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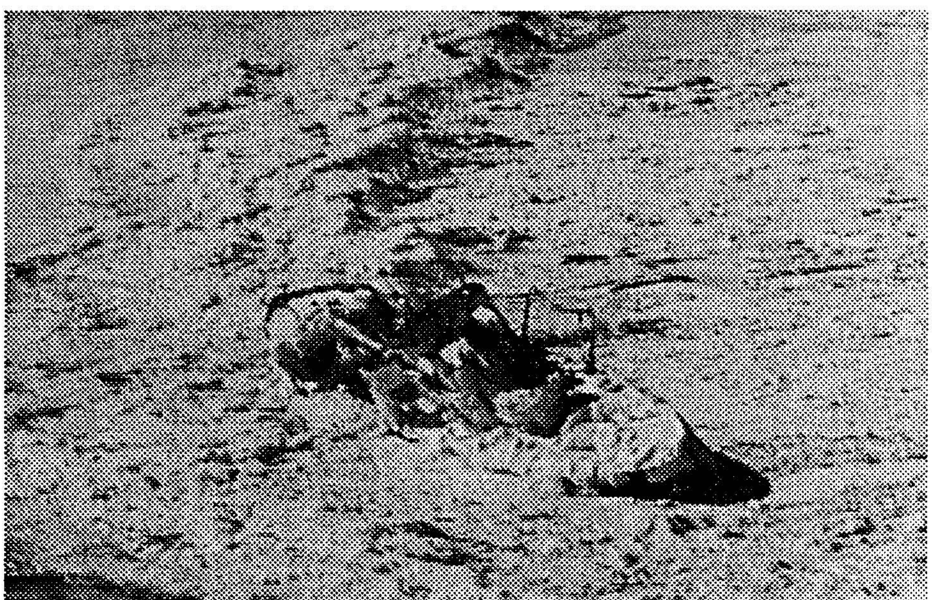
USCGC MESQUITE SALVAGE OPERATION DEC. '89 - JULY '90 KEWEENAW PENINSULA, MICHIGAN



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FOREWORD

The 14 July 1990 removal and disposal of USCGC MESQUITE (WLB-305) from a rock ledge off Keweenaw Point, Michigan, was a wreck removal operation where shallow water and a thin hull plating both restricted and directed the salvors' options. The perseverance of the salvage crew in effecting the successful salvage of MESQUITE is a typical example of the persistence and tenacity demanded of a professional salvor. The job was difficult but successful.

This case study is intended to provide salvage engineers with a reference for use in situations where shallow drafts and heavy lifting are primary factors. The information in the appendixes is provided to give a feel for the types and quantities of calculations that are needed in these situations.

U.S. Coast Guard support was superb, particularly the assistance provided by personnel at the Portal Lifeboat Station and the Traverse City Air Station. Captain J. Hobaugh, Commander M. Egan, Lieutenant Commander E. Nicolaus, Lieutenant Commander A. Coates, and Chief Warrant Officer W. Curtis merit special mention for their timely and effective help throughout the salvage.

R. P. FISKE
Captain, U.S. Navy
Supervisor of Salvage

ABSTRACT/EXECUTIVE SUMMARY

On 4 December 1989, the United States Coast Guard Buoy Tender MESQUITE (WLB-305) stranded on a rock ledge while tending a light buoy in Lake Superior roughly one-half mile east-southeast of Keweenaw Point, near Copper Harbor, Michigan. With the hold and motor room flooded and five feet of water in the engine room, the crew abandoned ship and were rescued by a passing cargo vessel, M/V MANGAL DESAI.

Within seven hours of the casualty the U.S. Coast Guard formally requested NAVSEA to perform a damage survey and to prepare a plan for salvage of the MESQUITE. Within 18 hours of the casualty SUPSALV and its salvage contractor DONJON MARINE had personnel in Traverse City to survey the condition of MESQUITE. After an initial survey, the decision to attempt to float the ship off the ledge with pumps and tugs was initiated. Salvage support gear was flown in and local tugs and a barge were leased. In the end, weather brought the effort to a standstill and the MESQUITE had to be secured for the winter.

After the winter season, the MESQUITE was resurveyed and a wreck removal operation was undertaken to make it a part of the underwater preserve of the State of Michigan. Detailed engineering and planning for a truss/barge lift was undertaken and successfully completed. Mitigating circumstances working against the salvors were problems related to:

- Shallow depth of water at the lift site (12 feet).
- Large lifting loads.
- Wreck integrity.

Persistent planning and hard work by the salvors and various participating support agencies overcame these problems.

Significant lessons learned pertain to the design of load-bearing systems, load monitoring, rigging, and public relations.

The appendixes summarize the calculations and data pertinent to the operation.

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CHAPTER 1

INTRODUCTION/CHRONOLOGY

1-1 INITIAL SALVAGE SURVEY AND SALVAGE PLAN DEVELOPMENT

1-1.1 Situation. About 0230 local time on 4 December 1989, while tending Keweenaw Light Buoy LB1, the 180-foot United States Coast Guard Buoy Tender MESQUITE (WLB-305) stranded on a rock ledge in Lake Superior roughly one-half mile east-southeast of Keweenaw Point, near Copper Harbor, Michigan. MESQUITE lay aground in approximately 12 feet of water at a position reported as 47-23.8N, 87-43.95W. Figure 1-1 shows the stranding site.

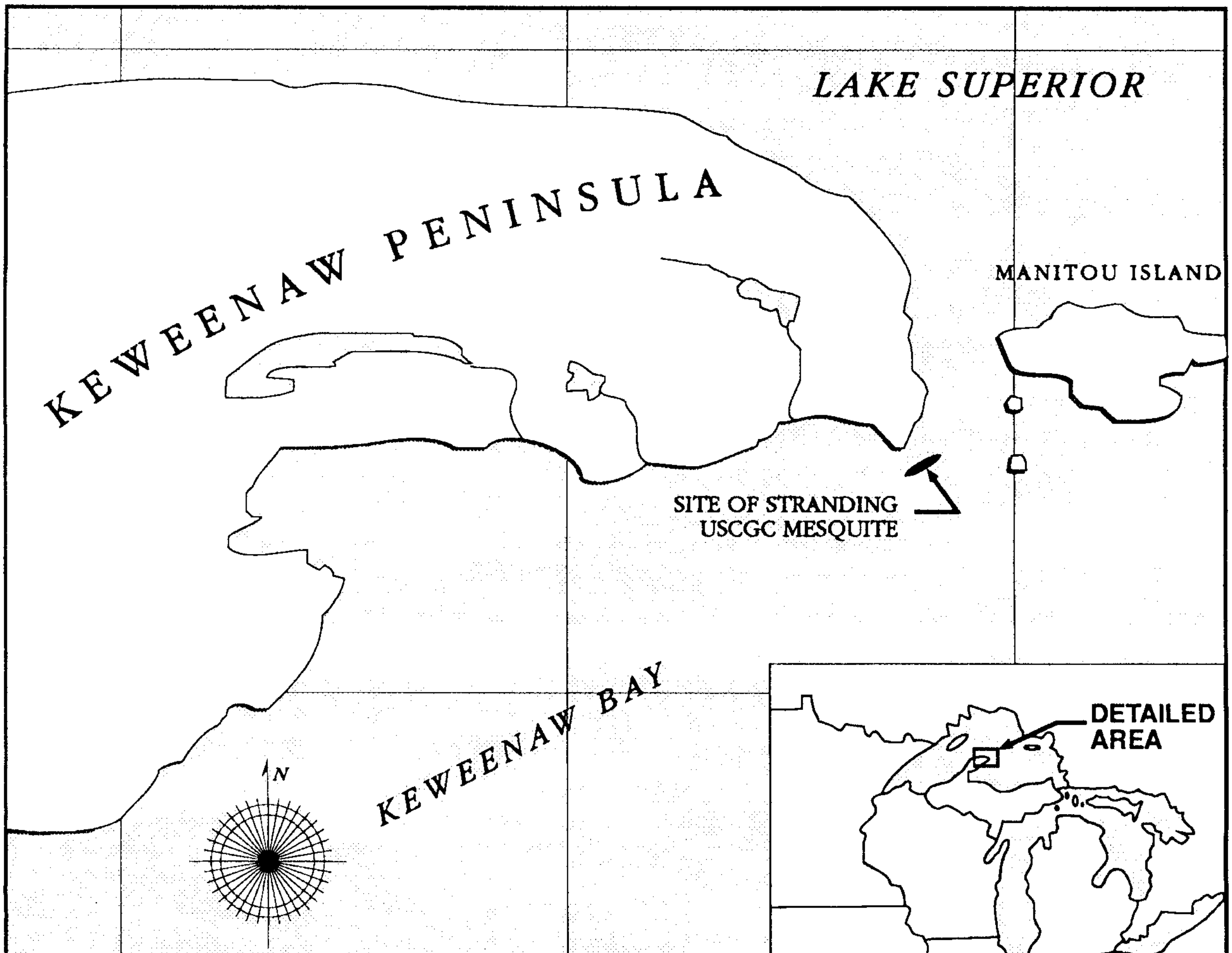


Figure 1-1. Stranding Site.

Immediately after stranding, MESQUITE reported buckled hull plating and framing in the machinery compartment near frame 92, and flooding at around three gallons per minute. As the ship worked on the rock, flooding between frames 74 and 92 increased.

About 0600, MESQUITE's Commanding Officer ordered the crew to abandon ship. The vessel's dry stores space forward of the engine room was flooded with 5 feet of water, the hold and motor room were flooded, the engine room had 10 inches of water over the deck plates, and the main electrical switchboard had shorted out. One of the fuel tanks abaft the engine room was holed and leaking diesel fuel. A passing cargo vessel, M/V MANGAL DESAI, assisted the Coast Guard in recovering the MESQUITE's crew. Three injured crewman were transported by Coast Guard helicopter to local hospitals.

1-1.2 Casualty Characteristics and Sailing Condition. MESQUITE is the lead ship of a six-ship subclass of 180-foot buoy tenders. She was built in August 1943 as Hull No. 76 by Marine Iron and Shipbuilding Company, Duluth, Minnesota and underwent a service life extension in 1978 at the Coast Guard's Curtis Bay Yard, Baltimore, Maryland.

Table 1-1 presents the ship's principal characteristics. Figure 1-2 shows MESQUITE's outboard and inboard profiles. Figure 1-3 shows the deck plans of the ship's first deck, second deck, and the hold.

Table 1-1. USCGC MESQUITE Principal Characteristics.

Length overall	180 feet
Length between perpendiculars	170 feet
Beam, molded	37 feet
Beam, molded waterline	34 feet 11¾ inches
Draft, mean*	12 feet 8 inches
Depth, molded	17 feet
Framing	longitudinal
Hull material	steel
Superstructure material	steel
Displacement*	935 long tons
Main engines (two)	700 horsepower
Generators (two)	80 KW
Emergency generator	40 KW
Propeller (one)	5-bladed
Complement	61 officers and men

*Data varies with source.

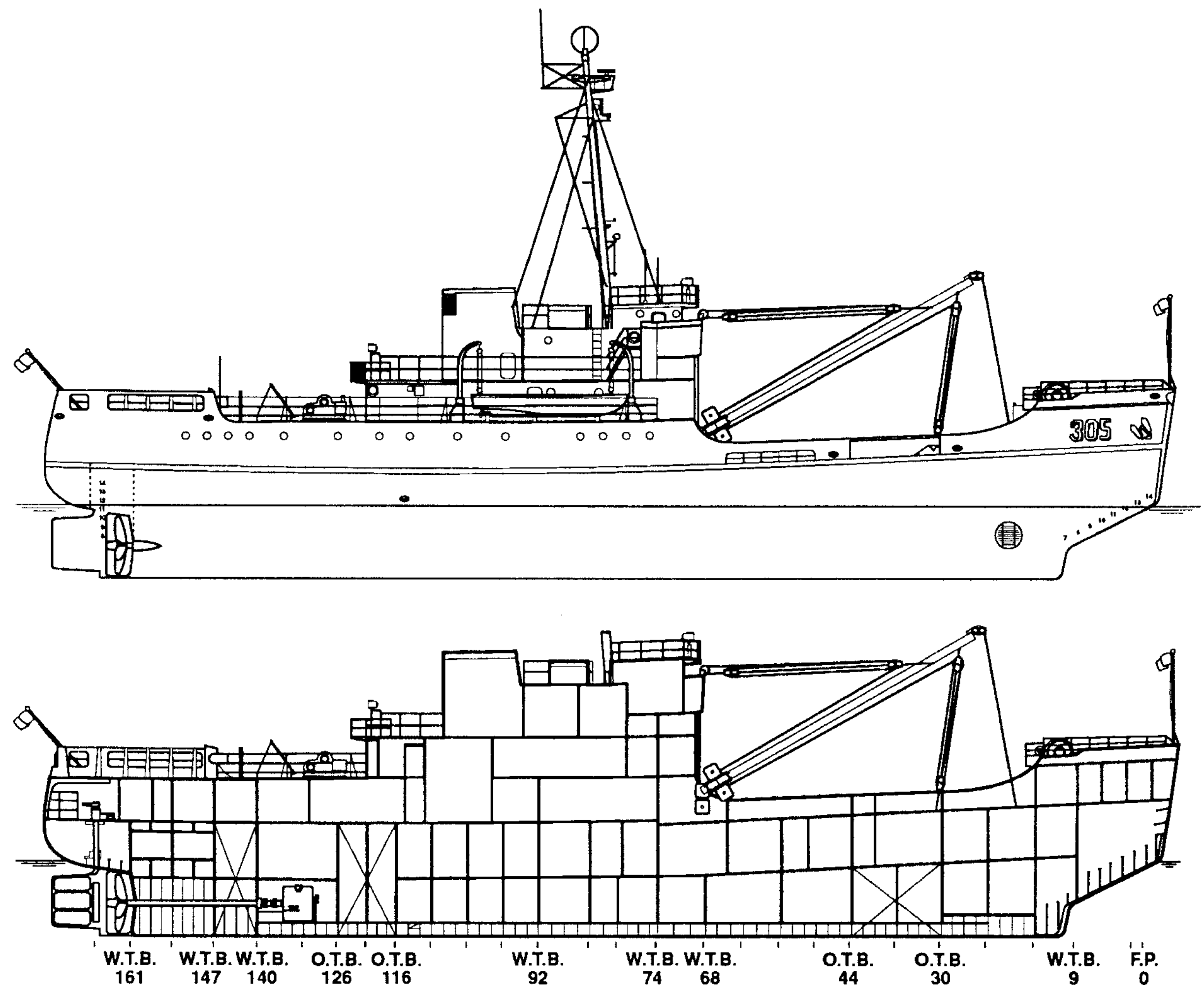
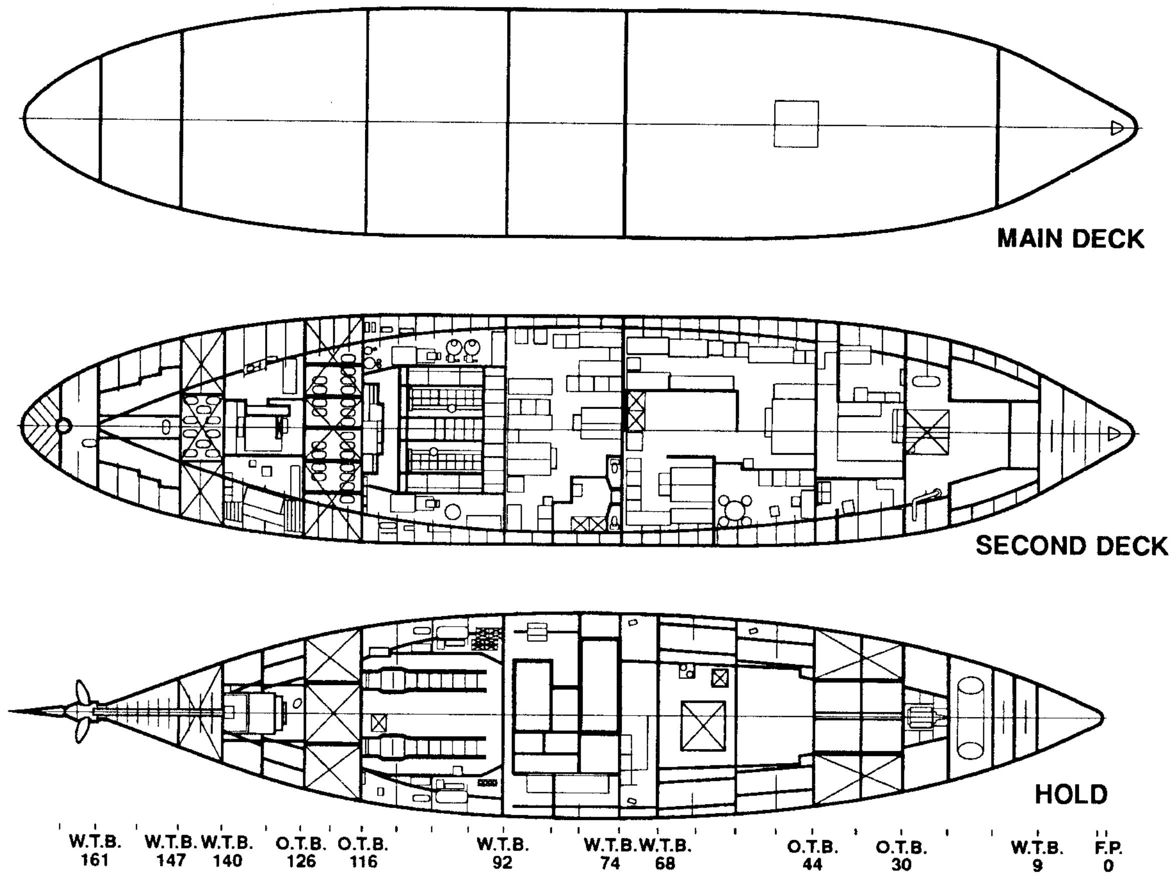


Figure 1-2. USCGC MESQUITE, Outboard/Inboard Profiles.



FRAME	HOLD	SECOND DECK	MAIN DECK
FR 0-9	PEAK TANK	PEAK TANK	BOS'N LOCKER
FR 9-16	TANK	CHAIN LOCKER	BOS'N LOCKER
FR 16-30	BOW THRUSTER	T'WEEN DECKS	BUOY DECK
FR 30-44	FUEL TANKS	SHOPS	BUOY DECK
FR 44-54	CARGO HOLD	CREW BERTHING	BUOY DECK
FR 56 68	SEWAGE SPACE	CREW BERTHING	BUOY DECK
FR 68-74	ENGINEERING STORES	CREW BERTHING	PASSAGE
FR 74-92	COLD/DRY STORAGE	CREW BERTHING	OFFICER CNT'Y
FR 92-116	GENERATOR ROOM	UPPER GEN'R RM	OFFICER CNT'Y
FR 116-126	FUEL TANKS	FUEL TANKS	EMERGENCY GEN'R
FR 126-140	MOTOR ROOM	UPPER MT'R RM	OFFICER CNT'Y
FR 140-147	FRESH WATER TANKS	TANKAGE	WARD ROOM
FR 147-161	AFT PEAK AND SKEG	HAWSER LOCKER	DC LOCKER
FR 161-168		LAZARETTE	STEERING GEAR

Figure 1-3. USCGC MESQUITE, Deck Plans.

The pilot house status board showed drafts before stranding as 11 feet 9 inches forward, and 13 feet 3 inches aft for a mean draft of 12 feet 6 inches.

The ship carried four National Oceanic and Atmospheric Administration (NOAA) instrumented buoys on the buoy deck along with miscellaneous dunnage; there was an 8,000-pound clump anchor in the main cargo hold forward.

MESQUITE's drawings and technical information were on board but not readily available due to flooding and inaccessibility of compartments. IRIS-class tenders, another subclass of 180-foot buoy tenders, are very similar and some of their drawings were available; accordingly, they became reference documents for the salvage effort.

1-1.3 Casualty Site Conditions. MESQUITE stranded on a relatively smooth rock ledge that slopes down to the east and north. Annually, ice floes sweep the ledge and push loose rock into deeper water.

At the time of the stranding, environmental conditions were:

- Wind: southeast, 10-15 knots.
- Seas: northeast, 2-4 feet.
- Visibility: 10 miles.
- Air temperature: 4 degrees Fahrenheit.
- Water temperature: 34 degrees Fahrenheit.
- Fresh water.
- Underwater visibility 15 to 20 feet.

Currents and seas were wind-driven; currents seldom exceeded one-half knot. Seas varied with wind direction and fetch. Tides were negligible.

Local weather patterns are cyclic and influenced by weather systems moving south from the Canadian northwest. Air temperatures ranged from -10 degrees Fahrenheit to 20 degrees Fahrenheit during the operation. Nearly constant snow restricted visibility and hampered helicopter operations.

1-2 CHRONOLOGY

The following is a chronological description of the events surrounding the stranding of the MESQUITE.

4 Dec 89

0230 -	USCGC MESQUITE (WLB-305) grounds about one-half mile east-southeast of Keweenaw Point, near Copper Harbor, Michigan.
1000 -	USCG formally requests that NAVSEA, SUPSALV provide services to survey and develop a plan to salvage MESQUITE. SUPSALV Representative (SUPSALVREP), salvage master, assistant salvage master, and two divers mobilize to Traverse City, Michigan, to conduct survey and to prepare cost estimate for salvage of MESQUITE. First personnel arrive at 2330.
5 Dec 89	Initial casualty site survey. SUPSALVREP designated as salvage officer, reporting to Commanding Officer, USCG Group Sault Ste. Marie, Michigan. Salvage engineer mobilized to Traverse City, Michigan.
6 Dec 89	Survey continues. Logistics effort to procure and mobilize salvage resources begins. Salvors' debrief of MESQUITE crew localizes damage, confirming diving survey results.
7 Dec 89	Survey continues; mobilization of salvage equipment commences in Port Newark, New Jersey. Salvors move base of operations from Traverse City to Houghton, Michigan. Salvage team assists in mobilizing USCG Strike Team equipment for removal of fuel oil from MESQUITE.
1400 -	Storm center passes over the peninsula with winds shifting to south-southeast, exposing MESQUITE to the seas.
8 Dec 89	Mobilization of salvage equipment continues. Storm develops at casualty site. Additional salvage personnel and equipment mobilized by USCG C-130 from Port Newark to Houghton-Hancock, Michigan. Crane barge and tug chartered in Houghton-Hancock for operations. Additional salvage crew included one salvage foreman and three salvage technicians.

