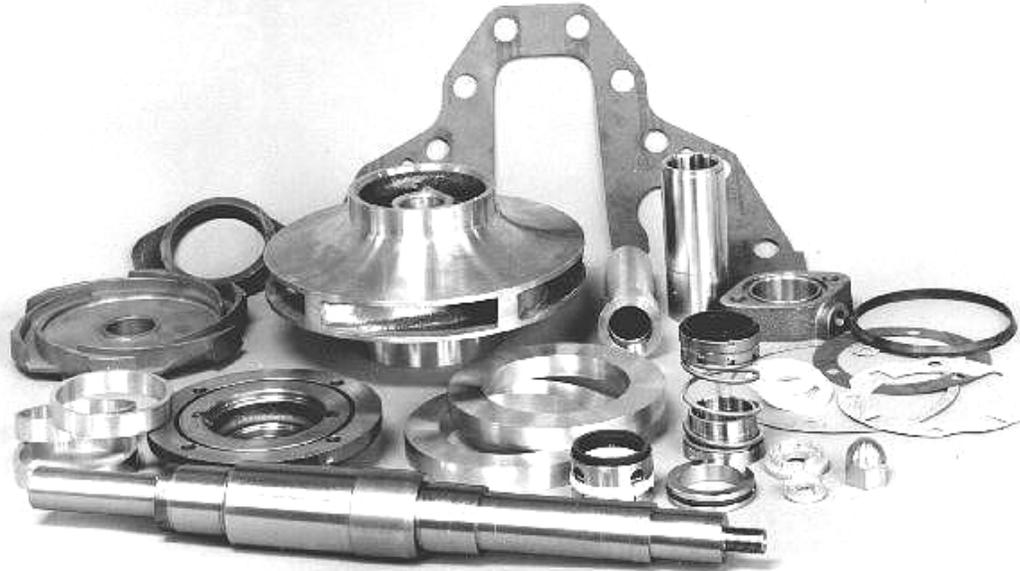


A SPARE PARTS SEA STORY



by Bill Lee

In the massive and multi-year effort required to design and build a new class of nuclear-powered aircraft carriers, complications often arise. Such things can also happen, as Murphy has repeatedly demonstrated to us, at the most inconvenient of times.

This is the tale of just such a complication. Late in the design/build cycle of NIMITZ, Newport News Shipbuilding was faced with an unexpected predicament. I played a small part in an innovative solution that got the shipyard-and the Navy-out of a bad situation.

But first, a little background for the vast majority of people who have never heard the term Q-COSAL and to possibly rekindle nightmares for those who have tried to forget it.

~ The Q-COSAL Circus ~

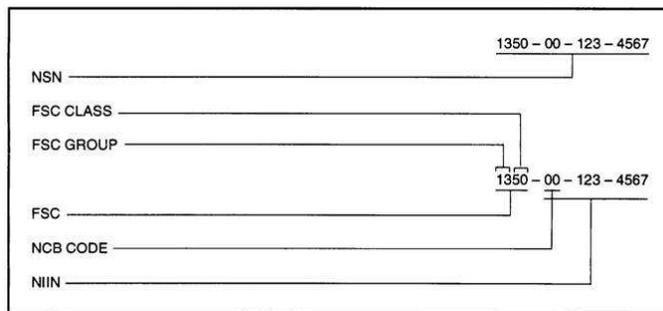
The acronym Q-COSAL stands for Quality Coordinated Shipboard Allowance List. It is the Navy's designation for a comprehensive list of spare parts associated with a ship's nuclear propulsion plant. Why Q instead of N? I don't know. N would have seemed more logical since similar lists for other branches of the Navy use more relevant alpha-prefixes. Like A for aircraft... Maybe using Q was Admiral Rickover's clever and pointed way of reminding the rest of the Navy that his program was more about quality than theirs.

As 1974 drew to a close, NIMITZ was nearing completion. The propulsion plant design team was extremely busy supporting dock-side testing and dealing with other matters that we felt were far more urgent than worrying about spare parts. Little did we know...

