he concluded the following: “All in all, today was one of the big events of the trip. Seeing these people, how they live, what they do and what they are really like has meant a lot to me.”
**Trinkets and Treasures:** After the crew returned to the ship, a number of Eskimos visited the MAHATTAN, some even coming over the ice by dog sled, bringing young children with them. The youngest of the ship’s visitors roamed all over the huge ship, but spent most of their time in the galley, savoring candy, cookies and other seldom-seen treats.

Their parents brought soapstone and whalebone carvings, seal skins and fur boots, and rings made from walrus tusks. These were sold to their sea-going hosts in the ship’s galley at modest prices, ranging from one dollar for trinkets to $60 for a rare narwhal tusk that one of the ship’s operating crew purchased. Dave joined in with the others and procured several items, including this soapstone carving of an arctic owl and a set of miniature mukluks finely handcrafted by an Eskimo woman.

**Homeward Bound…Slowly:** For the next several days, as the two ships struggled to retrace their track south, the technical team outlined and then drafted a comprehensive report of their experiences, findings and conclusions. By May 22nd, a draft report had been completed, except for a section devoted to analysis of the thicknesses and consistency of the various kinds of ice encountered during the voyage. As that section was being completed, the remaining sections of the report were reviewed and edited.

In parallel with that activity, the ship’s crew had fabricated a wooden cofferdam inside the damaged void tank and had filled it with concrete. This action precluded any further in-leakage for the duration of the voyage home. Nevertheless, the ship’s skipper was careful, when going astern thereafter, not to further damage the ship’s stern.

Further trouble occurred on the afternoon of May 26th. The Canadian icebreaker had spent most of the morning moving around the MANHATTAN and breaking up the ice that repeatedly hindered her passage. While the icebreaker was stopped abeam on the windward side of the tanker, about thirty feet away, strong winds began to push the vessels closer together.

Although the icebreaker’s crew tried to prevent sideways movement of their vessel, the unwavering wind pushed the two ships into physical contact with one another. Windblown loose ice quickly closed in on the icebreaker’s port side, effectively trapping the two vessels together.
Due to strong, persistent winds, no attempts were made to disengage for several days. On the morning of May 30th, after the wind had finally died down, both ships went to full power, but had no success disengaging.

The next day, a Sunday, a large group of personnel from both ships gathered on the ice and began to laboriously drill a line of holes parallel with the icebreaker’s windward side, in hopes of weakening the five-to-six foot thick ice that had been packed there.

Dave, who participated, later noted in his log that this was a monumental task, considering the number of holes needed and the amount of effort required to drill a single hole. He also laconically commented that the attempt was unsuccessful.

**Seat-of-the-Pants-Engineering:** The MANHATTAN’s chief engineer than posed an innovative possible solution. He suggested laying a two-inch steel pipe on the ice, parallel with the icebreaker’s hull and running steam under pressure through it. This concept worked beautifully. Using 75 psig steam from the tanker’s propulsion plant, within a hour the pipe had cut a trench three feet deep in the ice.

Continued application of this solution resulted in large chucks of ice being melted, and the Canadian icebreaker was finally able to first free herself, and then the MANHATTAN. Both crews chalked up another ‘arctic lesson learned’.

By June 9th, the ships were moving easily into progressively more open water, retracing her path southward along the west coast of Greenland. Two days later, after leaving the Canadian icebreaker behind, the MAHATTAN steamed at full power around the tip of Newfoundland.
The comprehensive report that had been in the works for more than two weeks was essentially completed by the end of the first week in June. Upon his return to Newport News, Dave prepared his own account of the trip for shipyard management in which he included a map, reproduced below, to graphically indicate progress between April 3\textsuperscript{rd} and June 4\textsuperscript{th}.

The map shows the general path taken in 1970 by the MANHATTAN from Newport News to the point far north where the decision was made to proceed no further west and instead, to head for Pond Inlet and back to the United States. Part of the return trip, from the area near the northwest coast of Greenland is not represented, since it is similar to the outboard portion of the voyage which took place in open water.