9 Dec 89	Storm at casualty location forces stand-down of personnel and assets. Salvors board MESQUITE in an attempt to light off the Number 3 generator to provide power for a planned attempt to air-lifted pumps. However, the generators' heat exchangers were frozen and ice and sea state made working aboard unsafe, therefore the attempt was aborted. At Hancock, salvage gear was loaded onto crane barge. Final preparations completed for transit of all salvage resources from Houghton-Hancock to casualty site.
10 Dec 89	Salvors conduct an after-storm survey of MESQUITE, finding considerable additional damage. SUPSALVREP directs that an underwater video survey of MESQUITE be conducted, and recommends suspension of further mobilization, pending USCG approval of termination of salvage operations. Tug and crane barge begin transit to wreck site. Portable pumping systems prepare for transit to MESQUITE to pump crew's berthing compartment to minimize free surface and increase stability. Pumping systems demobilize due to worsened condition of MESQUITE.
11 Dec 89	Underwater video equipment mobilized to Houghton, Michigan. Salvors assess options, including winter mooring of MESQUITE, if operations are abandoned until the spring.
12 Dec 89	Divers complete underwater video and still-photograph survey of MESQUITE. Salvors and USCG review condition survey data and salvage options. USCG decides to terminate salvage operations officially. Tug and crane barge ordered to return to Houghton-Hancock for demobilization.
13 Dec 89	SUPSALVREP departs. Assistant salvage master and two divers demobilized. Demobilization of remaining personnel and equipment begins. Salvage gear unloaded from crane barge and transported to Houghton-Hancock Airport. Crane barge and tug demobilized.
14 Dec 89	Remainder of salvage team and equipment demobilized. Crew and gear flown by USCG C-130 to Newark, New Jersey. Demobilization of all assets completed.
Dec 89 - Feb 90	SUPSALV provides the Coast Guard with estimates for options to salvage MESQUITE including refloating, heavy lift, or to wreck it in place.

Mar 90	Formal cost estimates to dead-lift and transport MESQUITE to site for sinking provided to Coast Guard. SUPSALV coordinates the engineering and project management by reviewing the salvage plan and engineering rational provided by the contractor. Contractor directed to test the trusses with a dead load and upgrade the safety factor on the lift.
3 May 90	SUPSALV and contractor attend meeting at Houghton-Hancock to brief state and Federal agencies on the salvage plan with the intended pollution abatement measures to be taken for the permits for disposal.
22 May 90	Using a USCG boat, the salvage contractors' personnel, the SUPSALV representative, and the USCG representative inspect MESQUITE and divers conduct an underwater survey of hull.
23 May 90	SUPSALV representative conducts a preliminary debriefing of Coast Guard and departs site to prepare salvage proposals.
24 May 90	Held formal planning meeting and increased the requirement for reserve strength in the initial lifting configuration, and increased the funding requested, based on the survey results. SUPSALV directs single-point lift forward and four doubled-wire sling arrangement aft.
25 May-23 Jun 90	Proceeded with Prefab and outfit work on the barge and padeyes and conducted a test lift on the lift barge.
30 Jun 90	Arrived on site with heavy lift barge and tug. Placed salvage crew on board. Moored heavy lift barge to stern quarter of MESQUITE. Conducted a general condition survey of MESQUITE. Rigged torches and set up on MESQUITE to begin removing necessary sections of deck house.
1 Jul 90	Began to remove pollutants and other required materials from the top side deck house of MESQUITE. Began to install the forward parbuckling attachment. Rigged the pollution boom around MESQUITE.
2 Jul 90	Continued to remove pollutants and other required materials form the top side portion of MESQUITE. Completed forward rolling sling attachment. Continued precutting sections of deck house for removal. Began installation of the stern lifting padeyes (S).

3 Jul 90	Continued to remove pollutants and other materials from MESQUITE. Continued precutting sections of deck house. Continued installation of the stern lifting padeyes (S). Placed stern parbuckling wires under MESQUITE.
4 Jul 90	Continued to remove pollutants and other materials from MESQUITE. Completed precutting sections of deck house of MESQUITE. Continued installation of the stern lifting padeyes (S). Connected aft parbuckling wires to lifting pad (S) and parbuckled MESQUITE to even keel.
5 Jul 90	Lifted pilot house off MESQUITE. Continued installation of stern lifting padeyes (P). Cleaned up pollutants which appeared as a result of the parbuckling operation. Started installation of forward single point lift padeye.
6 Jul 90	Continued removal of superstructure and deck fittings. Continued installation of stern lifting attachments (P). Continued installation of forward single point lift padeye.
7 Jul 90	Continued removal of superstructure and deck fittings. Continued installation of stern lifting attachments (P).
8 Jul 90	Completed removal of superstructure and deck fittings. Cleaned up residual pollutants that appeared as a result of operation.
9 Jul 90	Continued installation of stern lifting pads (P) and forward lift pad. Continued miscellaneous clean up and removal operations.
10 Jul 90	Continued installation of stern lifting pads (P) and forward lift pad. Continued miscellaneous clean up and removal operations.
11 Jul 90	Completed installation of stern lifting pads (P) and forward lift pad. Completed miscellaneous clean up and removal operations.
12 Jul 90	Began to change over MESQUITE from the parbuckling configuration to the lifting configuration. Tested pumping system by pumping or blowing each compartment. Repaired leaks as found.

13 Jul 90	Change over from the parbuckling configuration to the lifting configuration. Attached traveling block to forward lift pad and connected aft lifting slings to aft lift pads (P/S). Checked hull for pollutants and to make sure it is ready for dumping.
14 Jul 90	Removed pollution boom from around MESQUITE. Lifted MESQUITE and transited to dump site. Lowered MESQUITE to final resting place. Removed lifting wires from MESQUITE. Initiated on site watch over wreck to observe for any flotsam or pollution.
15 Jul 90	Started preparations to get heavy lift flotilla ready for tow back to Port Newark, NJ.
16 Jul 90	Reported satisfactory condition of disposal site to Coast Guard and plans to depart site. Removed salvage crew from heavy lift barge and began transit back to Port Newark, NJ.
17 Jul 90	Fueled the tug, removed pollutants from barge.
18 Jul 90	Tug and barge depart for home.

CHAPTER 2

SALVAGE RESCUE ATTEMPT

2-1 FIRST SALVAGE EFFORT

2-1.1 Tasking and Immediate Response. Onset of the Great Lakes winter near Michigan's Upper Peninsula made rapid salvage the only practical option. One winter storm could cause the vessel to be a total loss.

Within seven hours of the casualty, the U.S. Coast Guard (USCG) formally requested that the Commander, Naval Sea Systems Command (NAVSEA) perform a damage survey and prepare a plan for salvage of MESQUITE, shown in Figure A-1. Because the Navy had no organic assets to provide immediate services in the Great Lakes, the Supervisor of Salvage (SUPSALV) tasked his East Coast Zone salvage contractor, DONJON Marine Co., Inc. to perform the service under contract N00024-86-D-4266/0004.

On 4 December, within 10 hours of tasking and within 18 hours of the casualty, DONJON Marine had enough personnel in Traverse City, Michigan, to survey and determine the damage to and condition of MESQUITE. Coast Guard helicopters transported the SUPSALV representative and survey crew to the casualty site on 5 and 6 December.

2-2 ORGANIZATION

Upon abandonment, salvage became the responsibility of the Commanding Officer, Coast Guard Group Sault Ste. Marie, Michigan. The SUPSALV representative reported directly to him and exercised technical control over DONJON Marine Co., Inc. The USCG Atlantic Strike Team, NOAA, the Michigan State Department of Environmental Protection, and the Michigan State Police provided logistics and safety support.

2-3 SURVEY

When the salvors conducted the initial diving and condition survey on MESQUITE on 5-6 December, the ship had a mean port list of 6 degrees and occasionally moved with the seas between 2 degrees to starboard and 7½ degrees to port. The ship's heading was 243 magnetic with no discernible swing. Draft forward was approximately 9 feet, while draft aft was about 14 feet. Soundings around the ship showed 9 feet of water forward, 14 feet aft, with about 8 feet on the port side at Frame 70 and 9½ feet at the same point on the starboard side.

The salvors surveyed all accessible spaces on the ship; all tanks except the forward fresh water tanks were sounded or opened. Upon completion of the survey, salvors dogged all doors and hatches tightly. Table 2-1 and Figures 2-1 and 2-2 depict the conditions in each of MESQUITE's spaces, hull damage, and keel bearing areas as found during the survey.

Table 2-1. USCGC MESQUITE - Condition of Spaces After Stranding.

SPACE	CONDITION	COMMENT
Deck Workshop	Dry, equipment stowed	--
Paint Locker	Dry, containers stowed	--
Forepeak Tank	Filled to within 3'1" of overhead	Not holed
Chain Locker	Dry	--
Anchors (P/S)	Under foot	Weight Reduction
Buoy Deck	NOAA buoys and dunnage secure	—
Bow Thruster Room	Filled to within 4' of overhead	Equalized with lake
A-3-W	Inaccessible (petcocks in hold)	Assumed 95%
A-4-W	Inaccessible (petcocks in hold)	Assumed 95%
A-5-W	Inaccessible (petcocks in hold)	Assumed 95%
Shops and Laundry	Dry	--
Cargo Hold	Flooded to within 2' of overhead	Equalized with lake
Sewage Space	Flooded to overhead	Equalized with lake
Berthing Cmpt. (fwd)	Dry	--
Berthing Cmpt. (aft)	Flooded to 18" above deck	Flooding through drain
Engineering Stores	Flooded to overhead	Under pressure
Cold Storage	Flooded to overhead	Magazine assumed flooded
Deck House	Crew and some effects removed	Weight reduction
Boats (P/S)	Boats are unshipped	Weight reduction
Engine Room	Flooded to 3' of overhead	Equalized with lake
B-2-F	6'11" fuel, 4'2" water	Holed, equalized with lake
B-3-F	11'10" fuel, 0 water	--
B-4-F	13'2" fuel, 0 water	--
Motor Room	Flooded to within 3' of overhead	Equalized with lake
C-201-W	7'8.25" water	--
C-202-W	6'9" water	--
C-1	2'0" water	--
Aft Peak	5'0" water	--
Hawser Storage	Dry	--
Lazarette	Dry	--

Figure 2-1. Slippery Deck Conditions on MESQUITE.

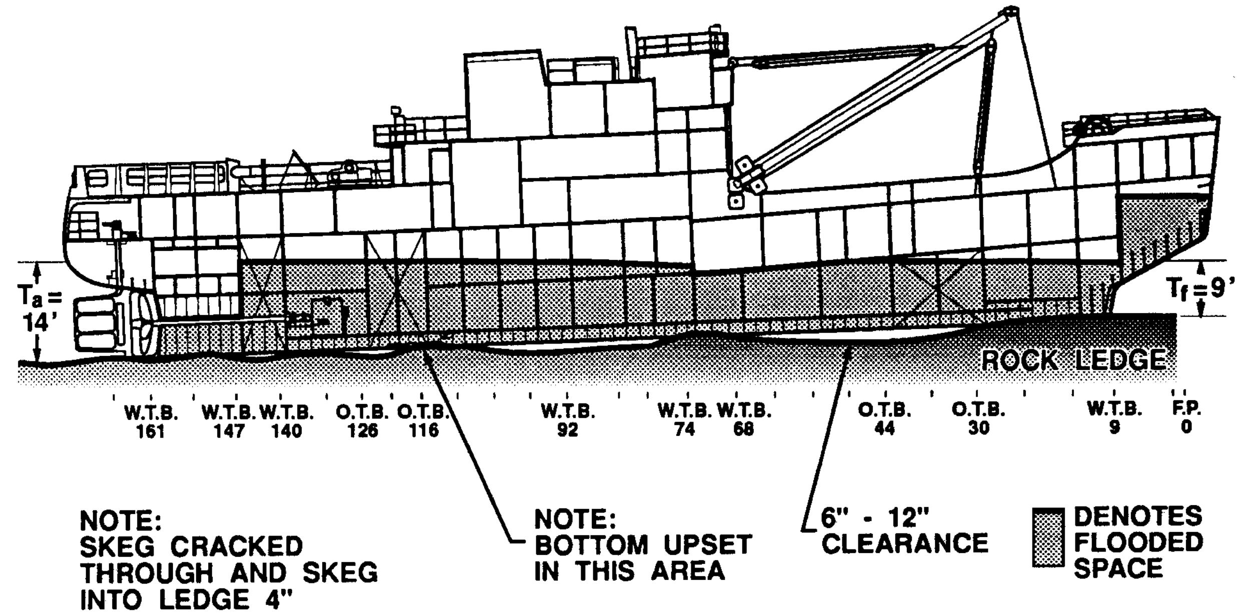


Figure 2-2. USCGC MESQUITE, Initial Grounded Condition.

The ship was supported intermittently along its length, with about 25 percent of the keel in contact with the bottom. The longest bearing areas were at the stem, skeg, starboard-side Frame 116, and the port side from Frames 44 to 62. There were many locations where the vessel did not bear on the rock ledge, but in several areas there was not enough clearance between the keel and the bottom for divers to see the keel or A-strake. Damage to the hull consisted of upset hull plating along the ship's length, primarily along the keel and 8 to 10 feet outboard of the centerline, to port and starboard. There was significant upsetting in way of the main cargo hold and the engineering store room; the latter was holed. Three large cracks began in the engine room at Frame 115 and extended aft into the centerline fuel tank, B-2-F.

Figure B-1 contains a detailed description of the underwater hull survey and damage assessment conducted on 6 December 1989.

2-4 ANALYSES

As in most salvage operations, an engineering analysis of the condition of MESQUITE based on technical data for the ship and information gathered in the survey was the first step in developing a salvage plan. The engineering analysis was in turn followed by an operational analysis and selection of the equipment for the operation.

2-4.1 Engineering Analysis. The engineering analysis had three parts:

- Ground Reaction,
- Stability, and
- Freeing Force.

2-4.1.1 Determination of Ground Reaction. The ground reaction is the weight of the ship supported by the ground or the total weight of the ship minus the portion of the weight supported by buoyancy. The *U.S. Navy Ship Salvage Manual, Volume 1 (Strandings)*, S0300-A6-MAN-010, provides four basic methods of estimating ground reaction and recommends computing it by two methods. In the case of MESQUITE, none of the methods applied exactly because the hull had been breached and there was flooding throughout. To accurately calculate ground reaction, it was necessary to apply basic principles to a model which took the total weight of the ship, added the flooded water to that weight, and then subtracted the water that was pumped out of the hull.

From the Table of Offsets obtained from MESQUITE, a Hydrostatic Table was generated by computer. A copy of this Hydrostatic Table is included in Figure C-1. The Table compared favorably to the Hydrodynamic Properties Nomogram in the *Stability and Loading Manual* for the USCGC EVERGREEN (WMEC-295), an IRIS-class 180-foot buoy tender. In Navy documents, the Hydrodynamic Properties Nomogram is identified as the Draft Diagram and Functions of Form. The favorable comparison gave credibility to using EVERGREEN's stability data in the initial salvage calculations for MESQUITE. A copy of EVERGREEN's draft diagram and Hydrodynamic Properties Nomogram and light ship load condition sheet are in Figure C-2. This document was generated for saltwater. The on-site salvors used volumes to correct for density differences between fresh water and saltwater. From this Hydrodynamic Properties Nomogram, at a mean draft of 12 feet 6 inches, fresh water displacement is approximately 994 long tons.

Starting with EVERGREEN's light ship weight of 804 long tons and adding provisions, stores, crew and effects, and ammunition, the total fixed weight of the ship becomes 822.7 long tons. A weight and moment summary, provided in Figure D-1, gives the condition of the tankage in MESQUITE before stranding. The liquid load was developed from soundings of accessible intact tanks, combined with MESQUITE's chief engineman's recollection of tank loading prior to stranding.

The total weight in the sailing condition totals 997.7 long tons, only 3 tons or 0.3 percent greater than the displacement at the sailing drafts derived from EVERGREEN's nomogram. This close concurrence gave salvors confidence in their estimate of the ship's condition before stranding. Table 2-2 summarizes this condition.

Table 2-2. USCGC MESQUITE Condition Before Stranding.

T_f	11 feet 9 inches
T_a	13 feet 3 inches
T_m	12 feet 6 inches
Δ (FW)	997.7 long tons
LCG	0.78 feet FWD of amidships
LCB	0.73 feet AFT of amidships
LCF	3.25 feet AFT of amidships
MT1	103.4 foot-tons
KM	17.45 feet
KG	14.56 feet
FSF	269.6 foot-tons
GM	2.89 feet
GM_V	2.62 feet

The weight of water in each space was calculated by:

a. Determining the volume of water in the space from the survey and from the ship's drawings in the case of spaces 100 percent full. Volume was calculated using sectional areas at depth and Simpson's multipliers.

b. Multiplying the volume by a permeability factor taken from the USCGC EVERGREEN *Stability and Loading Manual.*

c. Dividing the resultant volume by the density of fresh water. (36 ft^3/ton)

The calculations, rounded off, show that the floodwater raises the total weight of MESQUITE to 1,502 tons. For a stranded mean draft of 11 feet 6 inches, the total buoyancy of the hull derived from the hydrostatic data is 873 tons. The ground reaction is then:

Total weight = 1,502 tons

Total buoyancy = 873 tons

Ground reaction = 629 tons

2-4.1.2 Stability Analysis. The stability analysis was divided into two parts:

- Determination of the effect of the ground reaction on metacentric height.
- Determination of the effect of free surface in the tanks and flooded compartments on metacentric height.

2-4.1.3 Ground Reaction Effect. The ground reaction effect acts like a weight removal at the keel in causing a virtual rise in the center of gravity *(KG)*. This virtual rise in *KG* in an intact grounded ship can be calculated easily. The decrease in metacentric height *(GM)* for the intact ship is the difference between the heights of the metacenter (KM_t), above the baseline, and of the center of gravity *(KG)*, above baseline, corrected for the ground reaction.

$$GM' = KM_t - KG'$$

$$KG' = \frac{KG \times W_t}{\Delta}$$

where:

GM'	=	metacentric height corrected for ground reaction
KM_t	=	height of metacenter at grounded drafts (from the Hydrostatic Tables)
KG'	=	effective height of the center of gravity as grounded
KG	=	height of the center of gravity as grounded
W_t	=	total weight of the ship
Δ	=	displacement at grounded drafts

$$KG' = \frac{(11.60 \times 1{,}502.1)}{872.5}$$

$$KG' = \frac{17{,}424.36}{872.5}$$

KG' = 19.97 feet
KM_t = 16.99 feet (from the Hydrostatic Tables)

therefore:

$$GM' = 16.99 - 19.97$$
$$GM' = -2.98 \text{ feet}$$

The virtual rise in the center of gravity for the intact ship was enough to make the ship unstable. In the case of the MESQUITE, which was essentially drydocked on the ledge with transverse support restraining her from rolling over, the negative metacentric height was not an immediate concern. However, the dewatering plan was designed to mitigate the effect of the virtual rise while the ship was experiencing a transition from a state of negative *GM* to positive *GM*.

2-4.1.4 Free Surface Effect. To determine the free surface effect, a *free surface factor* (FSF) for each affected space was either calculated or taken from the ship's tank capacity plan. The free surface factor was determined by dividing the transverse moment of inertia of a compartment's free surface by the liquid density, and multiplying that number by the transference factor. Transference factors and procedures for their use were taken from *Principles of Naval Architecture*, Revised (1967) published by the Society of Naval Architects and Marine Engineers. To ensure a conservative analysis, compartments were assumed to be either trapezoidal or rectangular in shape with lengths and widths equal to their extreme beams and lengths.

The total free surface effect resulted in a virtual rise in the center of gravity of 2.82 feet. A sample of free surface effect calculations are provided in Figure D-2.

2-4.1.5 Freeing Force. The horizontal force required to overcome the ground reaction is the product of the ground reaction and the coefficient of friction. Empirical data provided in the *U.S. Navy Ship Salvage Manual, Volume 1 (Strandings)*, S0300-A6-MAN-010, gives the coefficient of friction for rock as ranging between 0.80 and 1.5. In the case of MESQUITE, stranding in intermittent contact with a smooth, ice-scoured ledge with no loose rock, no impalements, and no loose and hanging steel structure justified the use of the lowest coefficient of friction, 0.80.

2-4.2 Operational Analysis. With the maximum ground reaction, the stability of the vessel, and the freeing force determination in hand, the salvors could proceed with an analysis to determine the operational concept of the salvage operation.

A primary concern in any salvage operation is the reduction of the pollution potential of fuels and other oils carried in the casualty. The rupture of tank B-2 had resulted in spillage of some of the oil contained in this tank. The task of removing any remaining fuel from the ship's tanks was assigned to the Coast Guard Atlantic Strike Team—specialists in this type of work.

It was clear from the initial engineering analysis that refloating was required. To achieve this, the following issues had to be addressed:

- Reduction of the ground reaction.

- Reduction of the free surface effect to develop a positive metacentric height for refloating.

These goals could be accomplished by removing floodwater and liquid load. A prerequisite to removal of floodwater was restoration of the watertight envelope by patching. The conditions of the operation—time criticality, cold environment, small clearances between the hull and bottom—did not lend themselves to sophisticated patching methods. Patching would be by plugs and wedges, epoxy filling, and small box patches.