Since NIMITZ (CVN-68) was the first of a new class of nuclear-powered carriers, Rickover's organization had cognizance over the entire propulsion plant. Consequently, the listing of required onboard spare parts developed for the NIMITZ propulsion plant got pretty big. About 70,000 individual items, ranging in size from tiny screws to large, multi-ton equipment parts eventually made their way onto NIMITZ' Q-COSAL list.

How many units of each item required varied. History of failure and number of shipboard installed components were but two factors. If a spare part was a 'consumable' used in many places (i.e., a standard-sized gasket) it was stocked in greater quantity than any replacement part for a single piece of reliable equipment. Many parts had application outside the Navy and were stocked by the Federal Government using a bewildering set of identification systems. Some parts had Federal Stock Numbers; others had Navy Stock Numbers, or National Stock Numbers (both used the duplicate acronym-NSN). There were also Military Equipment Stock Numbers and National Item Identification Numbers.

The one thing all these systems had in common was the usage of a thirteen digit numbering format. Attempts to make all that simple resulted in charts like this one. Each of four fields represented 'something', but the uninitiated had to have a spare parts 'bible' handy to make any sense of it.



Fortunately, the Supervisor of Shipbuilding office at NNS included supply specialists. Without their help, the task of stocking the NIMITZ with spare parts would have been far more difficult than it was. Not that it was easy, by any stretch of the imagination.

Spare parts were usually ordered when machinery was procured. The purchase orders for some vital pieces of equipment, especially ones of a new and untested design, included an entire spare unit, which was stored ashore by the Navy. That seemingly simple process got bogged down when the list had items added or quantities increased at a late date. Often, such changes were the result of experience during the initial testing of NIMITZ equipment that had no prior operational history. Vendors complained about late modifications to orders they thought were completed. But their pain was eased by requesting and often receiving large increases in contract values to cover additional hardware, disruption of manufacturing processes and overnight shipping costs.

In those days before computers, lists were laboriously created largely by hand, and modified in the same manner. Errors in transcribing the thirteen digit numbers from list to purchase order to manufacturers' internal paperwork were frequent, and sometimes escaped detection. All it took was for one digit to be wrong, and the result, when a mis-identified part arrived at the shipyard, was sometimes as humorous as it was costly.

~ *NIMITZ Nit-Picking* ~

As NIMITZ neared completion, scant attention was paid to spare parts. Traditionally, manufacturers concentrated on getting equipment to the shipyard in time to support a vessel's construction sequence. The manufacture and shipment of spare parts was given less priority. It was generally understood that spares only had to be available by time of ship delivery. That all changed when Admiral Rickover made one of his infamous edicts: all Q-COSAL items destined for NIMITZ had to onboard before the first sea trials.

When Rickover made his shocking pronouncement, production of some parts had not even been started. To make matters worse, some of those items had manufacturing processes that had lengthy lead times. Some parts were available in factories, but those were mostly destined for installation in machinery for the third NIMITZ-class carrier. A number of items on the NIMITZ Q-COSAL were GFE (Government Furnished Equipment) and not even a part of the shipyard's procurement responsibility.

None of that mattered to Rickover. It was a classic case of 'don't confuse me with facts; my mind's made up'. Shipyard, SOS, 'Regular' Navy and his own staff's appeals were all summarily dismissed. The only thing left to do was to somehow comply. The yard reserved its rights to subsequently seek contract changes in price and schedule, including the disruptive effects on other work, I should add. But that's a whole other story...

Suddenly, there was a new game in town, and I got to play! Don Kane, Chief Engineer of the NIMITZ propulsion plant design team asked, well, directed me to get involved. That was because a lot of the propulsion plant equipment for which spare parts were missing was my technical responsibility at the time.

Fortunately, a beneficial coincidence, the kind that often plays a part in achieving success under adversity, existed. The SOS Supply Officer, Commander Jay Wheeler, happened to be a neighbor and close friend of mine. Jay was regular navy, had previously been the MIDWAY's supply officer and had a respect for NNS capabilities. He was not in agreement with Rickover's edict, but Jay was a 'can-do' guy. He often referred to such situations as insurmountable opportunities, and then successfully took them head-on.

