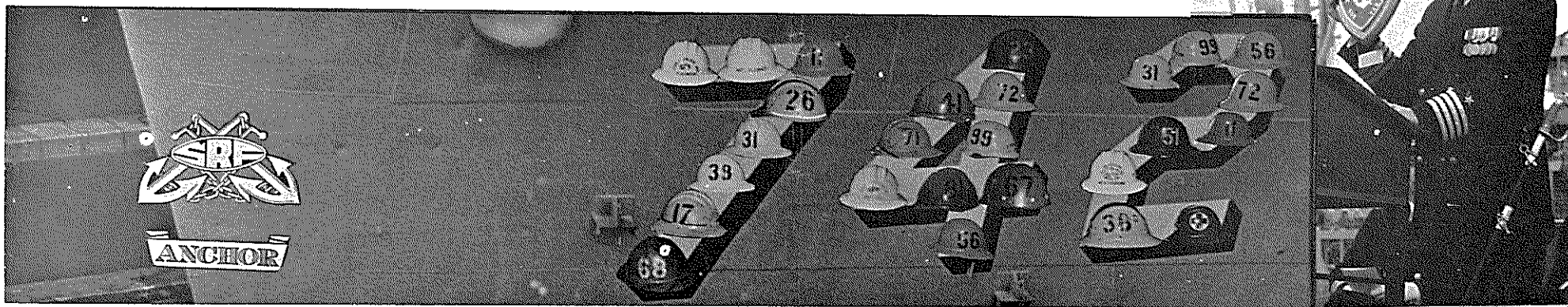


Progress of USS FRANK KNOX, An All Hands' Evolution

U. S. NAVAL SHIP REPAIR FACILITY, YOKOSUKA, JAPAN



Planning FRANK KNOX's Return

LCDR B. F. Tibbitts, Project Officer

...At the day of the first floating test...

As this article is being written the KNOX has been successfully refloated in drydock #5. As I look at the new smooth freshly painted hull of the KNOX it is difficult to recall how she first appeared to me over a year ago in Taiwan. In this article I shall give some of my thoughts and impressions about this project with particular emphasis on the hull repairs and the part played by Planning Department.

...At Kaohsiung, Taiwan...

After the KNOX was pulled free from Pratas Reef she was towed to Kaohsiung, Taiwan. A group of SRF officers flew down to meet the ship: CDR C.O. Mixon (former Repair Supt.), LCDR B.F. Tibbitts, LT W.C. Toney (former C-212), and LT J.J. Billington (former Ass't Repair Supt.). After a short ride across Kaohsiung harbor in a Chinese tug I boarded the KNOX which was moored alongside the Yokosuka home-ported ship USS MARS (ARS-1). The KNOX was easily identifiable. Her sides were streaked with rust and oil. Closer inspection revealed that her side plates were marred and dented from the actions of the salvage craft and barges. Although it was evident that the hard-pressed crew had made an attempt to clean the ship prior to entering port much remained to be done. Her main deck, passageways and fantail were filled with a mass of salvage equipment: hoses, compressors, towing wires and fittings, damage control equipment, etc. Her gun mounts looked curiously strange until I realized then that the gun barrels were missing.

See what we have done!

The USS FRANK KNOX returning to active status on 19 November 1966. CAPT J. A. Obermeyer, CO, SRF (Top, right) express his pleasure for the accomplishment of this project, strongly emphasizes continued support to the Fleet, and displays the FRANK KNOX's plaque presented by DDR-742



Shortly after I proceeded to the bridge and introduced myself to the CO, the ship left the MARS and was maneuvered into position to enter a floating drydock.

Although the KNOX is a 2,200-ton destroyer the many flooded spaces had loaded the ship to almost 4,000 tons. The floating drydock was just barely able to lift the ship. As the dock's tanks were slowly emptied more and more of the damaged hull came into view.

Where the sonar dome used to be was a jagged hole 20 feet on a side. Jagged fingers of metal, twisted beams, foam and other debris extended out from her sides and down below her keel line. Her bow, sagging many inches below her keel line, completely overtaxed and crushed the keel blocks forward of the sonar dome area. The keel had been pushed up as much as 12 inches which caused the side blocks to crack and distort due to their unusually heavy load. Her propeller blades had been almost completely chewed off by the coral.