A detailed pumping plan would be worked out as part of the salvage plan development. The pumping plan would include the requirement of moving the center of ground reaction forward and keeping the ship aground until all was ready for refloating.

In addition to pumping off floodwater, the NOAA buoys, fuel, dunnage, and clumps would be removed.

When the ground reaction had been reduced as much as practical and the ship was stable, MESQUITE would be hauled off her strand by tug pull.

2-4.3 Equipment Selection. A search was conducted to identify equipment that could be provided at the site quickly. Equipment criteria were:

- Capability to perform as required,
- Cold weather reliability, and
- Availability.

With this criteria, and the Coast Guard offer to airship selected equipment to the site, the decision was made to use DONJON Marine equipment. The mobilized equipment included:

- Three 6-inch hydraulic submersible pumping systems, including pump heads and hydraulic power units.
- Six portable, gasoline- and diesel-driven, 3-inch pumping systems.
- One portable generator.
- One diving air compressor.
- Patching material and tools.
- Hoses for hydraulic and portable pumps.

The pumping plan would provide enough capacity to overcome expected leakage from damage that divers could not reach to patch with the ship aground. The equipment was flown to the salvage site in a Coast Guard C-130 aircraft.

The location and urgency of the job precluded bringing in a floating plant from the New Jersey base. Salvors would have to make do with equipment that could be chartered locally. A limited amount of equipment was available. Roen Salvage, a local marine operator in Houghton, Michigan, supplied a barge with a 60- to 70-ton crawler crane, derated to 30 tons for marine service, and a 500-horsepower tug. The tug would serve as both a handling tug for the barge and a pulling tug for the salvage operation. The crane was suitable for handling salvage equipment and for removing material from the casualty.

2-5 SALVAGE PLAN DEVELOPMENT

As the salvage plan evolved, it broke down into nine major steps:

a. Remove of all fuel from the ship.

b. Patch accessible holes in the hull, leaving centerline fuel tank B-2-F open to the sea.

c. Remove topside weight.

d. Test pump and patch hull openings not visible to divers.

e. Dewater the hull.

f. Refloat the ship.

g. Additional surveys, patching of holes in the hull that were inaccessible when the hull was aground and complete dewatering.

h. Make final surveys, strip the flooded compartments, and secure patches.

i. Tow to a safe haven for delivery to the Coast Guard.

2-5.1 Removing Remaining Fuel. The Coast Guard Atlantic Strike Team would remove the diesel fuel from B-2-F, B-3-F, and B-4-F and refill tanks B-3-F and B-4-F with lake water to stabilize MESQUITE. The contractor would assist the Strike Team. A containment boom would be kept around about the ship until all oil and other potential pollutants had been removed or secured. If the fuel was removed coincident with patching and dewatering, tanks B-3-F and B-4-F would be left empty.

2-5.2 Patching the Hull. Divers would patch accessible holes and cracks. The cracks in tank B-2-F would not be patched unless environmental conditions dictated it, or unless there was flooding through the after engine room bulkhead.

The cargo hold would not be pumped until the ship was afloat because:

- There was a hole in the compartment that divers could not reach because of hull contact with the rock ledge and because the hole was under the installed fixed ballast.

- The hold was full of material that was likely to clog the pumps and slow dewatering.

2-5.3 Removing Weight. The crane barge would come alongside, set the salvage pumps aboard MESQUITE, and land the hydraulic power units on the fantail. The crane barge would remove the NOAA buoys, dunnage, and other material to lighten MESQUITE.

2-5.4 Test-pumping the Hull. Patched compartments would be test-pumped to ensure the patches were effective and to locate additional holes and cracks. If holes were where the divers could not make a good patch, the space would be dewatered and the hole patched when MESQUITE was afloat.

2-5.5 Dewatering the Hull. When the patches were in place, the hull would be dewatered in accordance with the pumping plan summarized in Table 2-3. The ground reaction and the effect of pumping on stability at each stage is shown in Table 2-4.

Table 2-3. USCGC MESQUITE Dewatering Plan.

STAGE A	
1. Remove NOAA buoys 2. Pump out crew's berthing 3. Pump out P/S fuel tanks, B-2 and B-3 4. Rig motor room for pumping	7.14 long tons 27.75 long tons 43.26 long tons
STAGE B	
1. Pump out motor room 2. Rig P/S fresh water tanks aft for pumping 3. Rig engineering stores for pumping	51.71 long tons
STAGE C	
1. Pump out P/S fresh water tanks 2. Pump out engineering stores 3. Rig P/S cold storage spaces for pumping 4. Rig fwd fresh water and peak tanks for pumping	20.63 long tons 34.72 long tons
STAGE D	
1. Pump out peak tank 2. Pump out fresh water tanks 3. Rig remaining spaces for pumping and striping	15.50 long tons 50.14 long tons
STAGE E	
1. Pump out engine room 2. Pump out cold storage 3. Rig remaining spaces for pumping and stripping	163.37 long tons 104.77 long tons
STAGE F	
1. Pump out bow thruster 2. Remove MESQUITE from strand	22.5 long tons
STAGE G	
1. Strip all spaces of residual water 2. Dewater and patch cargo hold 3. Tow MESQUITE to safe haven 4. Maintain watch and pumps on standby in all spaces	

Table 2-4. Ground Reaction/*Gm* Summary.

STAGE	GROUND REACTION (LTON)	GM_v (FT-TON)	GM_V FT-TON)
AS GROUNDED	629.3	-2.92	-5.77
STAGE A	554.5	-1.98	-3.00
STAGE B	502.8	-1.57	-2.49
STAGE C	447.5	-1.05	-1.90
STAGE D	381.8	-0.44	-1.18
STAGE E	113.7	1.35	1.00
STAGE F	91.2	1.46	1.26

GM_v = *GM* Corrected for Ground Reaction
GM_V = GM_v Corrected for Free Surface

2-5.6 Refloating the Hull. After dewatering, bow anchors would be buoyed off and made ready to slip, or, if weather conditions permitted, roused aboard the crane barge. With the barge standing off, a chartered tug made up to her stern would ease MESQUITE to the east and pull her stern first into deeper water.

When the MESQUITE was afloat, it would have a weight distribution similar to that shown in the refloated condition in the weight and moment study, Figure D-3. MESQUITE's refloated displacement would be 964 long tons with a volume of 34,704 cubic feet.

From the Hydrostatic Tables:

$$T_m = 12.42 \text{ feet}$$

At this draft:

LCB = 0.70 feet aft of amidships
LCF = 3.20 feet aft of amidships
LCG = 2.43 feet aft of amidships
$MT1$ = 102.5 foot-tons

Trim was found by:

$$\text{Trim} = \frac{\Delta \times (LCG - LCB)}{(12 \times MT1)}$$

$$\text{Trim} = \frac{964 \times (-2.43 - (0.70))}{(12 \times 102.5)}$$

$$\text{Trim} = 1.36 \text{ feet by the stern}$$

therefore:

$$T_f = T_r - \left(\text{Trim} \times \left(\frac{LCF}{LBP}\right)\right)$$

$$T_f = 12.42 - \left(1.36 \times \frac{(3.20 + 85)}{170}\right)$$

$$T_f = 12.42 - 0.71$$

$$T_f = 11.71 \text{ feet}$$

then:

$$T_a = T_f + \text{Trim}$$

$$T_a = 11.71 + 1.36$$

$$T_a = 13.07 \text{ feet}$$

Correcting for the draft marks forward:

$$T_f\,(\text{marks}) = T_f\,(FP) - (\text{Trim} \times dm/LBP)$$

Where *dm* is the distance between the draft marks and *FP;* in this case 14 feet:

$$T_f(\text{marks}) = 11.71 - \left(1.36 \times \left(\frac{14}{170}\right)\right)$$

$$T_f = 11.71 - 0.11$$

$$T_f = 11.60 \text{ feet}$$

MESQUITE's list after extraction would be negligible.

2-5.7 Stripping Water and Securing Patches. After refloating, residual water would be stripped from the ship, patches secured and tightened, loose gear stabilized and secured, and pump watches posted.

2-5.8 Towing to a Safe Haven. The ship would be rigged for tow by making up a towing bridle, rigging battery-powered towing lights, and providing a riding crew with adequate salvage and survival gear. Preliminary negotiations had been initiated with three shipyards, Peterson Builders, Inc., Sturgeon Bay, Wisconsin, Port Arthur Shipbuilding, Thunder Bay and Frazier Shipyard, Superior Wisconsin, to be ready to take the ship in hand and drydock it upon arrival.

2-6 OPERATIONS

2-6.1 Preparation. On 8 December, additional salvage personnel, including a salvage foreman and three salvage technicians, and equipment were mobilized by Coast Guard C-130 from Port Newark to Houghton-Hancock, Michigan. The following day the salvage equipment was loaded on the chartered crane barge and final preparations were completed for the transit of all salvage resources from Houghton-Hancock to casualty site. The salvage crew boarded the casualty, but were unable to work because of the weather. When the weather moderated on 10 December, the tug and crane barge got underway for the casualty wreck site and the salvage team flew to MESQUITE.

2-6.2 Storm. Storm conditions began to develop at the casualty site on 8 December. During the night and into the next day, a Great Lakes storm with 20- to 25-knot southwest winds passed through the area. A video tape made during a fly-over at the height of the storm shows the ship heeling about 5 degrees to starboard, then violently rolling 25 to 30 degrees to port. The action of snap-rolling to port and lazy righting to starboard probably caused the mast to shear and fall to port.

2-6.3 Resurvey. By 10 December the weather conditions had improved enough for salvors to board MESQUITE and conduct an after-storm survey. The ship's heading was now 240 magnetic, compared to the pre-storm heading of 243 magnetic. The draft forward was 10 feet vice 9 feet before the storm. The mean draft aft was 16 feet vice 14 feet, and the port list had increased to 19 degrees from 6 degrees. Salvors repeated the survey of accessible spaces. Table 2-5 summarizes conditions found on 10 December.

Table 2-5. USCGC MESQUITE - Condition of Spaces on 10 December.

SPACE	CONDITION	COMMENT
Deck Workshop	Dry, equipment adrift	--
Paint Locker	Dry, containers open and adrift	--
Forepeak Tank	Filled to within 3'1" of overhead	Not holed
Chain Locker	Dry	--
Anchors (P/S)	Tending forward	Ship appeared to have moved aft
Buoy Deck	2" - 4" ice, buoys secure, dunnage adrift	--
Bow Thruster Room	Inaccessible	Assumed flooded
A-3-W	Inaccessible (petcocks in hold)	Assumed flooded
A-4-W	Inaccessible (petcocks in hold)	Assumed flooded
A-5-W	Inaccessible (petcocks in hold)	Assumed flooded
Shops and Laundry	Inaccessible	Assumed dry
Cargo Hold	Inaccessible	Assumed flooded
Sewage Space	Inaccessible	Assumed flooded
Berthing Cmpt. (fwd)	Flooded 6' deep	--
Berthing Cmpt. (aft)	Flooded to overhead	--
Engineering Stores	Inaccessible	Assumed flooded
Cold Storage	Inaccessible	Assumed flooded
Deck House	Gear adrift, mast sheared, localized flooding	--
Engine Room	Flooded to overhead	Equalized with lake
B-2-F	Fuel up to sounding tube	Equalized with lake
B-3-F	11'10" fuel, no water	--
B-4-F	Under pressure	Assumed holed
Motor Room	Flooded to overhead	Equalized with lake
C-201-W	Water up to sounding tube	Assumed equalized with lake
C-202-W	Water up to sounding tube	Assumed equalized with lake
C-1	Flooded	Equalized with lake
Aft Peak	Inaccessible	Assumed flooded
Hawser Storage	Dry	--
Lazarette	Dry	--

Gear was adrift throughout the ship from previously secured lockers, shelves, and stowage areas. The deck house had water in pockets along the port side, in way of all port side heads, staterooms, and the port side passageway aft. This water was thought to have come aboard by downflooding through the nontight hatch leading to the fantail at Frame 140 .

The heel of the ship and the ice buildup on the weather decks made working extremely hazardous; water inside the deck house was beginning to freeze. It was possible to get divers safely into and out of the water through the awash port buoy gate. Divers surveyed the underwater hull and reported the damage that the ship had suffered from the storm. The hull was now in contact with the bottom along 80 percent of its length, compared to the pre-storm 25 percent. The divers reported numerous cracks, upsets, and holes along the entire underwater hull. Both the stem and skeg had been severely distorted. The ship had moved astern 10 to 15 feet, and the rock ledge had been pulverized. The bottom was strewn with pieces of hull plate, structure, ship's material, and tools; the latter had fallen through holes and cracks in the hull. Waves were surging through holes in the hull. Based on the ship survey, the salvage officer directed that an underwater video of the damage be recorded, and halted further mobilization of salvage equipment.

A detailed assessment of the damage subsequent to the storm is provided in Figure B-2. Figures 2-3 and 2-4 show typical conditions of the shell plating and additional flooding and hull contact.

On 11 December, an underwater video system was flown in. The next day divers surveyed the underwater hull, taking still photographs and making a video tape.

2-7 TERMINATION

2-7.1 Decision. After reviewing the 10 December survey and the 12 December video tape showing the hull damage, all organizations agreed that salvage was not feasible before the area iced in. Severe winter weather and ice buildup on the wreck was decreasing personnel safety and effective operation of equipment and small craft. The decision was made to secure the wreck for winter and curtail all further operations until spring, see Figure A-2 to A-4.

2-7.2 Additional Removals. Atlantic Strike Team personnel pumped as much fuel, bulk oils, gasoline and other potential pollutants as access and availability permitted. These latter fluids were transferred in drums and other containers to a barge moored astern of MESQUITE. USCG personnel stripped MESQUITE's accessible spaces of equipment, crew's effects, and other material of value. These items were packed in cardboard boxes and removed by helicopter.

2-7.3 Securing the Vessel. Ice sweeps the Keweenaw Point area throughout the winter and early spring. Since ice-generated forces could be large enough to move the wreck, mooring MESQUITE for the winter was considered. The size of the anchors or stake piles and ground tackle required made setting up a moor impractical in the short operating time remaining. Alternatively, the ship could be stabilized by increasing the ground reaction. Selected intact tanks and compartments were filled with water. Spaces filled included:

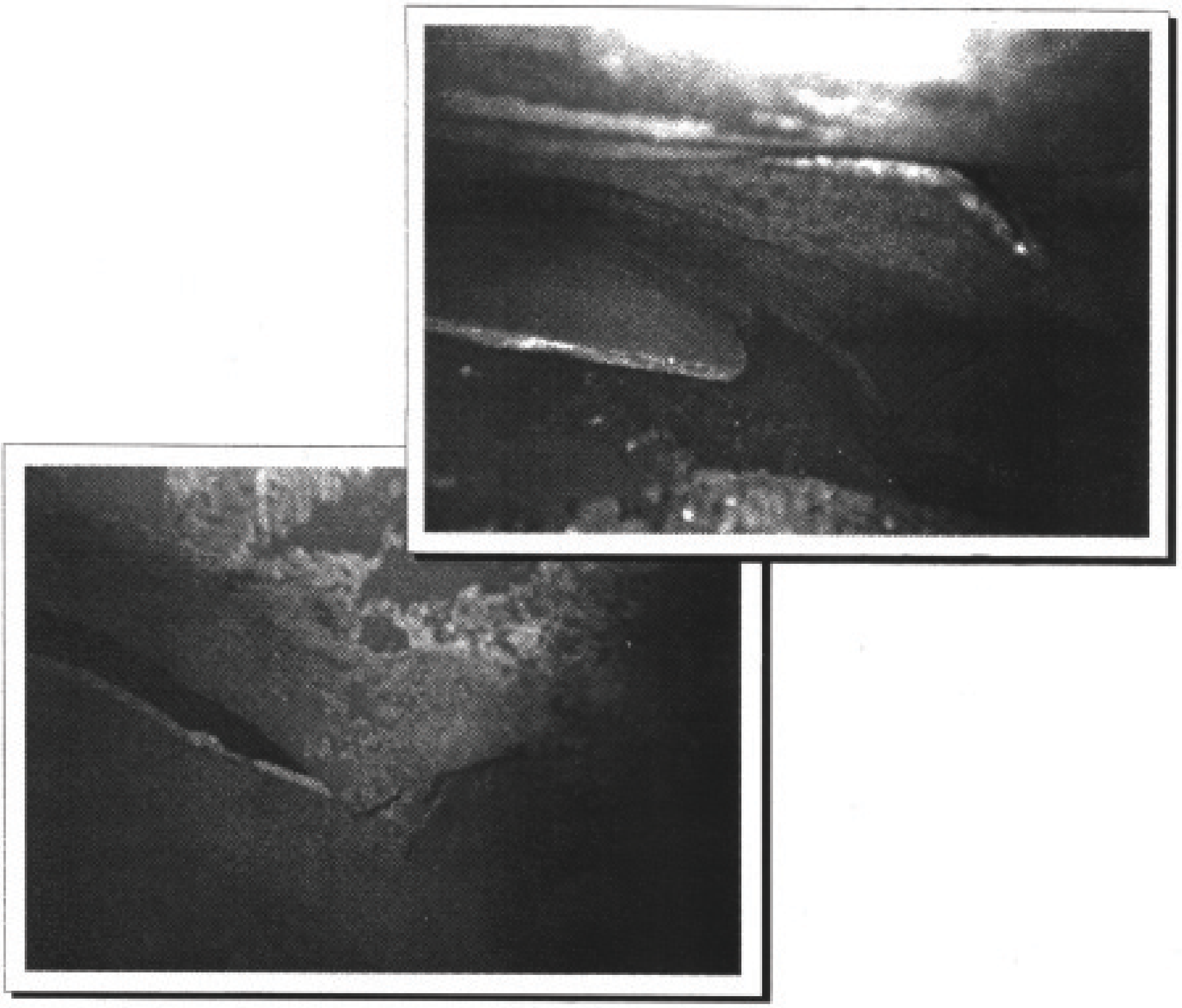


Figure 2-3. Cracks in Shell Plating.

- Forepeak, to the overhead,
- Chain lockers, to the overhead,
- Crew's berthing (fwd), to the maximum depth possible,
- Hawser storage (aft), to the overhead, and
- Lazarette, to overhead.

With this additional flooding, MESQUITE's ground reaction increased by about 79 long tons. The weight of ice buildup during the winter would increase the overall weight of the wreck and give additional stabilization.

2-7.4 Demobilization. The demobilization of the salvage personnel and equipment began on 12 December with the salvage gear being unloaded from the crane barge in Houghton and transported to the Houghton-Hancock Airport. After the salvage gear was ashore, the crane barge and the tug were demobilized. On 13 December, the SUPSALV representative departed with the assistant salvage master and two divers. On 14 December, the remainder of the salvage team with their equipment were flown by Coast Guard C-130 to Newark, New Jersey completing demobilization.

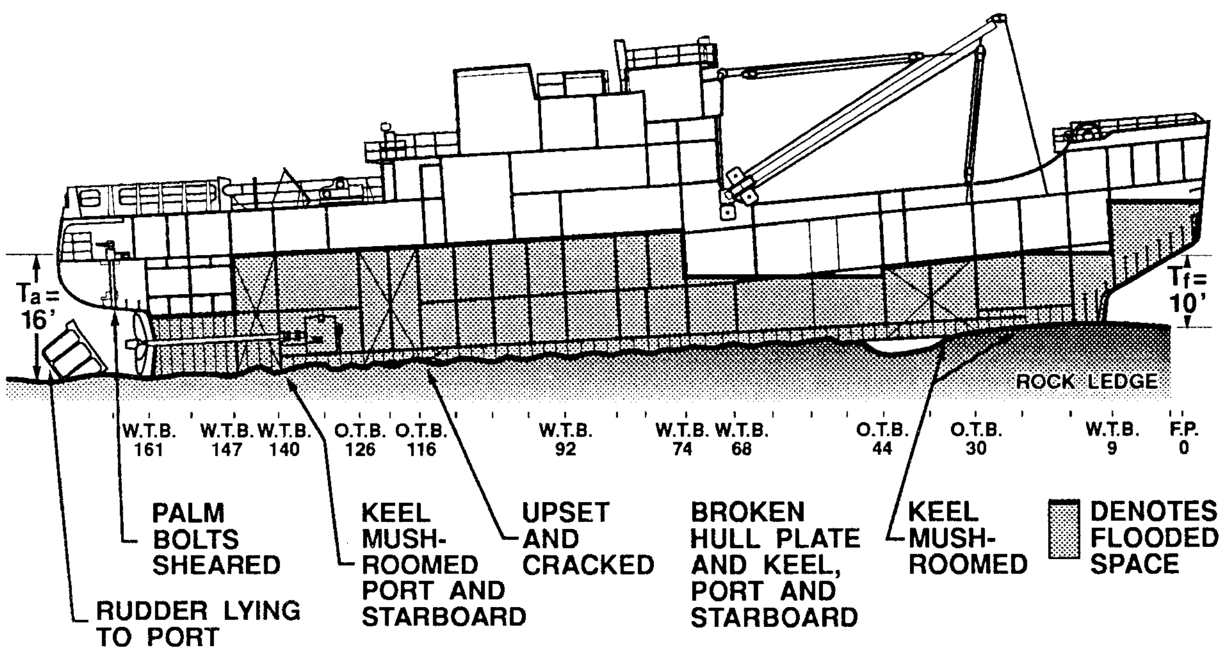


Figure 2-4. USCGC MESQUITE, Final Grounded Condition, December 11, 1989.

CHAPTER 3

SECOND SALVAGE EFFORT

3-1 WRECK REMOVAL

3.1.1 Tasking. With the direction provided by requisition number N00024-90-PR-00314 under contract number N00024-90-D-4148, delivery order 0002, the salvage effort for the USCGC MESQUITE (WLB-305) was restarted on 19 April 1990. This new tasking directed a resurvey and salvage of MESQUITE from its stranded position off the Keweenew Peninsula in Lake Superior. The salvage was to include raise-and-recover or raise-and-sink phases, which would be determined on-scene with concurrence of the USCG.