Working with Jay and others, I got familiar with the complex Q-COSAL format: twenty-four columns containing both relevant and obtuse information that covered several over-sized sheets. We struggled to decipher that information and identify items not on hand. The initial result was depressing. As I recall, over two thousand individual items were not on their way to NNS or already onboard ship.

MCRL PART II			
NSN	REF. NO.	FSCM	RNVC
4320-00-057-0762	55599	62983	2
5365-00-200-5226	556-3541-1	46859	2
5950-00-237-7237	556-012-001	16665	2
3030-00-269-9669	556	24161	2
5841-00-323-0747	556-1137	46859	2
5841-00-323-0749	556-1182	46859	2
5305-00-433-9073	556-2332	46859	2
5365-00-514-0363	556-3541	46859	2
3020-00-967-4607	556-35-1246FW160P		
	2	01351	2

The only bright spot in all this was that many of the missing items were closely associated. For example, one multi-purpose pump required about 100 spares, so expediting those parts was a one-stop shopping expedition. Since the equipment for CVN-69 was already installed, we asked the manufacturer of that particular piece of equipment to delay assembly work for CVN-70, and lend us the needed parts for temporary use during sea trials. After NIMITZ sea trials, instead of returning those parts, we told him to use the parts intended as CVN-68 spares to complete the CVN-70 pump.

But that still left an urgent need to further expedite manufacturers, or find alternate sources of supply. Jay tackled the GFE supply issue and achieved a number of minor miracles. I worked with the yard's Purchasing Department expeditors, who called in a lot of favors with propulsion plant equipment manufacturers. Some unauthorized promises regarding future orders were made. But not in writing...

By the time our promises were discovered, both Jay and I had moved on. He was sent to a major supply base on Guam to head up the supply department for that area of the world. I went to an entirely different assignment and work environment at Tenneco's headquarters in Houston. I like to think of it as rewards for the guilty. What follows will explain why.

As the scheduled date, March 1, 1975 for sea trials drew near; the list of missing items became greatly reduced. I don't recall the number, but the individual items still missing largely consisted of spares for pieces of machinery that existed in multiplicity in the NIMITZ propulsion plant design. We recommended to Naval Reactors that the items we could not obtain in time be declared non-essential for the builder's sea trials.

We reasoned that redundant equipment installed in the vessel was not required to attain full power at sea, and from a practical standpoint putting one of them on line, in the event of a breakdown, was better than tearing down a unit and installing spare parts under way. In addition, we noted the likelihood of failure during only a few days at sea was remote.

The Admiral's staff concurred; I guess they didn't want the trials postponed either. Surprisingly, Rickover went along with the majority of our recommendations. But one item remained non-negotiable. We were told that we absolutely had to somehow get spares for one particular and vital piece of equipment, somewhat similar to this one.



We didn't appeal further, for we had been made aware by the Admiral's staff of a prior failure involving a similar-service component during another shipyard's initial trials for a nuclear-powered vessel. There were no spare parts onboard, and those trials had to be suspended, much to the dismay, anger and embarrassment of Admiral Rickover.

It was well known that the phrase 'once burned, twice cautious' was a Rickover byword.

~ *Thinking Inside the Box* ~

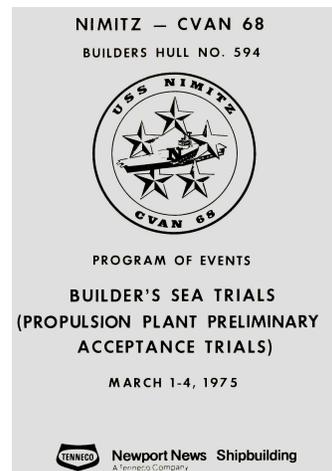
As is often said, necessity is the mother of invention, so we formulated an alternate approach. The initial order for two ship-sets of that particular piece of vital equipment included a spare unit, which had been delivered to the Navy. We recommended that unit be disassembled, and the parts sent to us for temporary use. That idea was rejected.