Each ‘hash mark’ along the path represents the ship’s position on a particular day. The widely spaced marks indicate the excellent progress that the vessel achieved when steaming in open water. The more closely spaced ‘hash marks’ graphically indicate how that progress was slowed…even stopped at times, when in pack ice.

Several of the marks, as described on previous pages, represent those times when the ship was stuck in the ice pack. One mark represents the five days when she and the Canadian icebreaker were trapped side-by-side in the beginning stages of the return voyage.
**Mother Nature’s Last Obstacle:** On June 10th, the vessel encountered fog so dense that visibility was down to a single ship length. Forced to drastically reduce speed, the MANHATTAN repeatedly sounded her steam whistle as a warning to any small fishing vessels in the area that might not see her until it was too late.

The next day, still slowed by fog, a crack in the ship’s hull was belatedly discovered. Located well forward and just under the reinforced ice belt, it ran both horizontally and vertically for a total distance of nine to ten feet in way of one of the forward wing tanks. The damage extended through two longitudinal strength members and was located just below the area where the reinforced ice belt had been fitted.

As Dave noted, it was impossible to determine how long this condition had existed, or what, exactly had cause the problem. The most widely accepted theory was that ice had caused the problem sometime when the vessel was backing down.

**Home is the Sailor:** The MANHATTAN docked in Philadelphia on June 13th. After being repaired, she resumed her original intended, conventional service of transporting oil around the world. Her reinforced bow was retained, but not used again. In 1987, she ran aground in Asia. Although successfully refloated, she was taken out of service and scrapped shortly thereafter.

The oil companies that had sponsored her two trips to the top of the world decided that it was infeasible to transport oil from Prudhoe Bay through the Northwest Passage to the East Coast of America on a year-round basis. That concept was abandoned and the Trans-Alaska oil pipeline was built instead.

Dave’s shipmates scattered, at the completion of their voyage together. He returned to Virginia and resumed performing analyses of ship structures and equipment foundations for the first of the NIMITZ-class carriers. Years later, his hands-on, at-sea experiences served him well on several occasions, when he was assigned to tanker design work at NNS. After a long and successful career at NNS, Dave Lester retired in 2011.

At a retirement party celebrating forty-four years of service with the shipyard, a biographical, audio-visual presentation created by his older brother, Jerry Lester was shown. Dave was delighted that it included numerous pictures of his ‘all expenses paid’ cruise to the top of the world over forty years previously.

Dave has not been north of the Arctic Circle since 1970 and has no plans to go again. But, if asked, who knows…
Postscript: This story is the proverbial ‘tip of the iceberg’. To fully appreciate Dave Lester’s 1970 at-sea experiences, one has to read…nay study…his highly detailed, daily log books. They are, in and of themselves, an engineering treasure. His 1970-generated sketches, analyses and conclusions represent wisdom and foresight seldom found in a young engineer.

When recently asked what benefit he derived, professionally, from his arctic adventure, Dave responded as follows: “Sailing on the MANHATTAN gave me a feel for what life was like onboard a ship, as well as some knowledge of steam plant operation and how a tanker handles at sea. I also learned much about the longitudinal strength aspects of ship design (i.e., hull girder bending moment and stresses in a ship).

“In the mid 1980’s, I worked on the design of the ULCC’s built at NNS as well as conversion work on several tankers. I think the MANHATTAN trip had a lot to do with my selection for those assignments, as well as for being asked to work on the Double Eagle tanker program later on. I enjoyed commercial design work and it gave me a nice break from the carrier design work that I did for most of my career”.