3-2 PREPARATIONS

3-2.1 Operational Analysis. During the period between January and March of 1990, informal discussions with SUPSALV about salvage schemes were continued (Figures A-5 and A-8). Upon returning to the grounding site on 21 May, MESQUITE was reinspected to determine what additional damage may have occurred during the winter. This resurvey, which included an underwater inspection on 22 May, confirmed that the bottom of the hull had been torn up significantly during the winter storms. Figure 3-1 shows the condition of the MESQUITE during the resurvey on 22 May. Patching or plugging the hull was no longer a viable salvage option. If MESQUITE was to be salvaged, there were three viable options:

S1) A combination of internal flotation with compressed air and dewatering with pumps and external buoyancy from barges or pontoons.

S2) An external lift with a heavy lift craft.

S3) Dragging MESQUITE into deeper water to gain more draft for pumping and dewatering.

With the condition of MESQUITE looking less favorable than anticipated, the salvors also recommended four options for wrecking her in place:

W1) Cutting the ship up in place and removing the pieces by barge for disposal.

W2) Lightening the hull and pulling it into deeper water.

W3) Cutting the hull into smaller sections and lifting and sinking in deeper water.

W4) Lightening the hull and lifting and lowering it into deeper water.

Figure 3-1. Condition of USCGC MESQUITE During the Resurvey on 22 May 1990.

SUPSALV and USCG discussed these options along with their cost, time requirements and resources. The USCG, using SUPSALV salvage cost estimates and their own repair/replacement cost estimates, decided to remove the wreck by lifting it off the rock shelf and lowering it into deeper water to make an underwater park for sport divers. This decision was made based on the recommendation of the Keweenaw Tourism Council, and followed a meeting of interested parties on 3 May, 1990. To accomplish this, option W4, lightening the wreck and lifting and lowering it into deep water was chosen. This plan was formalized by letter to the Coast Guard on 7 June, 1990, seen in Figure A-10.

3-2.2 Engineering Analysis. The primary assets needed to lift MESQUITE and lower her into deep water were the former COGNAC "A" platform trusses. These trusses were the modified Jacket Installation and Hammer Handling Structure Truss Nos. 7 and 8 used on the Shell COGNAC "A" Platform installation. The original configuration of these lowering trusses is shown in Figures 3-2A and 3-2B. Modification and installation of these trusses on a barge would be required prior to use in this lift.

In order to execute the lift of MESQUITE successfully, the following lift barge characteristics had to be met:

- Capability of lifting the fixed weight of the ship.
- Draft of less than 11 feet during lift.
- Ability to support the ship during transit to the disposal site.
- Ability to reach out over the strand and center about the ship's centerline.
- Ability to transit the Great Lakes and locks without modification.
- Ability to be self-sufficient and capable of staying on-site during the entire operation.

3-2.3 Lift Configuration. The original lift rig design took maximum advantage of the existing geometry of the trusses, the barge, and the MESQUITE. After a detailed review of the barge, the inboard longitudinal truss beams were set atop the barge's longitudinal bulkheads with the aft transverse truss beams sitting atop frame 39. This resulted in a center-to-center lift block spacing of 54 feet 6 inches and a 22-foot clearance over the stern. The aft padeye locations were selected at the fore and aft fuel tank transverse bulkheads centered about frame 121. The forward padeye locations were at frames 70 and 62. Frame 62 was a transverse bulkhead. This configuration provided a lift point spread on the wreck of 55 feet—just 6 inches greater than the spread between the lifting blocks. To the eight lifting points, eight sets of lift slings would connect the lifting blocks to the lifting padeyes, seen in Figure 3-3.

3-2.4 Lift Capacity. The displacement of MESQUITE at the time of grounding was about 1,000 tons. By removing all weights from topside and the holds, cutting away all the superstructure above the 01 level, and off-pumping fuel and other liquids, it was calculated that the lifting weight could be reduced to 800 tons. In addition, by pumping and blowing the submerged compartments, additional buoyancy could be provided to reduce the lift load to as little as 500 tons. In light of these figures, 1,000 tons was established as the design load for all strength and structural calculations.

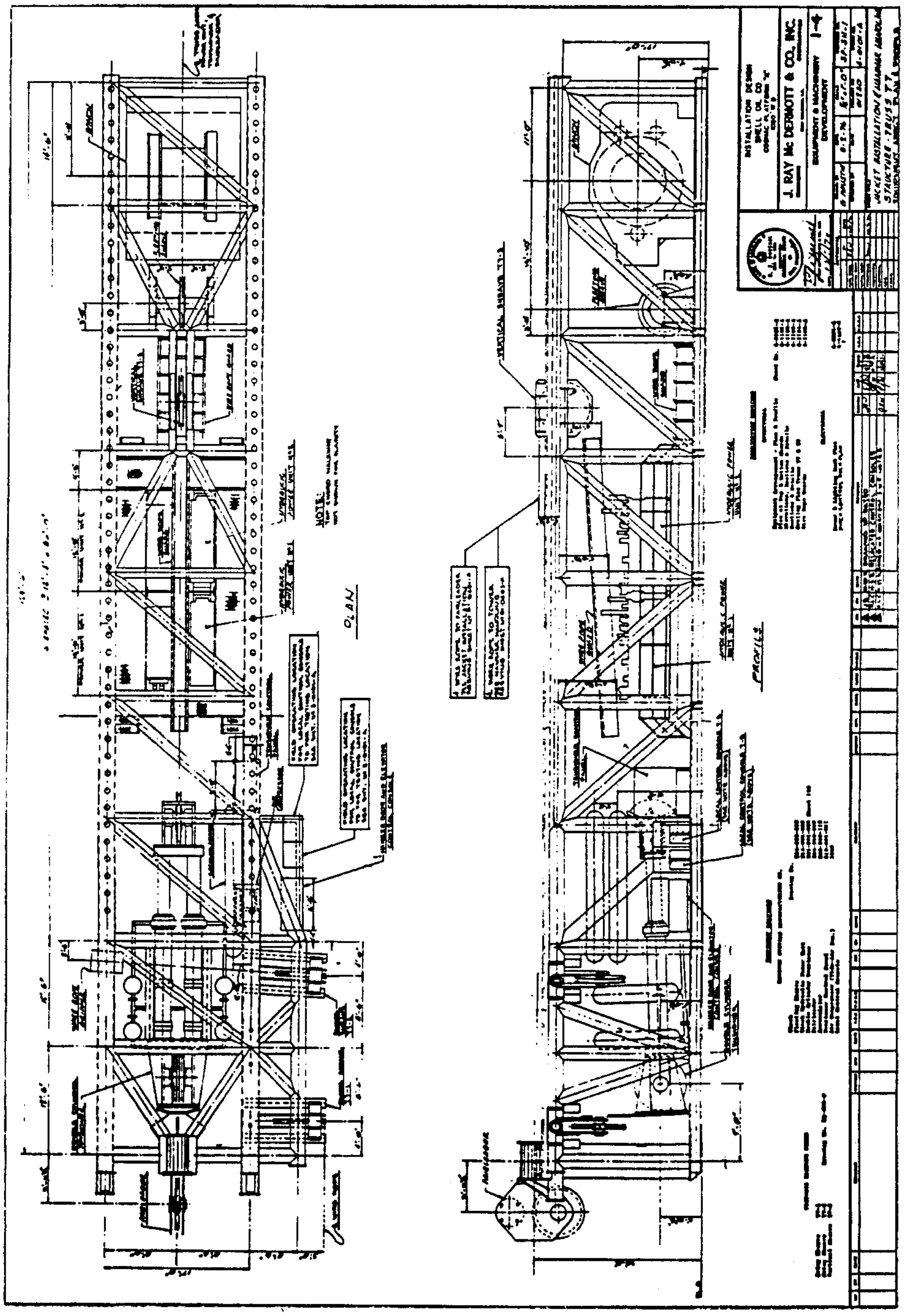


Figure 3-2A. COGNAC "A" Platform Gear.

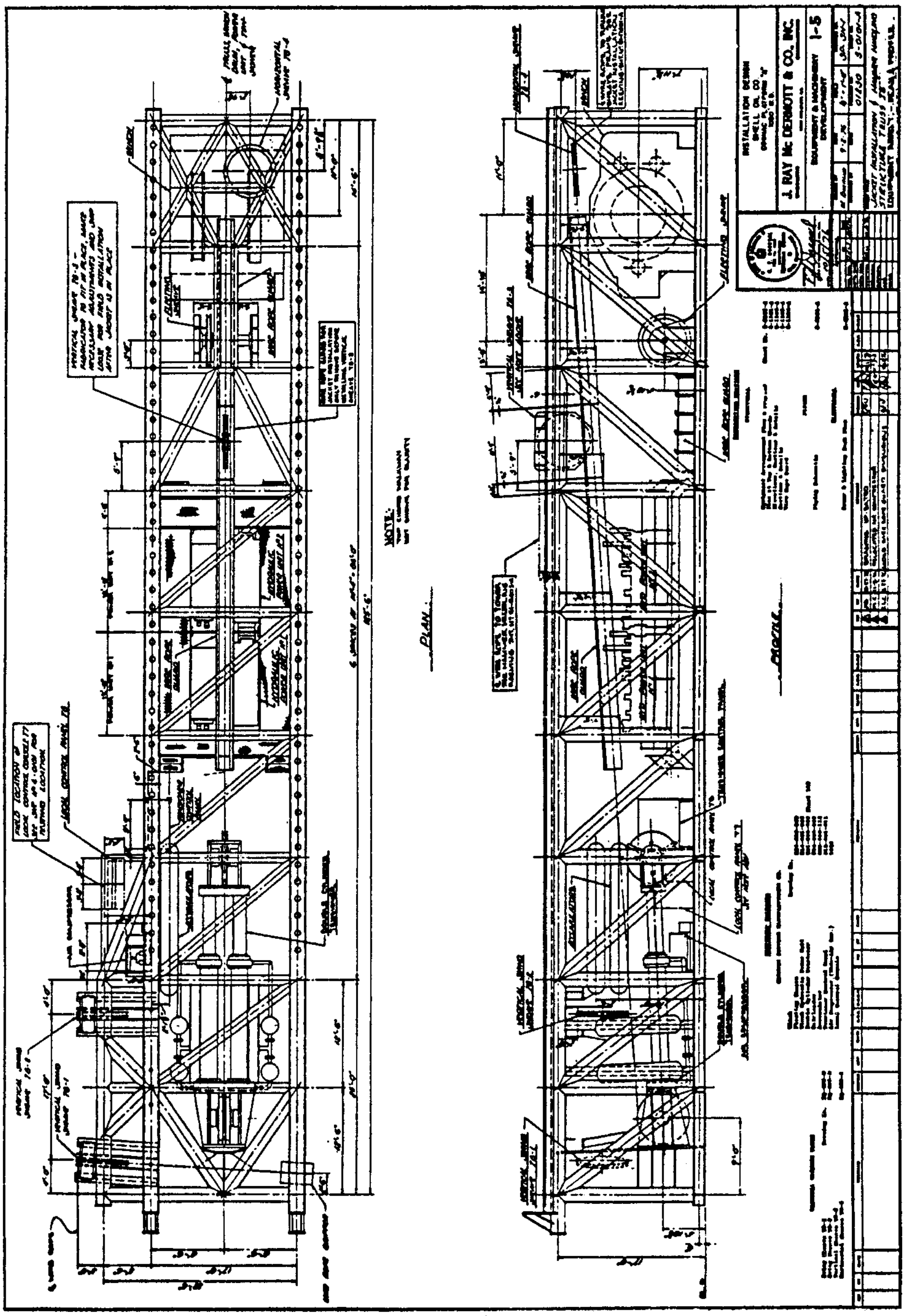


Figure 3-2B. COGNAC "A" Platform Gear.

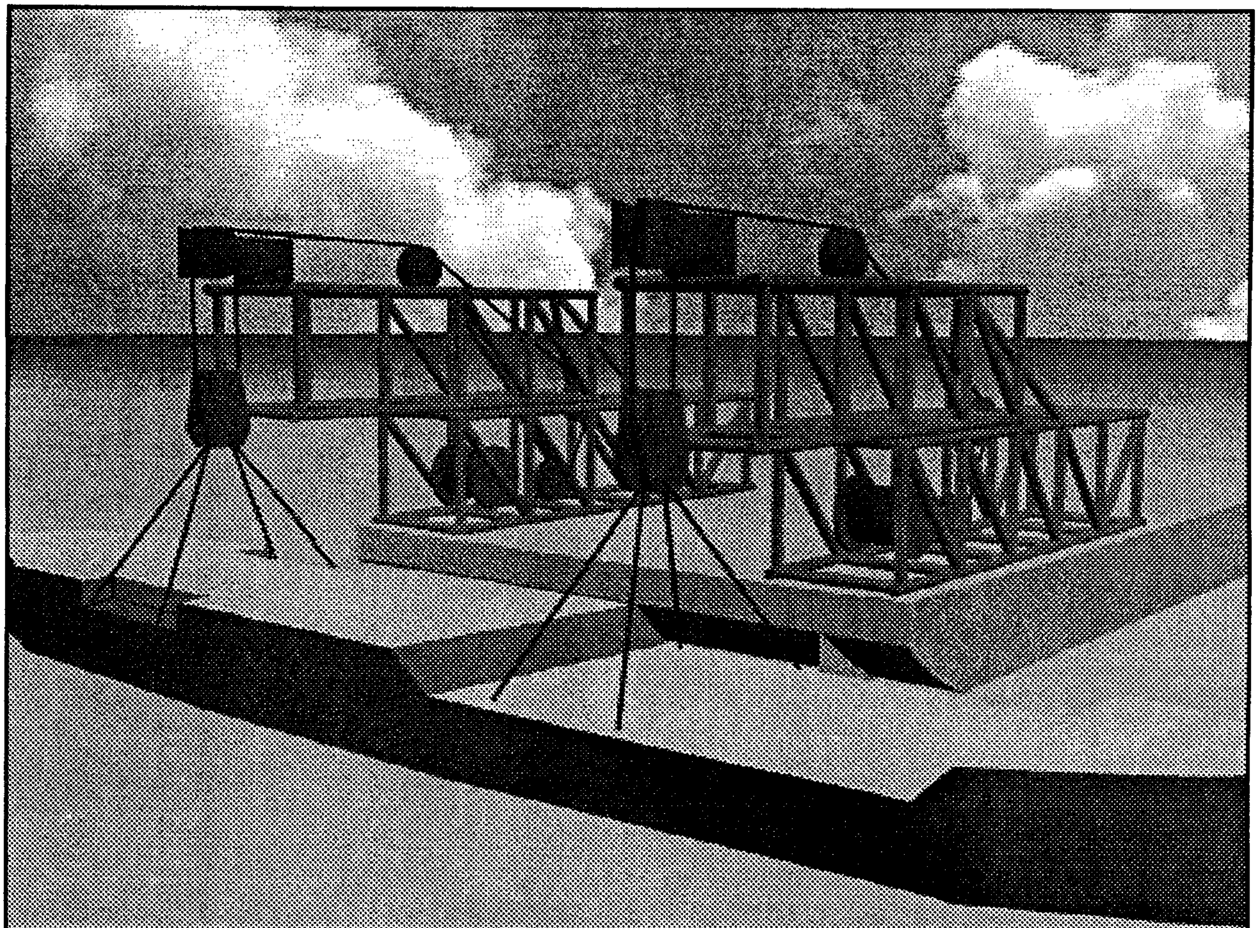


Figure 3-3. Computer Model Image of Initial Lift Configuration.

3-3 BARGE ARRANGEMENTS AND MODIFICATIONS

3-3.1 Barge. After a wide search, DONJON leased WEEKS BARGE 297 for this operation. This barge has an overall length of 250 feet, a depth of 16 feet, and a beam of 75 feet. Longitudinal bulkheads run full-length 18 feet 9 inches port and starboard (P/S) of the centerline.

3-3.2 COGNAC "A" Trusses. The COGNAC "A" trusses, as configured for the BARGE #45 lift, were installed on the WEEKS BARGE 297, as seen in Figure 3-4. This configuration gave a hook clearance of 22 feet abaft the stern log. By setting the lift trusses directly on the barge deck, a 48-inch lift clearance (less as the lake level dropped) could be achieved with the barge ballasted and the lifting purchase hauled up. The remaining 36 inches of purchase were unusable as the slings would contact the lift trusses.

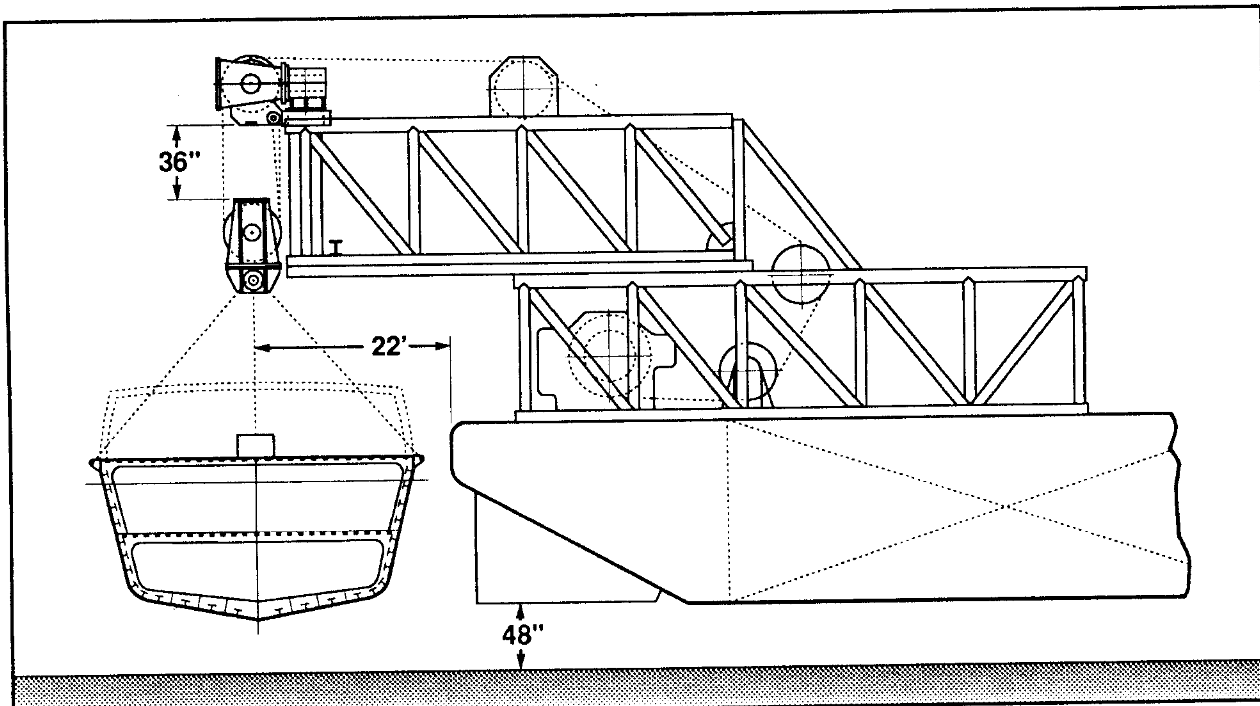


Figure 3-4. Barge/Wreck Lift Configuration (Profile).

3-3.3 Truss Location on the Barge. The truss location on the barge was achieved by taking maximum advantage of existing under-deck structural members (see Figure 3-5). Existing structure was strengthened and new structure was added as needed. Since the primary reaction loading was at the aft end of each truss, the aft transverse beams on the lift trusses were set atop transverse FR 39, 75 inches forward of the stern log. Transversely, the outboard lift truss beam sat within 21 inches of the side shell (the longitudinal was 24 inches inboard). The structure in this area was strengthened by welding the first inboard longitudinal to make it continuous and installing a deep web adjacent to it. In addition, structure was added 8 feet 6 inches outboard of the longitudinal bulkhead between frames 38 and 39½. This additional stiffening was in the longitudinal plane of the lifting purchase and would aid in distributing the reaction loading from the lift truss.

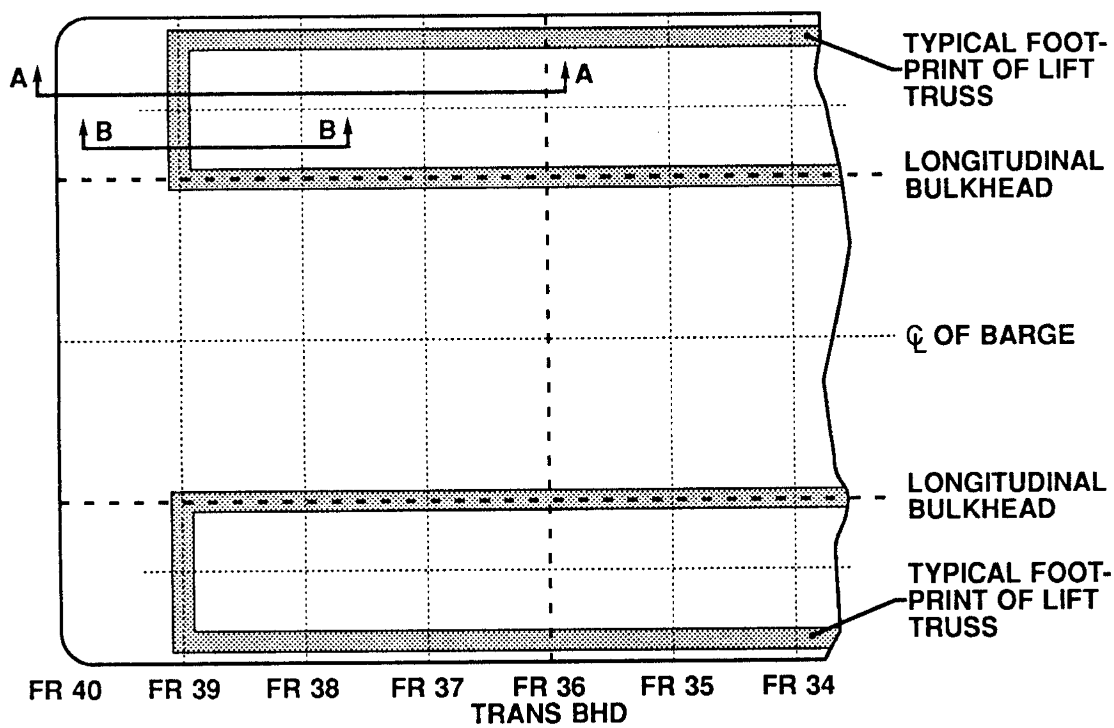


Figure 3-5. Heavy Lift Truss Locations on Barge.