During a discussion about what we might next suggest, an innovative idea was voiced by one of my staff: “Why not take the spare unit in its storage box to sea with us? There’s plenty of room on a carrier and we wouldn’t have to open up the unit or even go inside its box unless the primary installed unit and its back-up both failed.”

Now that’s, in my opinion, thinking inside the box! After giving the suggestion some thought, I was unable to come up with any good reason not to recommend that course of action. So I told Don Kane about the idea. Actually, I took along the idea’s originator, an engineer whom Don greatly respected, to help sell the concept. Nevertheless, you should have seen the initial look on Don’s face!

But then, he too thought about it, and couldn’t find any fault with the idea, either. The only alternative at that time appeared to be a postponement of sea trials. To wait for the spares to be made would have taken weeks. We had no stomach for such a delay. Detail plans, announcements and assignments for the trials had already been made.

Besides, after nearly a decade of planning, designing, building and then testing NIMITZ dockside, plus the loss of an entire year during construction because of late delivery of GFE, the thought of not going to sea was, well, unthinkable.



At Don’s direction, I quickly ran the idea by Jay Wheeler - during cocktail hour, I might add. Jay was all for it. It solved our last remaining problem and he enjoyed doing unorthodox things as much as we did. Next step: Sell the idea to Naval Reactors.

A lot of criticisms have been directed at Rickover and his organization over the years. But they were seldom faulted for taking too much time to make a decision. Don Kane and I called the appropriate section head in Rickover’s organization. He liked the idea and got the Admiral’s OK in a matter of hours. Of course, we then had to reduce the concept to a written recommendation, and I assigned that task to the guy who originated the idea.

Predictably, the people in charge of the Navy’s spare parts program were not thrilled, but their objections were quickly overcome. Rickover had the clout, and Jay Wheeler had the wherewithal within the wonderful world of the navy supply system to make it happen, and happen quickly. In just a few days, a large crate arrived at NNS’ receiving dock.

In anticipation, we had issued an NNDI (Nuclear New Design Instruction) that confounded the receipt inspection guys. They were instructed not to open the crate, but to just report any external damage to us. There was none. They reluctantly complied, but anointed their inspection report with a long list of reasons (AKA CYA) why they could not be held accountable because they were not allowed to perform their job properly. We filed their report.

The NNDI also directed that the crate to be moved to the Aircraft Engine Repair Shop at the extreme aft end of the NIMITZ' Hangar Bay. This location was selected because its serviced by overhead cranes that could be utilized if the crate had to be opened and the equipment dismantled. The crate measured several feet in each direction and weighed several tons. It was firmly secured by multiple wire cables ropes to recessed tie-down points (i.e., deck frogs) to prevent any movement during radical steering maneuvers. The crate was plastered on all four sides with red-lettered signs that repeated this admonition:

“DO NOT OPEN THIS CRATE EXCEPT UPON THE WRITTEN DIRECTION OF THE CHIEF ENGINEER OF NUCLEAR NEW DESIGN”.

That was one of several ‘approved, subject to’ comments in the Naval Reactors letter accepting our proposal. During the course of the builder’s sea trials, which commenced on March 1, 1975 and lasted four days, I made numerous trips to check on the crate. In addition to the ship’s planned twists and turns, we also experienced heavy weather. When backing down into a stormy sea to test the ship’s full astern capability, green water came over the fantail, causing the ship to vibrate under the pounding. But the crate’s lashings held fast.



On one such visit, I ran into Don Kane back there, also checking to make sure the crate had remained undisturbed or displaced. We laughed at one another’s insecurity, and then proceeded further aft to the fantail. There we contemplated in silent satisfaction the only externally visible sign of nine-plus years of propulsion plant design work; the carrier’s impressive rooster tail generated by a full power test run and tight turns.

~ Anticlimax ~

The builder’s sea trials were successful. So were the acceptance trials. The installed equipment operated flawlessly both times. During those at-sea periods, the crate remained unopened, the spare pump spared. It eventually got to go home. And so did we.