The inspection of the interior of the ship was necessarily brief. The most severely damaged spaces were still full of water and foam and could not be entered. The majority of the ship's electronics equipment had been removed from the ship while she was still on the reef. This equipment was hundreds of miles away stored aboard various ships. After discussing the extent of the temporary repairs to be accomplished in Kaohsiung with officials of the Chinese Navy Yard the inspection party returned to Yokosuka.

...Direction of the Secretary of Defense...

Soon thereafter I was designated as FRANK KNOX Project Officer and Design Supt. This was an apt combination since much of the early work on the KNOX was in the design area. At this time it was not known if SRF would be assigned the task of repairing the KNOX. However CAPT J.A. Obermeyer, CO, SRF directed that all possible advance planning be accomplished. My first task was to list the work to be accomplished so that an overall time and money estimate could be made. I prepared a list of the various compartments aboard the KNOX and the damaged machinery and equipment within them. C-230, Job Planning Branch, under the direction of T. KONISHI, made a shop-by-shop estimate of the work required. C-240, Design Division, under the guidance of T. IMAI, prepared a list of the structural materials required and ordered the necessary plans.

The KNOX arrived in Yokosuka on 27 September 1965 and was soon docked in drydock #2. Repair work had not been authorized yet but we were fully occupied in removing the foam from the ship's compartments. Some ship-checking was now possible and the work estimates were considerably refined. I added a growth factor to the estimates prepared by C-230, and SRF officially announced that the total repair package was estimated at 81,000 man-days. Today, almost 11 months later, the estimate is still within 5% of that figure. The accuracy of the initial estimate is especially commendable because at the time the estimate was made the forward fire room, forward engine room and all forward magazines were full of foam and could not be inspected. Furthermore the majority of the ship's electronics equipment had not yet arrived in Yokosuka and hadn't been inspected. LT V.E. Beach, Ass't Repair Supt. (Electronics), provided the electronics estimate; this estimate is still accurate to within 5%.

Bearing in mind SRF's outstanding reputation the highest officers in the Navy recommended that SRF repair the KNOX. Finally, on 2 November 1965 the Secretary of Defense directed SRF to restore the FRANK KNOX.

...The over 80,000 man-days of work...

It was obvious that drydock #2 did not have sufficient facilities to allow the restoration to commence. The choice lay between drydocks #4 and #5; I advocated drydock #5 because the crane facilities were more extensive. Since drydock #5 is larger than #4, it was felt by some that it would be better to put the KNOX in #4 and so have the larger #5 dock available for use by other ships. However LT T.E. Austin, Docking Officer, pointed it out that any U.S. Navy ship that could be docked in #5 could also be docked in #4. If a carrier had to be docked we would have to use drydock #6 anyway.

The decision was made; as soon as the foam was removed the hull was patched temporarily and the KNOX was set down in drydock #5.

During this period I was busy reviewing the enormous list of discrepancies that had been compiled. SRF had been directed to "restore" the KNOX. Although the entire ship would not be "overhauled" it was obvious that in many compartments more work would be accomplished than is actually done in a regular shipyard over-haul. I directed C-230 specifically as to what discrepancies would be corrected by SRF. The new CO of the KNOX, LCDR W.L. Reger, was asked if the ship's force would assume responsibility for accomplishing the remaining discrepancies. With very few exceptions this was agreed to. Since it was our desire to have the KNOX in first class condition when she left Yokosuka it became obvious that we could not restrict ourselves to just those items damaged during the grounding and/or subsequent salvage operations.

Some of the ship's equipment was in need of repair before the ship ran aground. In addition some machinery required attention solely because it would sit idle for so many months. The best judge of these items was the Chief Engineer of the KNOX. Throughout the restoration period I received over 200 work requests from the ship; these were by-and-large approved for SRF accomplishment. Three separate officers have served as Chief Engineer of KNOX during this period. Normally this might be a poor procedure but the officers in question have been of high caliber. I have not always agreed with them but overall relations have been very good. The officers in question were LT Veith, LTJG Loy and the present Chief Engineer, LTJG D.R. Conley.