3-3.4 Barge Structure Reinforcement Calculations. A structural analysis of the truss reaction loading on the barge was done for total barge reaction limits and for localized loadings. The results of each analysis are provided in Figure D-4. The structural analysis showed that the barge was able to accept structurally a full lift, but localized structural reinforcement of the aft deck on the barge was required (see Figure 3-6 for details). A close assessment of the barge ballast plan was required to offset the lifting moment and maintain the desired limiting drafts while not overstressing the structure of the barge.

3-3.5 Lift Truss Load Analysis. To be prudent, the lift trusses were analyzed for this configuration—they had been used in several configurations since their original design and installation in the COGNAC "A" lowering platform (Figures 3-2A and 3-2B) and in the BARGE #45 salvage. The loading for MESQUITE was different since it was a multiple-purchase hoist rig and vertical. Using a design load of 1,000 long tons as the maximum working load, the truss system was recalculated, using the following criteria:

- Acceptable tension and bending – 40 percent.
- Acceptable shear – 27 percent.

Calculations for the members that needed support and the drawings identifying those modifications are shown in Figure D-5.

3-3.6 Lift Wire Conversion to Four-part Purchase. To gain safety in the lift purchase by decreasing wire rope loading, increasing wire life, and making the lift operation more controllable by decreasing wire rope speed, a four-part purchase was introduced. The COGNAC "A" lift system had a single part 3½-inch wire rope passing through a Lebus, fairlead, and ram tensioner/compensators. This arrangement was changed to a four-part lift purchase with double sheave blocks that had been part of the motion compensator assembly on the COGNAC "A" platform. One of the blocks was fixed to the swivel fairlead as the head block, while the other block became the running block (see Figures 3-7 and 3-8). Both blocks were in their basic assembly configurations, with some additions: (1) the running block had a clevis and pin structure bolted to its base plate, while (2) the head block was bolted and welded to the fairlead base and had additional gussets welded from its lower flanges to the support column to carry the lift loads into the truss structure and to provide a padeye for terminating the end of the lift purchase wire.

3-3.7 New Intermediate Fairleads. To guide the hauling wire to the top of the new head block, an intermediate fairlead sheave was installed on the top of the upper truss assembly, (Figure 3-9). Details of these fairleads are provided in the drawings in Figure E-1.

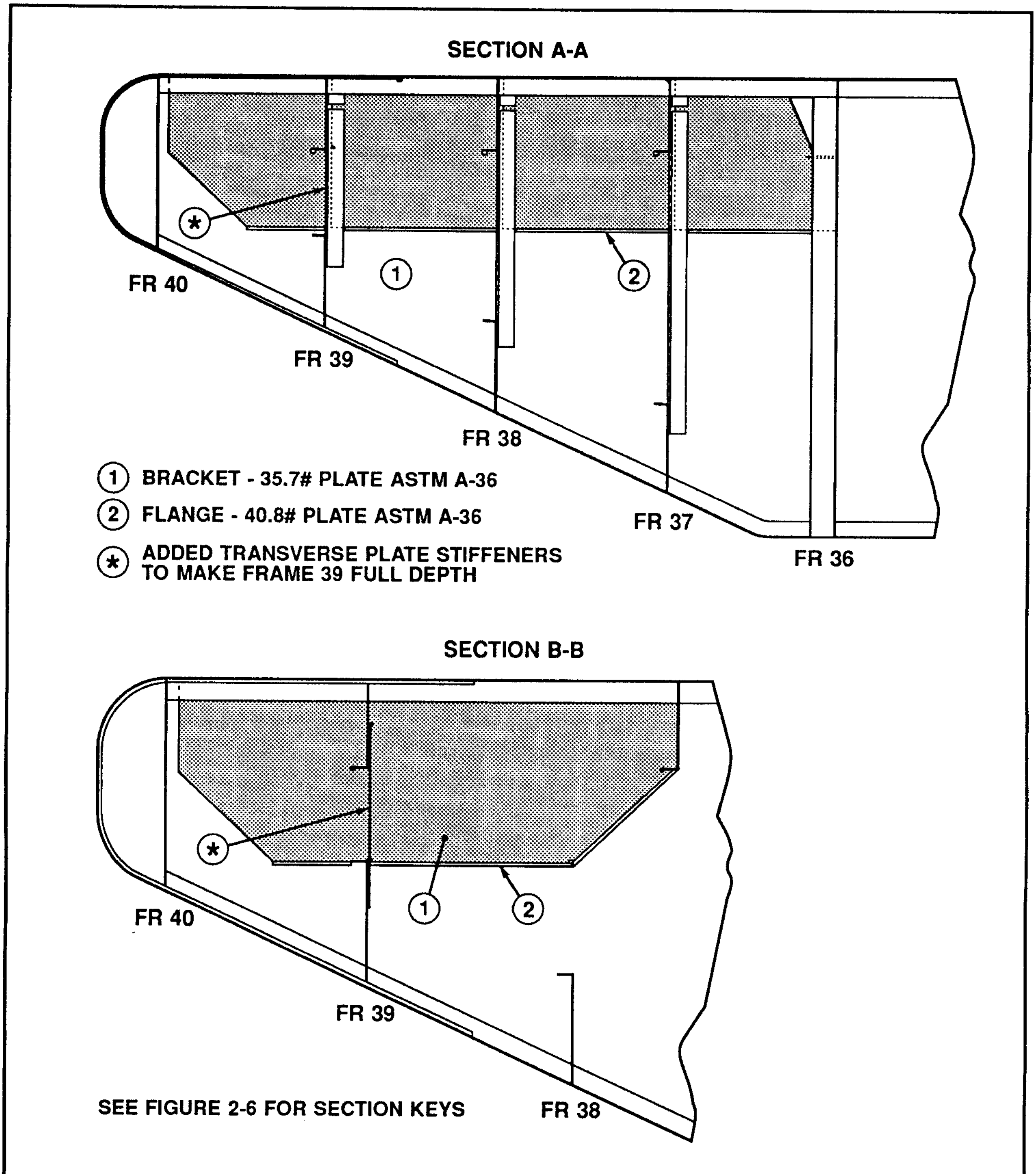


Figure 3-6. Barge Structural Modifications (Section A-A and B-B).

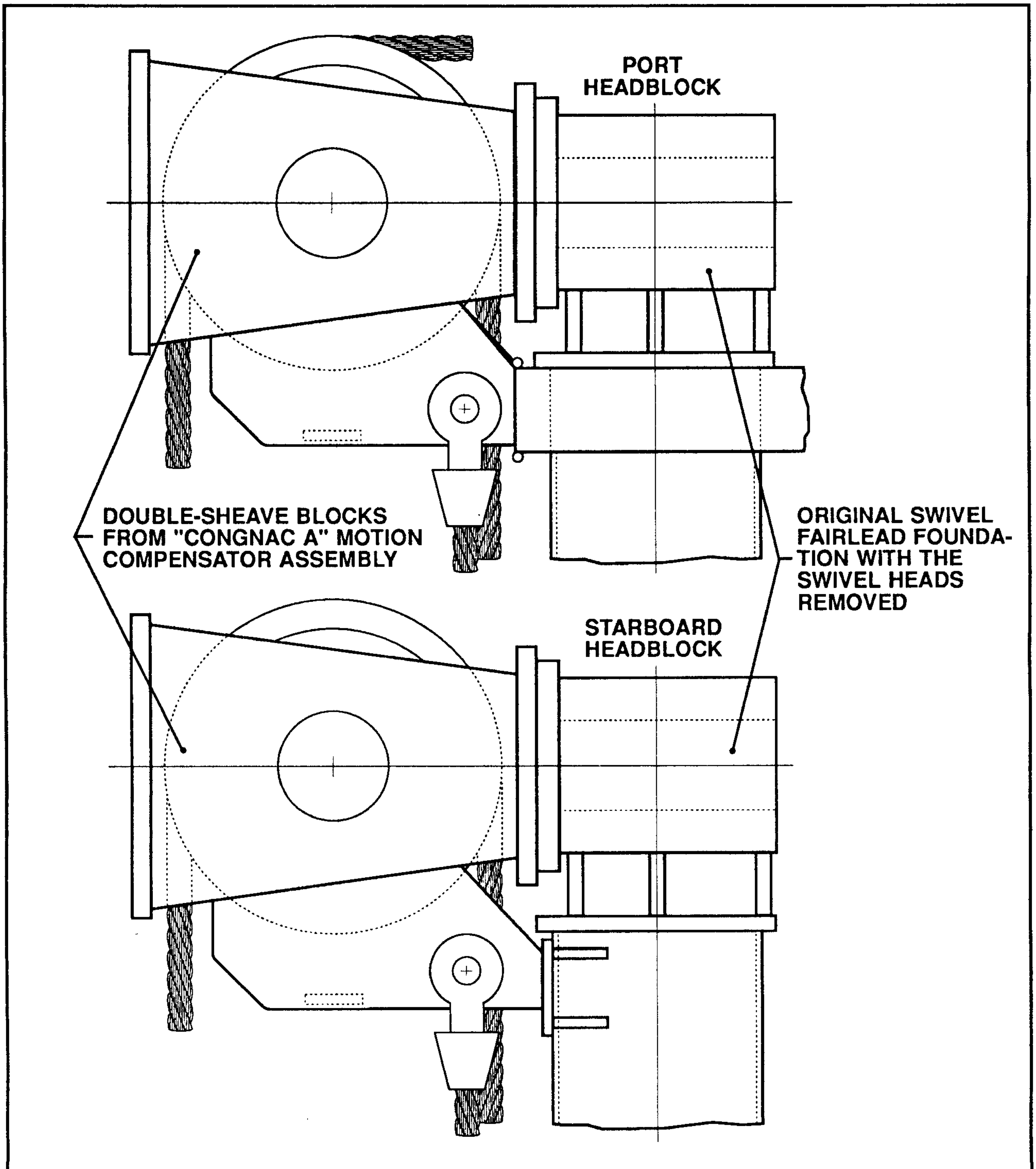


Figure 3-7. Lift Wire Conversion to 4-Point Purchase (Head Block).

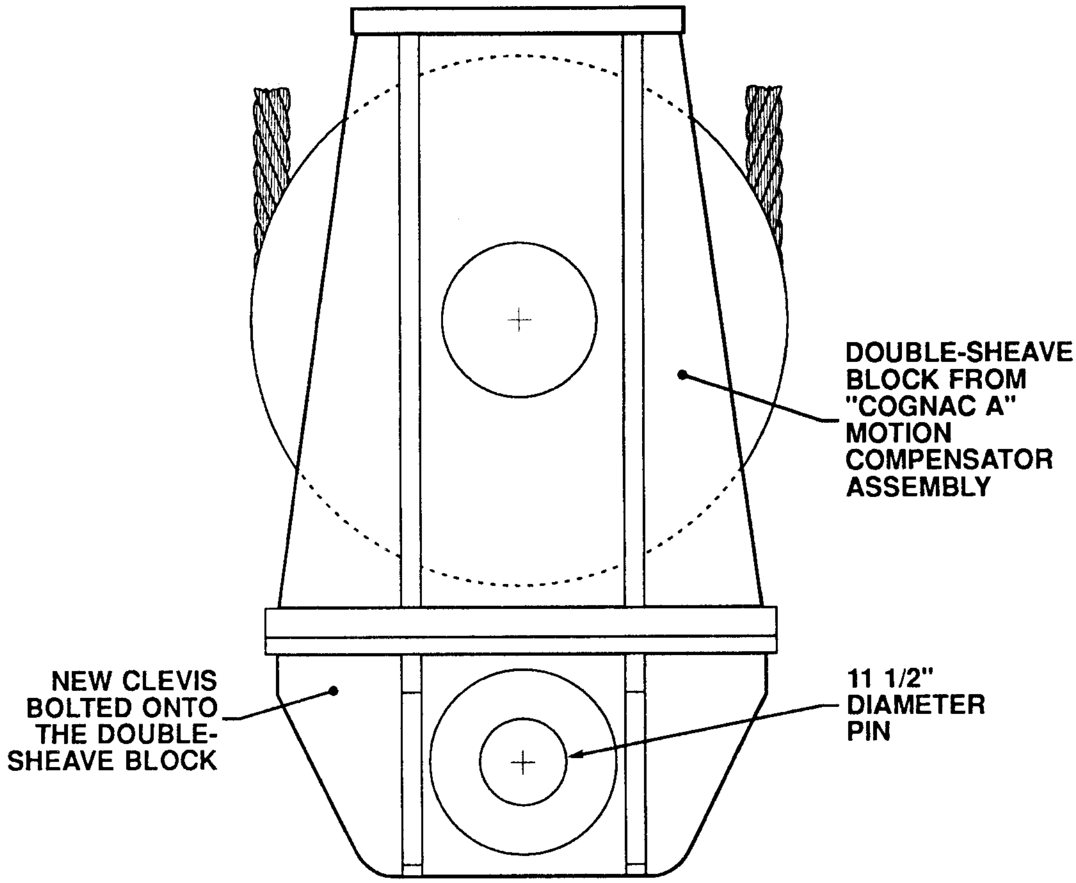


Figure 3-8. Running Block Arrangement.

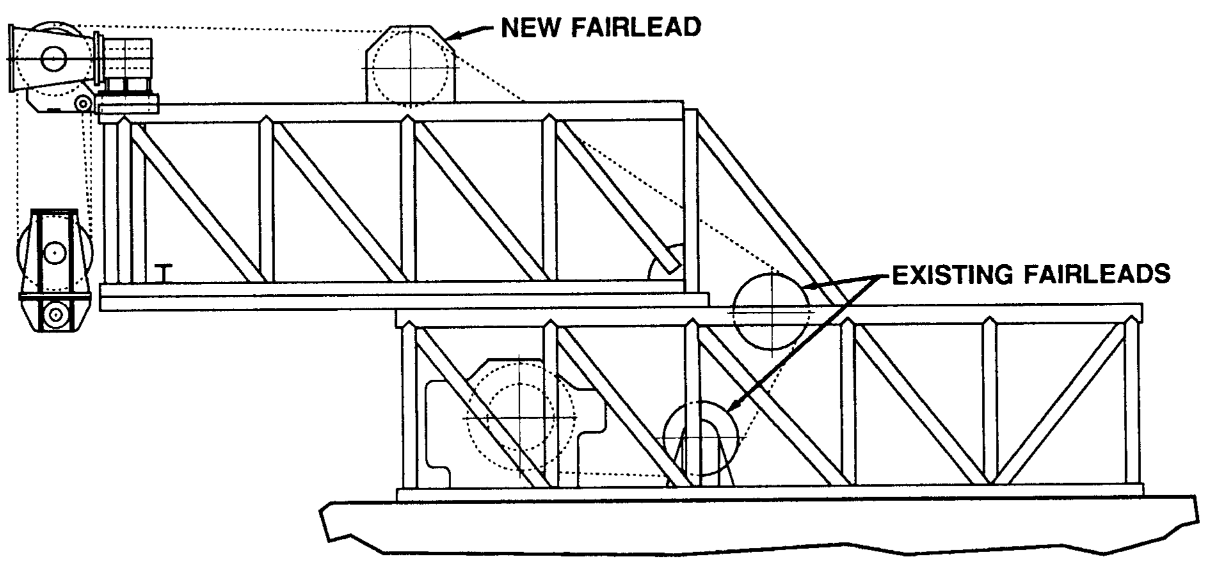


Figure 3-9. Intermediate Fairleaders.

3-3.8 Lift Pad Details. The original lifting connections were to be eight double padeyes welded to the deck and sheer strake of the MESQUITE. The spread of the truss was such that six of the padeyes would have landed atop transverse bulkheads and minor stiffening would be required for the remaining two. The padeye assemblies were designed to be welded to the deck and sheer strake at each lifting point, as shown in Figure 3-10. Each padeye assembly was made up with two pads for terminating the ends of each lift sling (the bitter ends of each sling went to the same padeye assembly). The padeyes used aft were welded to the ship at frames 116 and 126. Strength was obtained from the deck, bulkheads, and sheer strake. Due to the height constraint and resultant sling angles, the loads on these padeyes were significant. Each lifting padeye assembly was designed to transfer a load equal to the breaking strength of the two-part lift sling, with a factor of safety of 2½ based on the yield strength of the wire rope. The analysis confirmed that all structure and weldments met this criteria. The controlling fitting in the lift rig was the pin in the running block. To meet this criteria, the 11½-inch diameter pin was made out of chrome steel (an old tug shaft). Details of the padeyes are provided in Figure 3-10 and Figure E-2. After review of the proposed lifting scheme, the Supervisor of Salvage recommended manufacture of a single-point lift fixture for the forward lift point and doubling the after slings. This increased stability of the load upon lifting, and bolstered the factor of safety for the total rigging (see Figure 3-11).

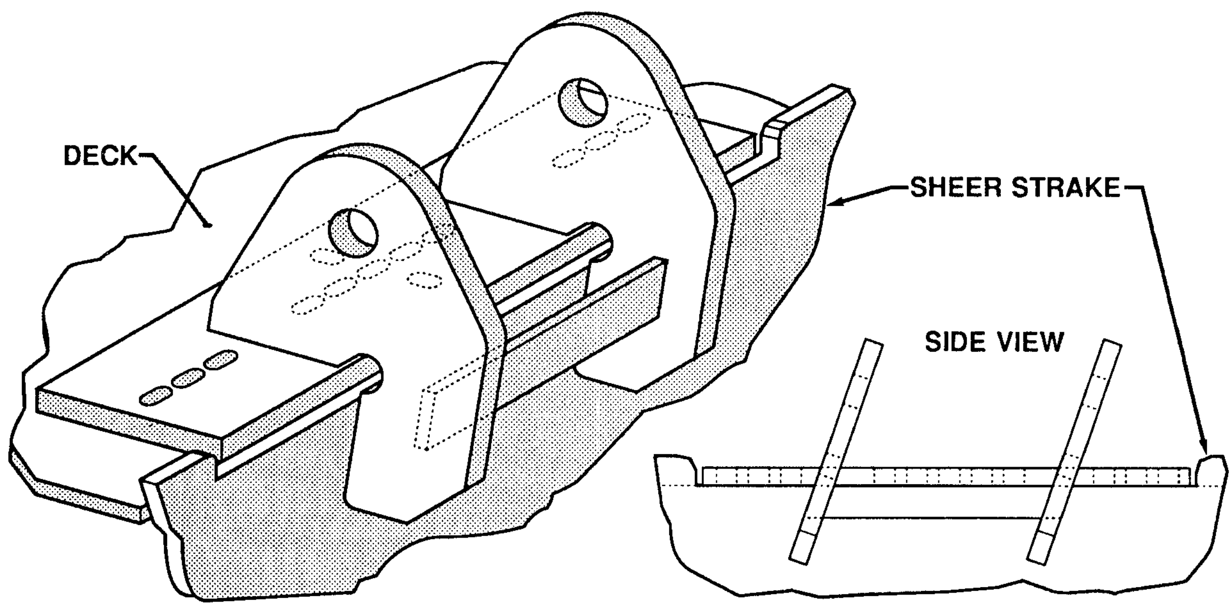


Figure 3-10. Lifting Padeye Assembly for Deck Edge.

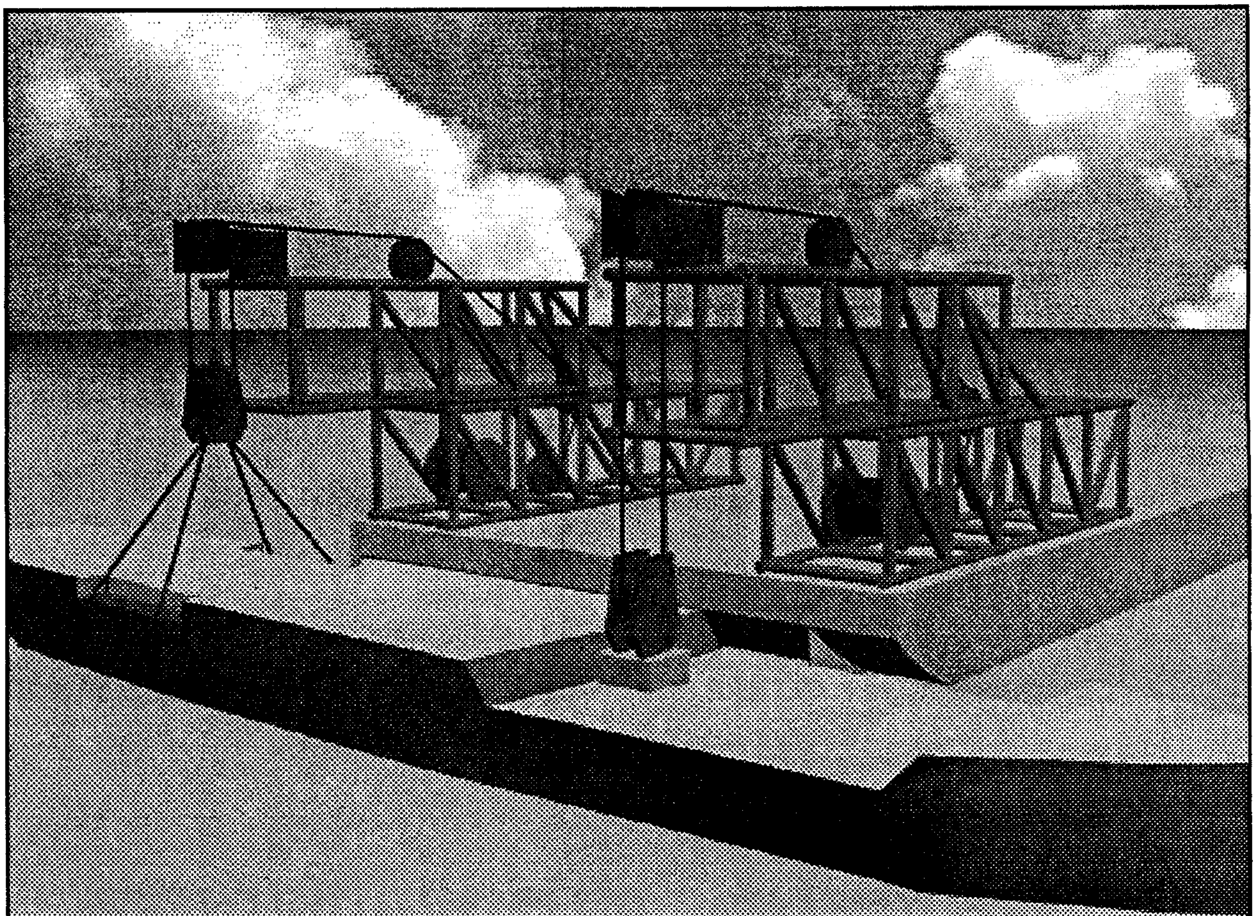


Figure 3-11. Computer Model Image of Final Lift Configuration.