It took some convincing on my part to get him to share what he considered to be a story of little interest or consequence. Dave, for once, you were wrong…

Bill Lee
January 2012

Cachet commemorating the 2nd voyage -
Autographed by the MANHATTAN’s Captain
~ APPENDIX ~

Converting a Conventional Ship into an Ice-breaking Supertanker

The SS MANHATTAN, designed as a large, conventional tanker, was built in Massachusetts in 1962. After a few years of routine service, she was designated in 1968 by her owners, the Humble Oil & Refining Company, to be extensively modified for the purpose of exploring the feasibility of transporting crude oil from Alaska to America’s East Coast via the fabled Northwest Passage; a distance of 4,400 miles.

A consortium of American oil companies became the sponsors of this ambitious project. Because there was no prior experience with such voyages, and model simulation was considered infeasible; they decided the only way to test the practicality of year around tanker usage in the Arctic was to conduct a major experiment, using a large ship and subjecting it to the rigors of such voyages. What soon became known as ‘The MANHATTAN Experiment’…or the world’s biggest ship model test…cost $54 million to accomplish. That amount is roughly equal to $250 million in today’s dollars.

They also established an ambitious schedule for making the first arctic exploratory voyage, along with specifying major changes to the MANHATTAN in order to provide her with ice-breaking capabilities. This resulted in an unusual collaboration of several American shipyards, including Newport News Shipbuilding. To speed the desired conversion work, the tanker was dry docked at Sun Shipbuilding in February, 1969, and cut into four huge segments. Sixty-five feet of the vessel’s bow was removed and discarded. It was replaced by a 125-foot long icebreaking bow that was built in two sections by Sun Shipbuilding and Bath Iron Works.

The forward section of the tanker was towed to Newport News, where it was reinforced by NNS with a one and one-half inch thick ice belt intended to protect the ship from large floes of ice. The midship section went to the Alabama Dry Dock and Shipbuilding Company, where additional hull steel was added. The stern section remained at Sun Shipbuilding, where it was strengthened both externally and internally.
The vessel’s midship and stern deck houses were also modified. Additional quarters were added in both areas, and a helicopter pad was built on the ship’s stern. Laboratories and electronic gear needed to support the vessel’s planned exploration were incorporated, along with a hydraulic system, midships, that would allow ballast to be moved fairly rapidly from a designated wing tank on one side to a similar tank on the other side of the ship.

When the modified sections had been regrouped at Sun Shipbuilding, the MANHATTAN was welded back together. When completed, her length had been increased from 940 to 1,005 feet, her beam widened by sixteen feet to 148 feet, and her deadweight had been increased by 9,000 tons.

Her propulsion machinery was unaltered, but her twin rudders and propellers were fitted with guards to preclude ice damage. When returned to Humble Oil, she was not only the largest merchant vessel registered in the United States, but also had become the biggest icebreaker in the world.

On August 24, 1969, the MANHATTAN headed northward from Philadelphia with 126 crew members, scientists and oil company representatives onboard. Her cargo tanks were filled with water to simulate a loaded vessel. In the company of two icebreakers, she first encountered thick ice near Baffin Island in early September.

The ice-breaking supertanker made good progress, although at times she had to change course to avoid ice too thick for her to master; even with the aid of the icebreakers that accompanied her and often had to help free the ship when entrapped in ice.
By September 14th, she reached Prudhoe Bay and delivered a single, ceremonial barrel of oil. A return trip, via the Northwest Passage, was completed on November 12, 1969, when she steamed into New York harbor.

This initial success, however, was tempered by the knowledge that the round trip had been made before the thickest and toughest ice that always develops during long arctic winters had been formed that year.

The oil companies’ consortium decided that another voyage, under ‘worst-case’ conditions was required in order to confirm the feasibility of ice-breaking tankers routinely transiting the Northwest Passage for commercial purposes. Thus, the stage was set for a second voyage in 1970; pitting their vessel against late winter conditions.

The MANHATTAN moved to Newport News, where minor voyage repairs and some alterations to her data collection systems were made to prepare for her second…and what proved to be her last…trip to the top of the world.