I was able to make a decision on the vast majority of the work in question within a few weeks. C-230 was then faced with the monumental task of writing job orders to cover the over 80,000 man-days of work. At the same time SRF was being called upon to overhaul EST's complete the LSSL program, complete the LCM Monitor/Commandment program, overhaul AFDL-10 and AF-5, etc. That clear and accurate job orders were produced for all of the above programs as well as the KNOX is due to the hard work and dedication of C-230. Despite the urgencies of CDR K.E. Phillips, former Planning Officer, and LCDR R.H. Rossman, Planning and Estimating Supt., to take periodic leave, C-230, from KONISHI on down remained at their tasks. Up to this point, I as Project Officer, had assumed many of the roles normally carried out by the Type Desk Officer, C-212. As the work progressed many shop reports and recommendations came forth. The Type Desk Officer, LT Toney and his assistant H. IKEYA acted upon these reports and issued job order revisions as appropriate. If a decision of magnitude was required it was referred to the Project Officer. Throughout the restoration ship's force work requests, OpTar jobs, and ShipAlts were handled by the Project Officer. It proved to be a good working relationship. Since I am now both KNOX Project Officer and C-212 all such decisions came to me.

...To redesign the hull...

I should now like to discuss the problems associated with repairing the damaged hull of the KNOX since in many aspects it is one of the most unusual jobs ever accomplished by SRF.

When the KNOX was originally constructed in the U.S. in 1944 the majority of her hull plates and frames were riveted together. In the years since, great advances have been made in welding techniques and almost all new warships are of welded construction. Indeed, there are very few practicing riveters at SRF today. I therefore requested permission from BuShips to redesign the hull of the KNOX to one of welded construction. BuShips places such confidence in SRF that within 24 hours I was phoned at home from Washington and given permission to proceed. We were not required to forward our plans to BuShips for prior approval, and I was merely cautioned to "do a good job."

Under the direction of myself as Design Supt., T. IMAI, Head Design Engineer and H. NOGAMI, Naval Architecture Branch Head, C-240 began preparing the new plans. On first glance you might think that this would be a relatively simple task. You might think that we could use the same plans and merely weld the pieces together instead of riveting them. Such is not the case. Plates are riveted together by having one plate overlap the other. Welding overlapped plates produces a rather poor joint

which can not be used in the middle 60% of the ship. It was therefore necessary to change from a lapped plate construction to a butt ed plate construction. Although this only required "moving" the skin of the ship about 3/4 inch this was sufficient to cause all of the plans to be redesigned. Although ships are not built to the close tolerances that watches are, errors of 3/4 inch are not allowed; generally structural plans are drawn so as to be accurate within 1/64 inch. Since adjoining plates were of different thicknesses it was necessary to fasten them in such a manner that the stresses in the ship's hull "flowed" smoothly from one plate to the next. The original frames of the ship had flanges on them so they could be riveted to the hull plates. Since the new frames were to be welded to the hull plates the flanges were unnecessary and were eliminated. It was therefore important to "size" the new frames such that they still carried the same degree of load as the previous frames. Unless we were careful it would have been easy to indiscriminately add frames and longitudinals and therefore produce a "stronger" hull than before. Such "strength" would have been misleading. You can not strengthen one area of the hull without having an effect on another. The ship can be likened to an I-beam; the main deck is the upper flange, the sides are the web and the bottom plating is the lower flange. If we had strengthened the lower flange of the ship we would have caused a condition to exist in which the upper flange (the main deck) would have been overstressed and could possibly fail.

Needless to say under the capable guidance of Mr. IMAI all of the above problems were well understood and such pitfalls avoided. Eventually 58 sets of hull structural plans were prepared. When it is considered that the ship Structures Section of C-240 consists of only 5 members the magnitude of this accomplishment can be appreciated. N. TOMITA, Section Head, A. ISHIDA and T. NEGISHI were responsible for preparing the majority of these plans. The remaining members of this Section were kept quite busy in carrying out all the many day-to-day tasks that the Section received.

ADM W. H. Baumberger, COMDESCRUPAC, praises the firmly established partnership between SRF and the KNOX.