3-3.9 Lift Slings. The lift slings were 3½-inch diameter wire rope, 56 feet long, with hot poured open sockets on both ends. They were rigged in an approximately 45-degree sling configuration with a factor of safety of 2½ based on their breaking strength.

3-3.10 Hydrostatic Analysis. To ensure that the barge was capable of performing the lift under the severe draft limitation of 11 feet, a hydrodynamic analysis was performed (see Appendix F). The result of the analysis was a ballasting plan that had tanks in the forward end of the barge filled to various levels with fresh water to counteract the immersion of the stern as the weight of the MESQUITE was taken by the lifting trusses.

3-3.11 Equipment Selection. Having been to the site of the wreck during the December 1989 effort, the salvors were well aware of the remoteness and lack of local resources that the area afforded. A master list was generated by the salvors to identify the equipment and the spares that would be needed to perform each part of the operation. This list, provided in Appendix G, became the barge load-out list for its departure from Port Newark, New Jersey.

3-3.12 Wreck Removal Plan. The proposed plan for removing the wreck from its grounded position on the rock ledge and lowering it into deep water was relatively simple, and consisted of the following steps:

a. Instituting oil spill prevention procedures at site.

b. Removing remaining oil and trying to remove any environmentally sensitive material out of the wreck.

c. Removing all USCG *high-value material* from the wreck.

d. Cutting away all superstructure above 01 level.

e. Emptying hold and accessible spaces of removable weights.

f. Installing lift pads.

g. Installing dewatering pumps and air fittings.

h. Parbuckling wreck to even keel.

i. Attaching lift wires.

j. Dewatering wreck.

k. Lifting wreck.

l. Towing to sinking site.

m. Removing all pumps and air hoses.

n. Lowering wreck to bottom.

o. Derigging wreck.

p. Cleaning up and depart from site.

3-3.13 Mobilization. The lift barge was to be loaded with all the support gear that would be needed for the duration of the operation. The tug J.A. WITTE was scheduled to depart on 10 May 1990 and tow the lift barge to the Great Lakes site in about two weeks. Upon her nearing the salvage site the salvors would be flown to the site.

3-4 OPERATIONS

3-4.1 Command and Control. For the second phase of the effort, the chain of command for both on-site and command headquarters was as follows:

USCG

CAPT Hobaugh – (On-scene Commander)
CDR Bill Hall – MLCLANT Liaison Officer
LCDR Al Coates – MLCLANT Liaison Officer

SUPSALV

CAPT C. A. Bartholomew – Supervisor of Salvage
CDR Bert Marsh – Salvage Officer

DONJON

Dale Springer – Salvage Master
John Witte Jr. – Assistant Salvage Master
Ken Edgar – Salvage Engineer
Steve Newes – Logistic/Finance Coordinator

3-4.2 On-site Preparations. The salvage site required no preparations, as the job was to be done entirely from the self-supporting barge brought in from DONJON's yard in Port Newark, New Jersey. The Coast Guard based their communications out of a rented cabin at Lac LaBelle, Michigan, while DONJON used a motel room in Houghton, Michigan as its land-based headquarters which was a 40-minute boat ride from the salvage site.

3-4.3 Pollution Prevention. A pollution abatement plan, detailed in Appendix H, was submitted to and approved by the Coast Guard and SUPSALV. The plan identified the equipment and procedures for control of potential pollution situations that could arise during MESQUITE's salvage. The Coast Guard Strike Team that inspected MESQUITE prior to the winter shut-down estimated that 2,000 to 3,000 gallons of oily waste remained in the hull. To remove this waste, DONJON had planned to use tanks in the lift barge for holding until transferring. During the operation, 18,000 gallons of fluid (classified as hazardous waste) were ultimately removed from the wreck. This volume of waste was temporarily held in the port bow rake tank of the lift barge. Ultimately the fluids were removed by a firm in Bark River, Michigan with the assistance of Coast Guard Marine Safety Office (MSO) Duluth.

3-4.4 Resurvey. A resurvey of MESQUITE was made on 2 May 1990. It included an external, internal, and underwater inspection of the hull. As a result of the winter storms, MESQUITE's keel had been pushed upwards several inches, and the hull had beaten a trough or cradle into the rock bottom at least one foot deep. In the survey of 6 December 1989, the drafts were 12 feet 6 inches forward and 16 feet aft at the stern centerline. The wreck had a 32- to 33-degree port list. This survey disclosed a water draft of 11 feet forward and 15 feet at the stern, showing that the water level of the lake was dropping. The internal survey showed that the basic structure of the decks and bulkheads was still intact but that more equipment and gear had broken loose and was adrift about the ship.

3-4.5 Lifting Preparations. The lift barge was brought to the site and moored to the aft port quarter of the wreck (Figure 3-12). During the course of the operation, the barge was repositioned several times to improve access to the wreck and ease rigging. One of the first items to be removed from MESQUITE was the ship's propeller (see Figure 3-13). Divers rigged it and released it, and the crane quickly brought it to the surface.

An oil boom was then placed around MESQUITE and the oil abatement gear was unstowed and setup for ready access.

Using hand tools and cutting torches, all deck gear and high-value items identified by the Coast Guard, listed in Figure A-11, were disassembled and removed by hand or with the truck crane on the barge (Figure 3-14).

The removal of superstructure was started as soon as the barge was moored alongside MESQUITE. Areas above the main deck were cut first using the barge crane to lift them away. Cutting had to be coordinated with the parbuckling operation to provide access without water present. The pilot house was removed after 20 hours of cutting.

All accessible spaces were cleared of stores and gear. Most of the small components were put in cardboard boxes and the heavier items were hoisted out with the help of the crane. The most troublesome items were the mattresses. When their foam liners became saturated with water, they could barely be handled by two men. The crane had to be used extensively to snake and lift these waterlogged mattresses out of the work areas.

The watertight doors and scuttles in the forward and aft berthing compartments and the engine room spaces were secured in preparation for the lifting operation.

The aft lift pads had been prefabricated, and utilized some of the ships' framing drawings. The pads were then brought to the site and installed by suspending them from the crane hook and aligning them by hand to the list of the deck. The aft starboard pad assemblies were installed first and fit perfectly, as seen in Figure 3-15a and 3-15b.

The forward lift pad was a prefabricated box structure that penetrated the deck at frame 68 and 62 and was welded to the boom gooseneck foundation at the bulkhead at frame 70. The majority of the pad foundation had been prewelded in box configuration and was fitted into place with ease. After its base and back side were welded to the hull, the remaining structure was fitted and welded to complete the installation. Details of the lift pad structural modifications are shown in Figure E-3.

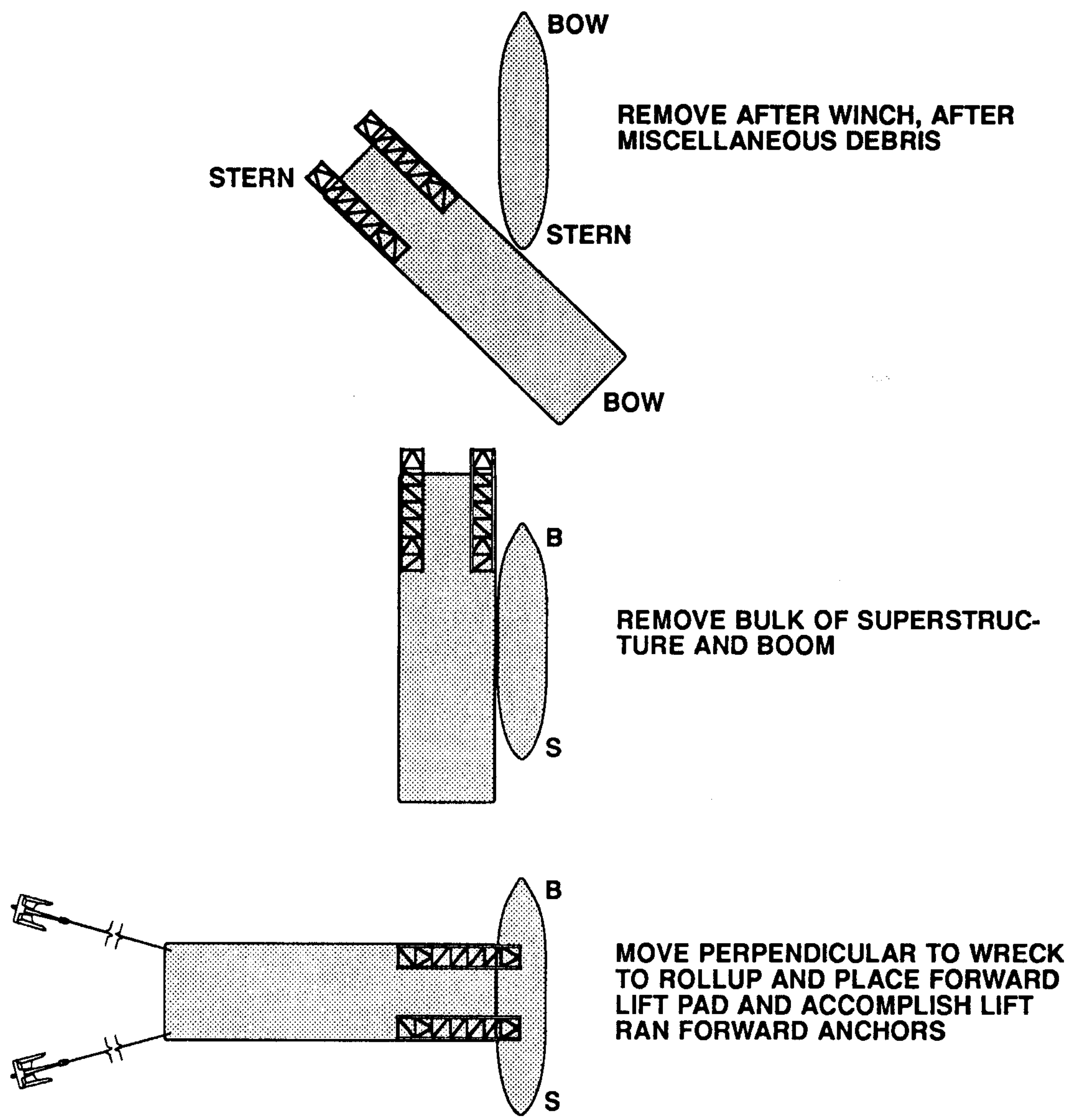


Figure 3-12. Mooring Along Side the Wreck.

Figure 3-13. Propeller Being removed from the Wreck.

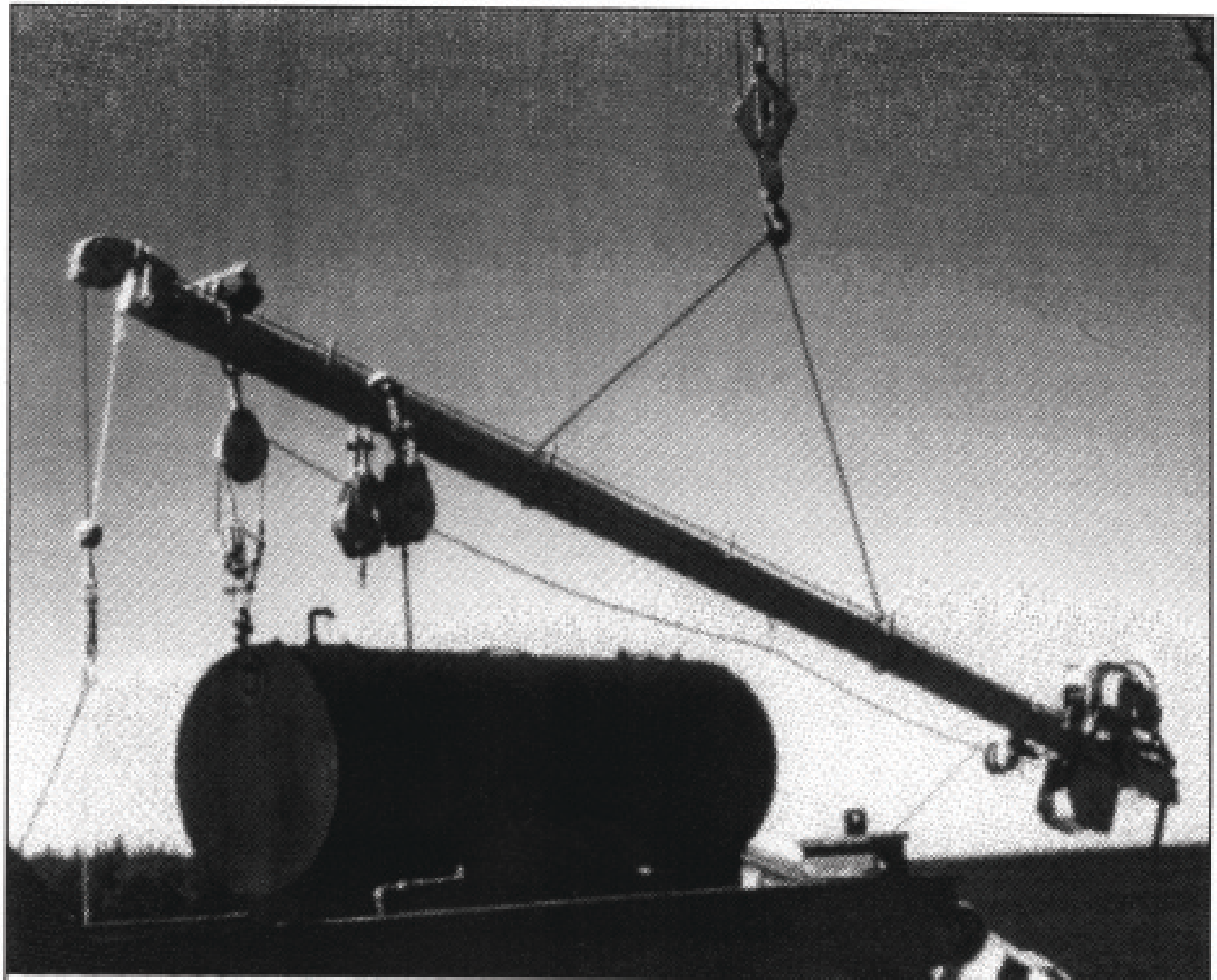


Figure 3-14. Boom Being Removed from the Wreck.

Figure 3-15A. Lift Pad Being Lowered into Place.

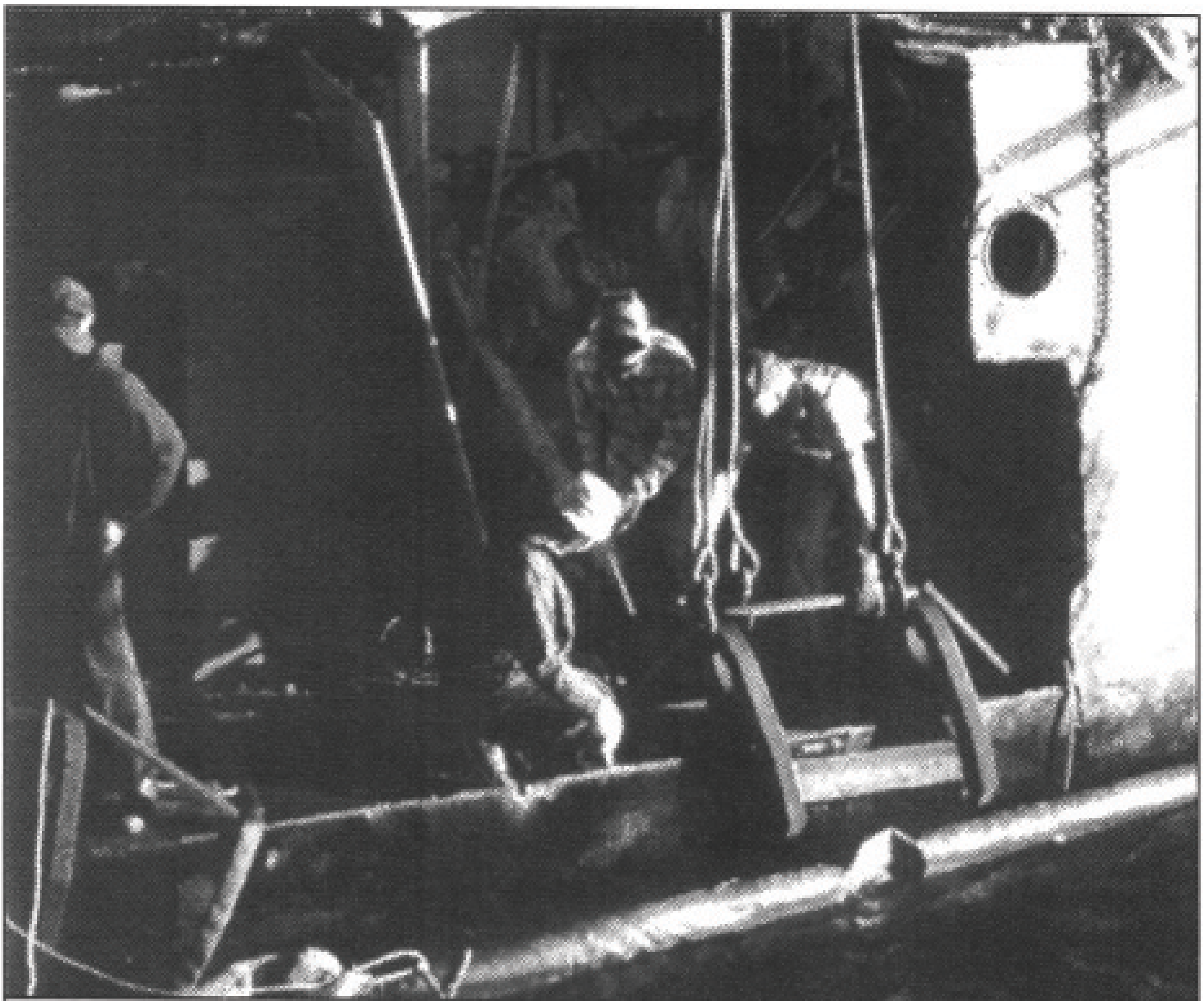


Figure 3-15B. Lift Pad Being Aligned on Sheerstrake.

Since the compartments had holes through the hull in many locations, the hull was dewatered by the combined use of compressed air and pumping to increase the buoyancy of the wreck in an effort to reduce the draft that the lift barge would assume to support the weight of the wreck. This was a situation where the barge's displacement draft—not its lifting capability—was the controlling factor. Compartments above the main deck would be pumped to remove trapped and entrained water, while lower spaces like the potable water tanks, fuel tanks, motor room, and berthing compartment were blown with air through air fittings atop vents or hatches penetrating the deck, shown in Figure 3-16.

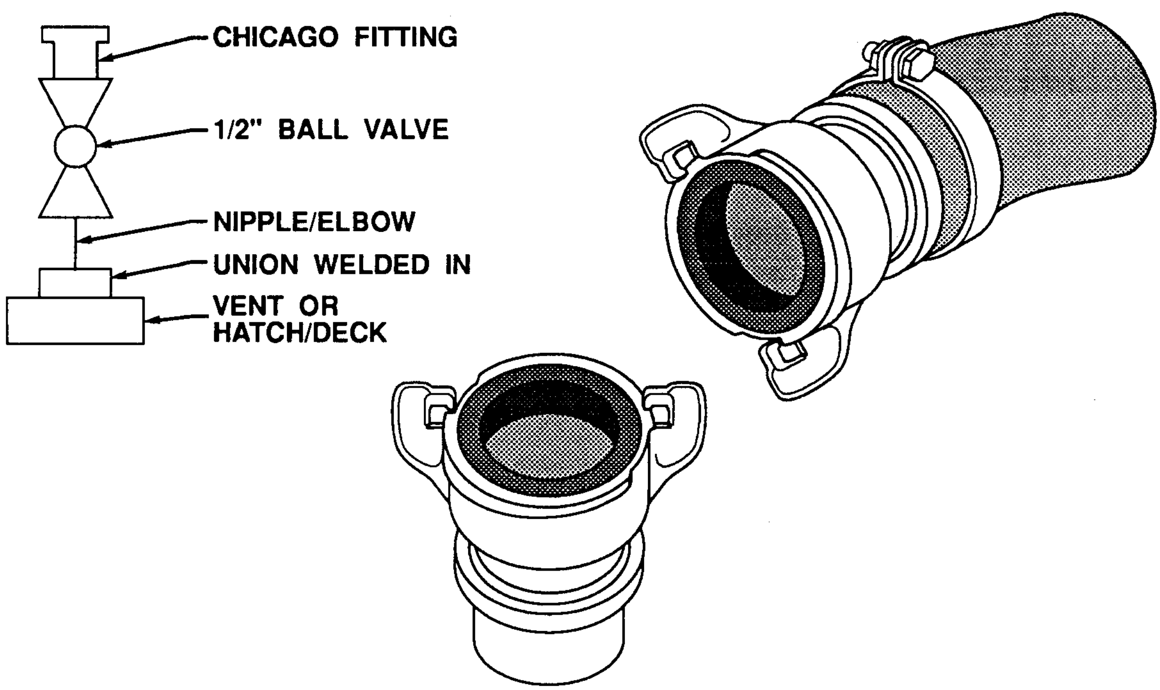


Figure 3-16. Chicago Air Fitting Used to Connect Air Supply Hoses to the Flooded Compartments.

The forward and aft berthing compartments were pumped. The forward berthing compartment pumped down readily but then leaked slightly through the drains in the sinks and heads. These leak sources were plugged readily. The aft berthing compartment would not pump down at first. Inspection found the same problem as forward but in addition the scuttle to the reefer decks was open. The scuttle was secured and the space was pumped down again, and failed. The source was the scuttle—which wasn't sprung—that had reversed threads so that it opened when it was turned clockwise. When the space was dry the scuttle was welded shut to prevent accidental opening.

The plan for parbuckling the wreck to even keel called for using 2- to 2½-inch wire pendants passed under the hull and attached to the starboard lifting padeyes fore and aft. When the forward lifting arrangement was modified to a single-point lift, an additional padeye was installed at frame 50, deck-edge starboard, to provide a replacement hard point for the absent forward-deck-edge lift pads.

After the starboard lifting padeyes were welded in place, a messenger wire was passed under the hull by the divers so that a doubled 2½-inch wire pendant could be hauled under the hull for parbuckling the wreck to even keel. The doubling was to get the right length. At this point, a suggestion was made to use the aft end parbuckling wire alone to roll the hull. Using a single parbuckling wire would decrease the rigging time and also free up the second lift truss when it came time to hook it into the forward lift pad. The single parbuckle wire idea was accepted as it looked promising, and the original plan could be easily reinstated if it failed. The crane, lifting bights of the messenger, pulled the parbuckling pendant under the hull until its two end fittings came up even with the after-most starboard lift padeyes and were bent onto them with 2-inch safety shackles, seen in Figure 3-17. Next, the bight of the parbuckling wire was bent onto the running block of the barge's port lifting truss. The block and wire was heaved in and the wreck gently rolled back to even keel.

With the port superstructure now out of the water, the cutting torches were moved over to the port side and cutting commenced on the 01 superstructure that were in way of the port lifting padeyes and pendants.

The prefabricated box structure of the forward lift pad was hoisted on deck and positioned for installation. The cutting locations in the deck plating were chalked, as were the final cut lines on the forward bulkhead at Frame 68. The box structure was put in place and worked into its final position with sledgehammers and *swedish steam* on the first try. No second markup and fitting was required. The structure was then welded into place and the aft gussets and bracket were fitted and welded into place to complete the job. While the forward lift pad was being installed, the superstructure in way of the aft port lift padeyes was being cut away. Once the deck edge was cleared, the padeye assemblies were hoisted into place, aligned, and welded. At the conclusion of this welding, all the lifting padeyes on the wreck were installed.

Figure 3-17. Hauling Lines Attached to Lift Pads Prior to Parbuckling the Wreck to Even Keel.

3-4.6 Lifting Sequence

3-4.6.1 Connection to Padeyes. With the conclusion of all padeye welding on the wreck, the parbuckling pendant was slacked in preparation for attaching the forward lifting block. When the wreck had settled back to its 32-degree port list, the parbuckling pendants were slacked until they laid lazy on the deck of the wreck.

The parbuckling pendant was continually slacked as the lift barge was warped forward on the wreck until the barge's starboard running block was athwartships of the forward lift pad.

With the help of a come-a-long, the running block was aligned to the angle of the deck and maneuvered into position for the lifting pin to be pulled home. The pin was then secured, as shown in Figure 3-18.

Figure 3-18. Lifting Pin Set to Capture Sling.

The hoisting falls were slacked in preparation for warping the barge back to make up the aft hoisting block with the lifting slings.

The barge was warped back in order to position the aft hoisting falls for connection to the slings. As the parbuckle maneuver was attempted, it became obvious that the wire pendant had cut into a portion of the sheer strake between frames and several inches into the tank top.

The hull was lowered to relieve the tension on the parbuckling pendants. With the aid of crane hauling on a wire pendant fairlead through a closed chock on the barge, the parbuckling pendant was freed from the hull. The pendant was repositioned and the MESQUITE was rolled back without listing.

To repair the damage and restore the structural integrity to the hull, a 40.8-pound steel plate was cut into a 14- by 30-inch strap, which was welded on doubler fashion, with the strap welded to the sheer strake first, as seen in Figure 3-19. The tank top was also patched.

The four 3½-inch lift slings were hoisted over the aft lifting padeyes by the barge crane. Initially, each sling had its open sockets bent onto the padeyes of the same assembly with its bight intended for the heavy lift running block pad. This reeving arrangement was a mistake, and the configuration was changed back to the originally planned rig, which had each sling span across the deck from port to starboard to allow the slings to equalize their loads during the lifting operation. All padeye connections were made, with the exception of the two pads that had the parbuckling pendants attached. At these locations, the lift slings were temporarily secured with line for later connection.

When the rigging of the aft slings was completed, the parbuckling pendants were slacked for the last time and the wreck was allowed to return to its normal position of 32 degrees port list. The parbuckling pendants were broken from the lift pads and retrieved on the barge. Once the parbuckling padeyes were cleared, the two remaining lift sling padeyes were bent onto the padeyes.

The bights of the four lift slings were now hoisted with the crane and positioned over a stanchion as a prerigging set for connecting to the running block. With the aid of chainfalls and manpower, the wires were positioned and the lifting pin was slid into position and secured. The releasing gear was then attached to all the padeye pins on the deck edge and at the forward lift point for later use by divers during the derigging operation.

3-4.6.2 Dewatering the Wreck. The dewatering effort on the wreck was an ongoing operation that started as soon as the lift barge was made up alongside. Portable stripping pumps were used wherever spaces were accessible—compressed air was used elsewhere. By the time the lift was ready to start, the portable pumps had been removed and the compressed air fittings connected. The compartments were blown fore and aft together.

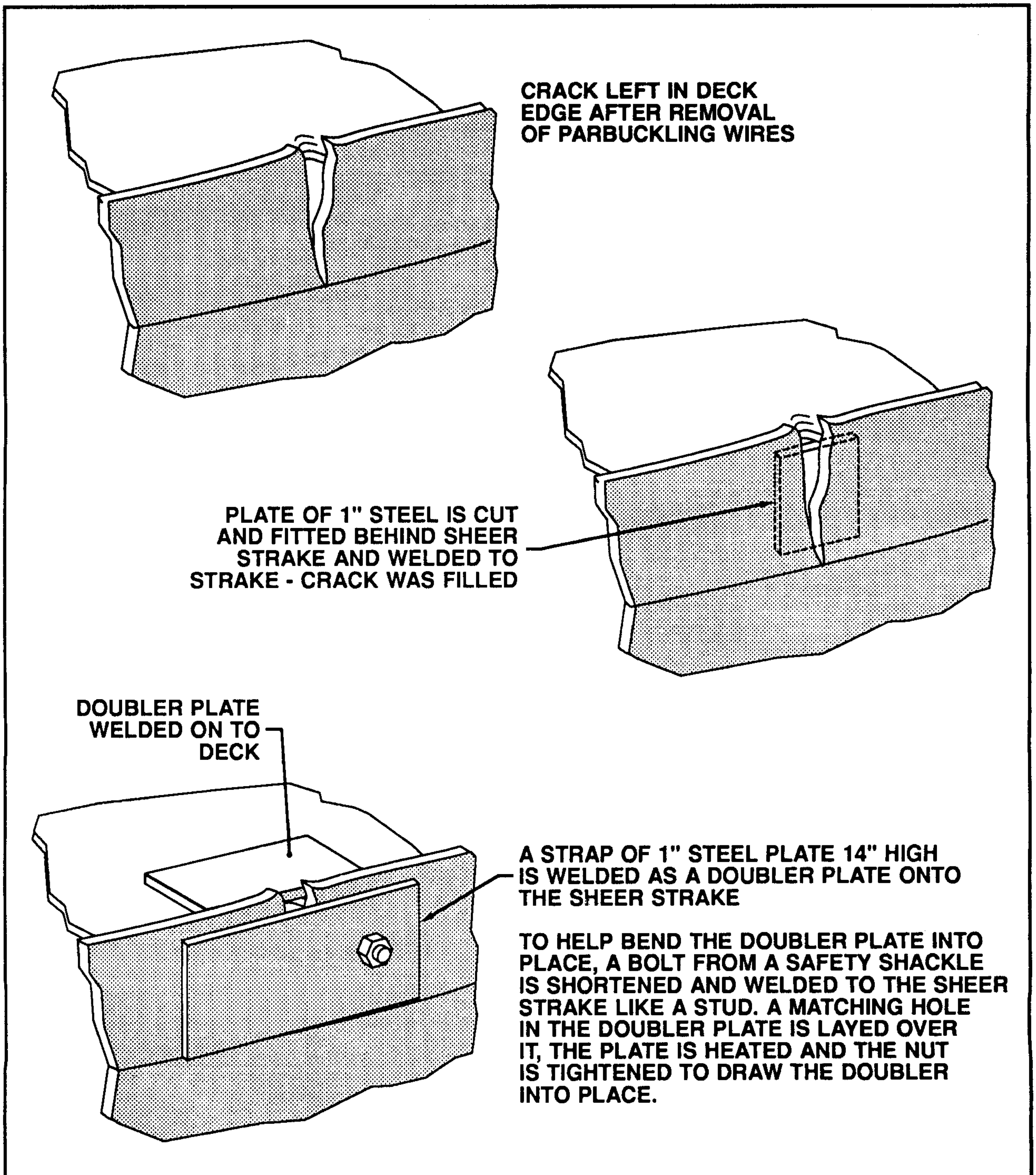


Figure 3-19. Repair of Cut in Sheer Strake.

3-4.6.3 Lifting the Wreck. The lifting operation commenced with the slack being taken out of the lift slings. The plan called for the lifting load to be countered by taking on ballast in the barge's forward tanks. The pumping operation was taking more time than anticipated and would require an additional 5 to 6 hours. The salvors decided to go ahead with the lift with the barge only partially ballasted. A watch was posted to call out the draft marks as the wreck was lifted. The lift trusses took the strain and the wreck rolled easily to no list. The lifting continued with the lift barge pulling herself down into the water as the wreck's displacement load was being transferred to the barge. When the wreck finally lifted off the bottom, the lift barge had less than a 6-inch clearance under its starboard skeg, shown in Figure 3-20.

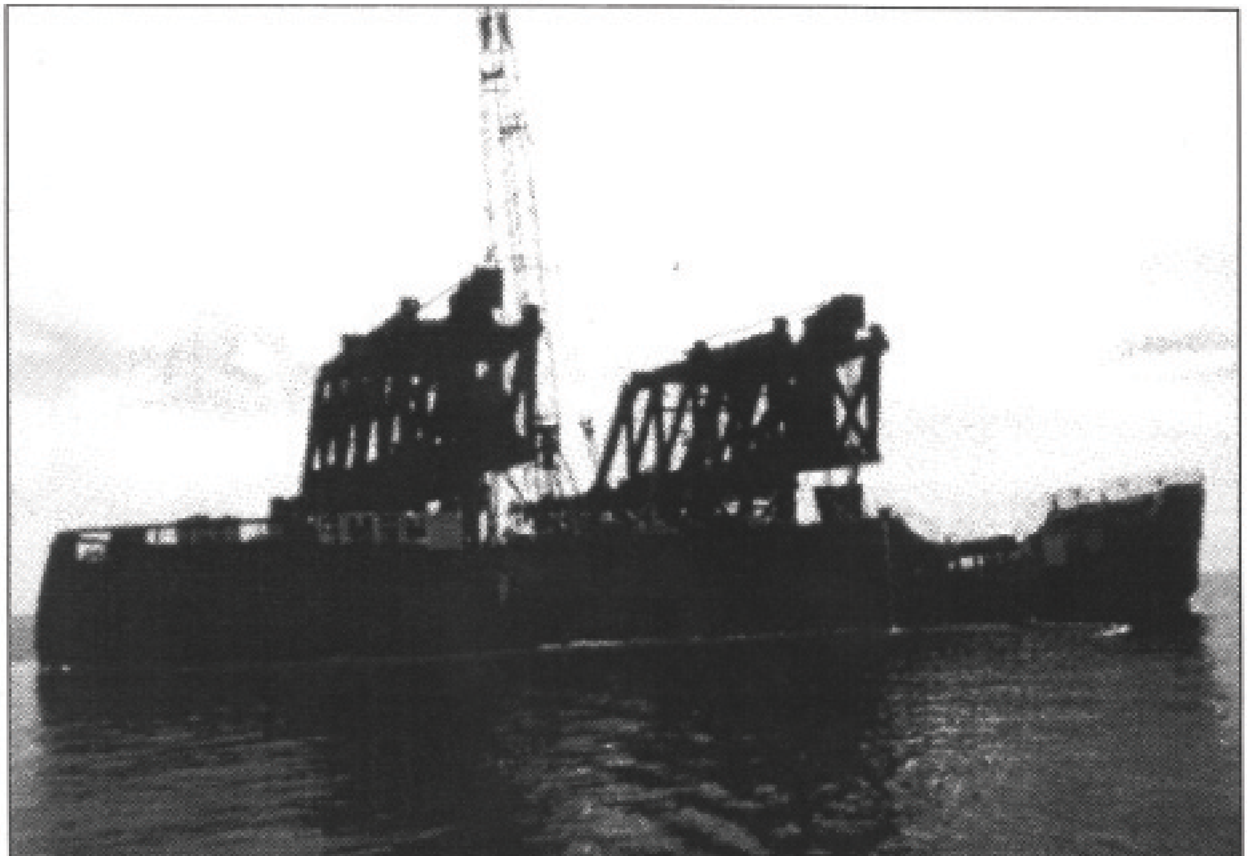


Figure 3-20. Wreck Being Lifted.

At that point the wreck was lifted clear of the bottom, the tug was made up *Chinese* to the starboard bow of the barge. Both of the mooring winches on the bow took a strain and the tug, barge, and MESQUITE were pulled off the rock shelf. During the passage off the rock shelf, MESQUITE took bottom twice but came off easily with the pull from the mooring winches.

3-4.6.4 Lowering. When MESQUITE was clear of the bottom, the tug proceeded to pull the tow to deep water by making way northeast, picking up the mooring anchors along the way. Once in deep water, the tug master opted to continue backing, and backed the tow 1½ miles to the lowering site (Figure 3-21).

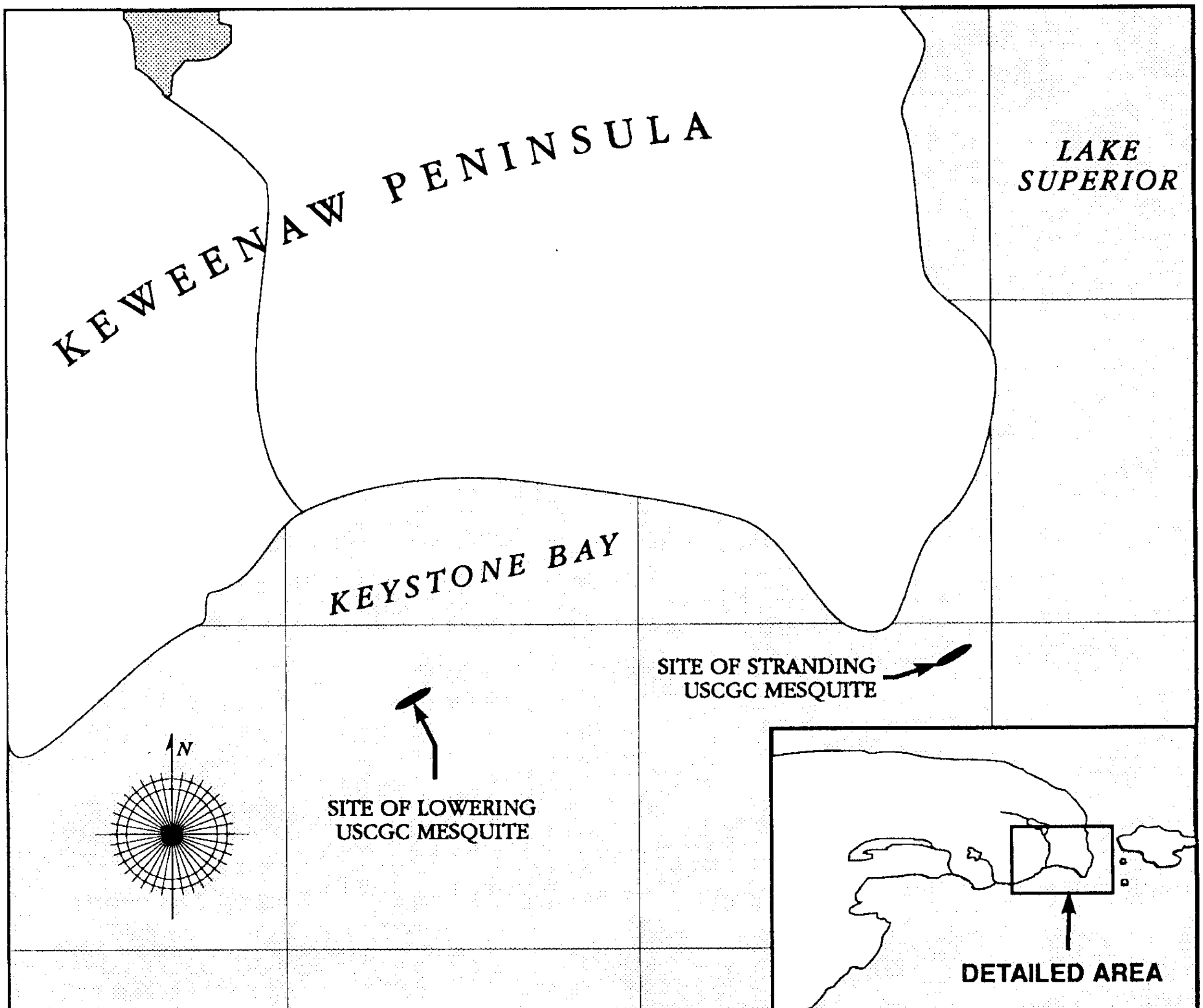


Figure 3-21. Lowering Site.

Once MESQUITE was positioned over the disposal site, the purchase wires were slacked and the hull started to sink. It took 10 minutes of paying out the lift wires to lower MESQUITE's deck to the water level. As soon as water began to pour over the deck, she quickly took on a dead weight of approximately 350 long tons as the buoyancy was lost. The lowering was straightforward and continued evenly until the bottom was reached at 117 feet with 75 feet clear over MESQUITE's davits.

The derigging operation had been well-planned, with pulling wires attached to the padeye pins in a ganged arrangement for removal from the surface with the barge crane, shown in Figure 3-22. A diver went down with the retrieval wire and derigged one forward, four port and four starboard pins in 20 minutes and was out of the water after only 29 minutes.

The superstructure and other expendable items taken from MESQUITE had been pushed overboard at the site, prior to moving MESQUITE (Figure 3-23).

3-4.7 Demobilization. After the wreck was detached from the barge, a 48-hour watch was posted on the site. This watch was a Coast Guard requirement to ensure that no pollution or other problems occur on the site. This period was used to secure the gear on the barge and prepare it for the tow back to home port. At the end of the 48-hour period, the Coast Guard was notified that no pollutants had leaked from the wreck and the salvage crew was released from the site.

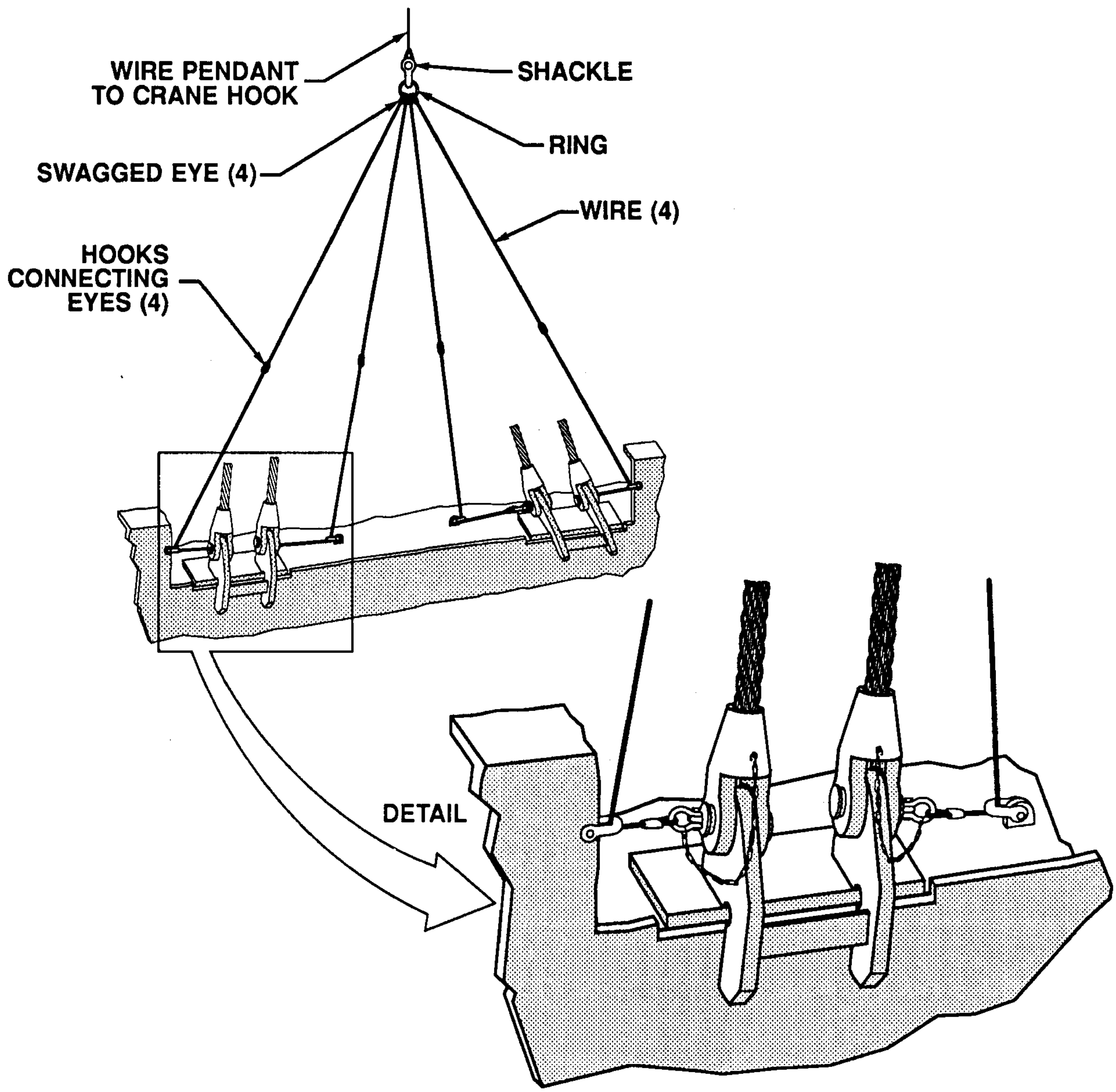


Figure 3-22. Derigging Arrangement.

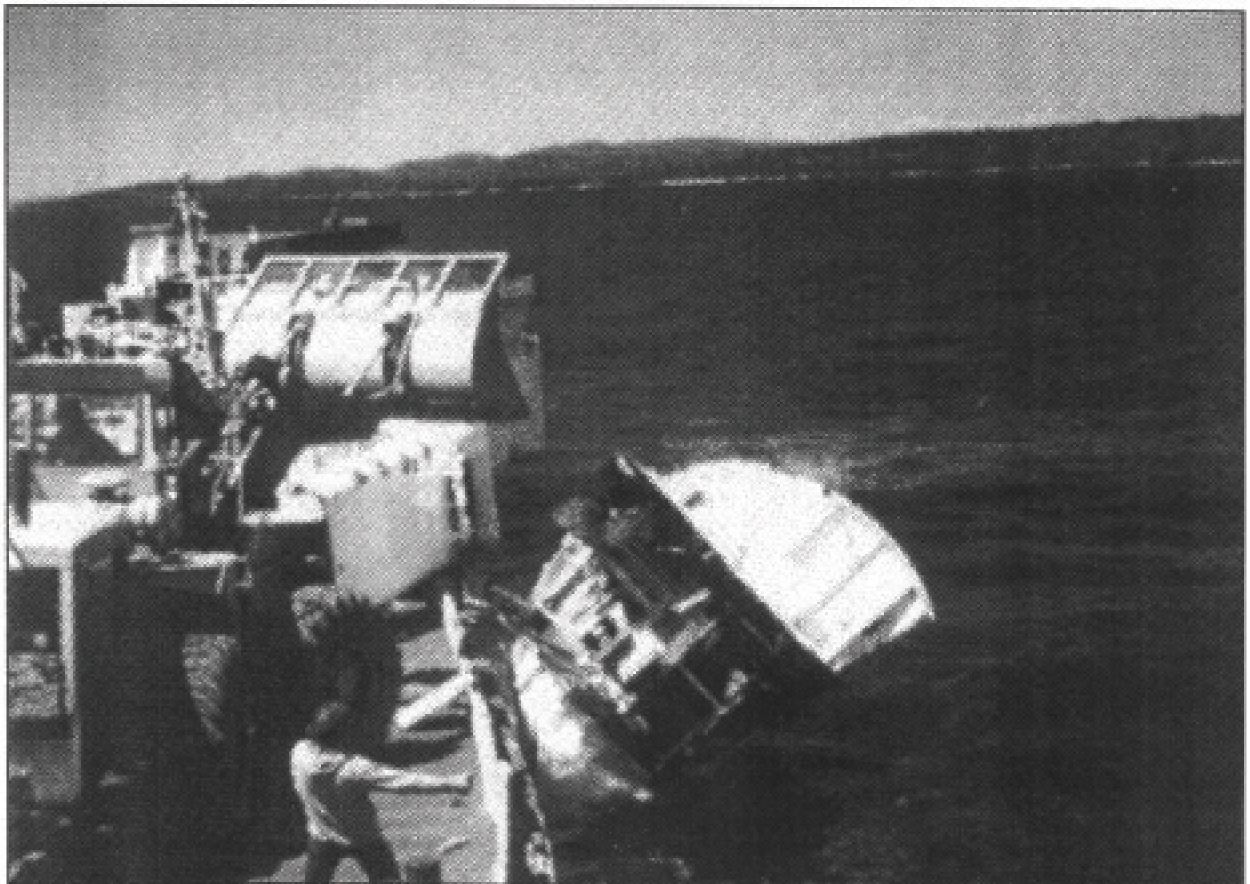


Figure 3-23. Superstructure Being Pushed Overboard at Disposal Site.

CHAPTER 4

ANALYSIS

4-1 PROBLEMS ENCOUNTERED AND THEIR SOLUTIONS

There was little unique or new about the problems encountered in the initial phase of the MESQUITE operation. The tough problems of a remote site, the need for rapid mobilization and deployment, and the near-Arctic weather reaffirmed the need for preparedness in salvage operations. The important principles emphasized by the MESQUITE operation include those discussed in the following paragraphs.

4-2 HEAVY LIFTS

4-2.1 Engineering Support. Heavy lifting operations require that full-time engineering support be provided from the initial concept planning stage through the final lift itself. The number of variables that can impact an operation of this type cannot be covered by part-time engineering support. Continuity of technical services throughout the process is mandatory.

4-2.2 Load Cells. Late in the planning and fabrication phase, it was recommended that a load cell be added to the rigging. However, logistics could not support a specially designed and manufactured strain gage in such short notice. Early design for any proposed heavy lift should include a means of direct and accurate load measurement.

4-3 WEATHER

The rapid deployment effort was significantly hampered by the weather as the initial attempt to refloat the MESQUITE was undertaken. Ice-breaking operations were undertaken by the Coast Guard to open the waterway for the support barge and tug that had to be reactivated from their traditional winter layups. The spuds of the barge posed the greatest difficulty, as they had frozen solid and took a great deal of ice chipping to enable them to be raised prior to moving the barge. Ultimately, the storm won and the operation had to be shut down for the winter.

4-4 AIR TRANSPORTATION

The importance of aircraft to marine salvage operations was made very clear in the initial response to MESQUITE's stranding. USCG helicopters and cargo aircraft were critical because they accelerated mobilization and demobilization to the remote tip of Keweenaw Peninsula.

4-5 ENVIRONMENTAL PERMITS

The myriad of agencies that must be dealt with to obtain the types of permits to undertake this type of operation can consume a tremendous number of manhours and potentially bring the effort to a standstill if they are not accomplished in a timely and forthright fashion. The Coast Guard was very professional and timely in their accomplishment of this critical part of the total MESQUITE effort, as seen in Appendices A-6 and A-9.

4-6 PLANNING AND FLEXIBILITY

Since there is no such thing as a job without problems, it makes perfect sense to include the inevitability of problems as part of the planning and design process. This job was an excellent example of providing proper planning for the lifting trusses, rigging components, powered equipment and material. When the unforseen problem occurred with the lift sling cutting through the shear strake the difficulty was quickly dealt with by application of ingenuity and available resources with little lost time.

4-7 PUBLIC RELATIONS

Michigan EPA, ACOE, local Tribal Councils, city and county governments, and state authorities were kept informed in a timely and open nature as to the salvage operations procedures, goals, timetable, and the antipollution procedures taken to protect the environment, seen in Figure A-7. This was an effect that was essential to the successful salvage.

APPENDIX A

MESSAGES AND LETTERS

O ZYB

FM COMCOGARD MLC LANT NEW YORK NY//V//

TO COMNAVSEASYSCOM WASHINGTON DC

CNO WASHINGTON DC//OP64//

INFO CCGDNINE CLEVELAND OH//O//

COMCOGARDGRU SAULT STE MARIE MI

USCGC KATMAI BAY

USCGC MOBILE BAY

USCGC ACACIA

COMDT COGARD WASHINGTON DC//G-CPM/G-N/G-ENE/G-CCS//

COMLANTAREA COGARD NEW YORK NY//A//

COGARD AIRSTA TRAVERSE CITY MI

COGARD MSO DULUTH MN

COGARD MLC SRD CLEVELAND OH

BT

UNCLAS //N16140//

SUBJ: DIVING/SALVAGE CONTRACTOR SERVICES; USCGC MESQUITE GROUNDING

A. COMCOGARDGRU SAULT STE MARIE MI 041325Z DEC 89 NOTAL

1. PER REF A AND PHONECON BETWEEN MLCLANT AND CAPT BARTHOLOMEW OF COMNAVSEASYSCOM ON 04DEC89, REQUEST NAVY SALVAGE SURVEY ASSETS BE PROVIDED IMMEDIATELY TO DETERMINE CONDITION AND RESOURCES REQUIRED TO SALVAGE USCGC MESQUITE.

2. MESQUITE PRESENTLY HOLED AND GROUNDED IN VICINITY OF KENEENAW PT ON LAKE SUPERIOR. BELIEVE ALL MAJOR WATER-TIGHT COMPARTMENTS ARE FLOODED TO WATERLINE BUT UNDERWATER SURVEY OF DAMAGE AND DETERMINATIONS BY PROFESSIONAL SALVAGE OFFICER IMPERATIVE BEFORE OFF-LOAD OR ANY OTHER SALVAGE ACTION INITIATED.

Figure A-1. Coast Guard Request for SUPSALV Services, 4 Dec 1989.

3. VESSEL BUILT DURING WWII AND IS OF SIMILAR CONSTRUCTION TO EXCGC BLACKTHORN SALVAGED BY COMNAVSEASYSCOM IN 1980.

4. MIPR BEING PROCESSED FOR $100K TO COMNAVSEASYSCOM TO PROVIDE NECESSARY RESOURCES TO EVALUATE PRESENT CONDITION OF MESQUITE AND PROVIDE DETAILED SALVAGE PLAN TO RAISE VESSEL.

5. COAST GUARD HH-3 AIR ASSETS ARE STAGED AT CG AIR STATION TRAVERSE CITY MI AND HOUGHTON MEMORIAL AIRPORT IN HANCOCK MI. COORDINATE ANY GENERAL LOGISTICS TO STAGING AREA WITH LCDR NICOLAUS AT 212-668-7270. CG AIR ASSETS WILL PROVIDE TRANSPORT OF NAVY CONTRACTOR PERSONNEL FROM STAGING AREA TO SITE. COORDINATE EXACT REQUIREMENTS FOR LOCAL STAGING OF NAVY EQUIPMENT/MATERIAL AND PERSONNEL LOGISTICS WITH LTJG RIZZO OR CWO CROPPER AT 906-635-3231/3240.

6. POC MLCLANT: LCDR NICOLAUS OR CDR EGAN AT 212-668-7270/6378. FAX: 212-668-6417.

7. POC COMNAVSEASYSCOM: CAPT BARTHOLOMEW AT 202-697-7403. FAX: 202-697-~~1003~~.7393

BT

NNNNNN

DRAFTED BY: ______________________ RELEASED BY: ______________________

E.A. NICOLAUS, LCDR D.M. EGAN, CDR

Figure A-1 (Continued). Coast Guard Request for SUPSALV Services, 4 Dec 1989.

FROM: SUPERVISOR OF SALVAGE REPRESENTATIVE

TO: OFFICER IN CHARGE

SUBJECT: SALVAGE OF USCG CUTTER MESQUITE (WLB-305)

ENCLOSURE: 1. DONJON SALVAGE RECOMMENDATION

1. Based on the results of the exterior hull survey conducted on the USCG Cutter MESQUITE on 10 December 1989, the initial plan to patch and pump the MESQUITE is no longer feasible. The damage resulting from the storm surge of 8 to 9 December has flattened the hull of the MESQUITE extensively, which has increased the structural side shell damage to an extent that is beyond any expectation of effectively patching the holes in the hull. The damage has included shattering of shell plate which has produced shards of metal and some 12" X 18" pieces of plate. The current heel of 19 degrees to port combined with the ice on deck, make the extensive work required on the hull unsafe.

2. I concur with the DONJON recommendation that the salvage effort be terminated at this time. A salvage effort in the spring time following the melt of the ice and snow should be evaluated based on a diving survey to be conducted at that time. I recommend an underwater video be used to document the condition of the exterior hull as it is prior to wintering. This documentation can be valuable in evaluating the ultimate disposition of the vessel.

3. Should a spring time salvage be considered I recommend a diving survey and cost estimates for the following methods be obtained either through the U.S. Navy Supervisor of Salvage or a private contractor.

a. Patch and pump

b. Displacement of flooding water by the installation of closed cell foam.

c. Sectioning of the hull with heavy lift craft removal

B. MARSH

LCDR, USN

Figure A-2. SUPSALV Standown letter to Coast Guard, 10 Dec 1989.

ADMINISTRATIVE MESSAGE

ROUTINE

R 211936Z DEC 89 ZYB PSN 689721M33

FM COMNAVSEASYSCOM WASHINGTON DC

TO CNO WASHINGTON DC
COMCOGARD MLC LANT NEW YORK NY//M/V//

INFO COMDT COGARD WASHINGTON DC//G-TGC//
COMLANTAREA COGARD NEW YORK NY//A// COMCOGARDGRU SAULT STE MARIE MI
CCGDNINE CLEVELAND OH//O//

BT
UNCLAS //N04700//

SUBJ: SALVAGE ASSISTANCE FOR USCGC MESQUITE

A. CNO WASHINGTON DC 071849Z DEC 89
B. COMNAVSEASYSCOM WASHINGTON DC 122223Z DEC 89
C. PHONECON NAVSEA (00C20) LCDR MARSH/ MLC LANT LCDR NICOLAUS OF 18 DEC 89

1. REF A DIRECTED ORIG TO PROVIDE SALVAGE ASSISTANCE TO USCGC MESQUITE. DUE TO SUBSEQUENT STORM DAMAGE REF B RECOMMENDED TERMINATION OF SALVOPS UNTIL SPRING.

2. INITIAL FUNDING FOR SURVEY/SALVAGE PLAN PREPARATION WAS EXPENDED DURING ACTUAL SALVAGE ATTEMPT FROM 4-14 DEC. REQUEST ADDITIONAL $100K TO COVER ALL COST TO DATE.

3. AS REQUESTED REF C. ORIG WILL PROVIDE ESTIMATE FOR SALVAGE OF MESQUITE NEXT SPRING VIA SEPCOR.

4. REQUEST COMNAVSEASYSCOM WASHINGTON DC BE INCLUDED AS INFO ADDEE FOR ALL SITREPS THIS SUBJ.
BT

DLVR: TRAFFIC CHECKER (01) .. INFO
00C20 (1) .. ORIG FOR COMNAVSEASYSCOM WA!
09B13 (1) /13/

-000/COPIES: 0002

689721 7021/356 01 OF 01 M4 05
CSN: RXSA0580

211934Z DEC 89
.SYSCOM WASHINGTON DC

Figure A-3. SUPSALV Message to Coast Guard Recommending Shutdown and Money for Salvage Proposals, 21 Dec 1989.

ADMINISTRATIVE MESSAGE

PRIORITY

P 231841Z DEC 89 ZYB PSN 700886M29

FM COMCOGARD MLC LANT NEW YORK NY//M/V//

TO COMDT COGARD WASHINGTON DC//G-TGC//

INFO COMNAVSEASYSCOM WASHINGTON DC
CNO WASHINGTON DC//OP64//
COGDNINE CLEVELAND OHIO//O//
COMCOGARDGRU SAULT STE MARIE MI
COMLANTAREA COGARD NEW YORK NY//A//
COGARD MLO SRD CLEVELAND OH

BT
UNCLAS //N16140//

SUBJ: DIVING SALVAGE CONTRACTOR SERVICES, USCGC MESQUITE GROUNDING

A. COMNAVSEASYSCOM WASHINGTON DC 211936Z DEC 89 NOTAL

1. PER REF A, REQUEST IMMEDIATE FUNDING IN AMOUNT OF $400K TO REIMBURSE MLCA FOR CSO INITIAL RESPONSE PROCUREMENTS ($200K) AND NAVSEA MIRR ($200) FOR USCGC MESQUITE SALVAGE.

2. MESQUITE REMAINS HOLED AND GROUNDED IN VICINITY OF KEWEENAW PT ON LAKE SUPERIOR. REQUESTED FUNDING COVERS INITIAL HULL AND MATERIAL SURVEY COSTS. SALVAGE EQUIPMENT, BARGES, EQUIPMENT TO REMOVE FUEL FROM MESQUITE AND OTHER ASSOCIATED LOGISTICS REQUIREMENTS FUTURE HEADQUARTERS FUNDING WILL BE REQUIRED FOR SALVAGE IN SPRING 90. ANTICIPATED COST ESTIMATES FOR SALVAGE TO BE PROVIDED TO YOU FROM COMNAVSEASYSCOM VIA MLCA JAN 90.

3. POC MLCLANT: LCDR NICOLAUS OR CDR EGAN AT 212-668-7230/6378. FAX 212-668-6417.
BT

Figure A-4. SUPSALV Message to Coast Guard Recommending Shutdown and Requesting Oil and Contaminate Removal, 23 Dec 1989.

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, DC 20362-5101

4740
OPR: 00C20
Ser: 00C2/0144
14 March 1990

From: Commander, Naval Sea Systems Command
To: Commander, Coast Guard Maintenance and Logistics Command, Atlantic

Subj: WRECK REMOVAL OF USCGC MESQUITE (WLB 305)

Ref: (a) PHONCON COMMANDER MLC ATLANTIC CDR EGAN/COMNAVSEASYSCOM (Code 00C) CDR MARSH of 2 Feb 90

Encl: (1) Cost Estimate Synopsis for Lift and Sink Option
(2) Barge 45 Salvage Operations Buffalo, N.Y.

1. As discussed in reference (a) a cost estimate for an alternative wreck removal method is provided as enclosure (1). This alternative method entails rental of a barge, installation of truss members and a deadweight lift of the MESQUITE hull for transport to a preselected site for sinking. The disposal site designated by the appropriate authority should be in water that is 120 to 130 feet deep, which will allow disconnecting of the load underwater without excessive cost due to depth differential pay for the divers.

2. The stages and time and cost estimates are detailed in enclosure (1). The abbreviated time on-scene compared to the time required for sectioning in place reduces the risk of weather delaying completion of the wreck removal. However, failure of the hull girder during the lift could necessitate transport in sections to an underwater disposal site. Therefore, a contingency is included in the estimate; after detailed resurvey in the summer, a more definitive cost proposal will be provided.

3. I have included as enclosure (2), a copy of a report on the salvage of a barge from the Niagara River, which describes the lifting truss arrangement similar to that proposed for this operation.

4. The same time frames for the project are recommended to take advantage of the best weather window. Again funding should be provided via Military Interdepartmental Purchase Request at least 60 days in advance of the operation. My point of contact remains CDR Marsh (C) 202-697-7403 (A/V) 227-7403.

C. A. BARTHOLOMEW
Director of Ocean Engineering
Supervisor of Salvage and Diving, USN

Copy to: (w/o enclosures)
COMDT COGARD
CCGDNINE Cleveland OH

Figure A-5. SUPSALV Letter to Coast Guard with Cost Estimates for Alternative Wreck Removal Plan, 14 Mar 1990.

COST ESTIMATE SYNOPSIS

WORK/TASK DESCRIPTION	TIME DAYS	DAYRATE LABOR & MATERIALS	SUBTOTAL
Resurvey	4	$6.25K	$25K
Mobilize 5000-ton displacement barge from the Gulf (if no asset locally available at the time delivery order is placed)	10	$8K	$80K
Outfit barge with trusses, mooring legs and living quarters	30	$8.33K	$250K
Transit New Jersey to Keweenaw PT, 2500 miles in 16 days	16	$10.9K	$175K
Rig MESQUITE, lift, disposal at site (within 1-2 miles of present position)	8 Flat $15K Slings Travel/Per Diem $25K	$17K	$176K
Demobilize to New Jersey	16	$10.9K	$175K
Remove equipment from barge and transit to Gulf			$200K
Report/Insurance			$100K
Contingency 27%			$319K
			$1,500K

Figure A-5 Continued). SUPSALV Letter to Coast Guard with Cost Estimates for Alternative Wreck Removal Plan, 14 Mar 1990.

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, DC 20362-5101

IN REPLY REFER TO
4740
OPR: 00C21
Ser: 00C2/2174
19 April 1990

From: Commander, Naval Sea Systems Command
To: Commander, Coast Guard Maintenance and Logistics Command, Atlantic

Subj: WRECK REMOVAL OF USCGC MESQUITE (WLB-305)

Ref: (a) PHONCON COMCOGARD MLC LANT LCDR Nicolaus/ COMNAVSEASYSCOM (Code 00C) CDR Marsh of 9 Apr 90

(b) MIPR DTCG-89-90-F-000043 Amendment II of 4 Apr 90

Encl: (1) Estimated Time Table for MESQUITE Wreck Removal

1. As discussed in reference (a) an estimated time table for the wreck removal is provided as enclosure (1). This method entails lease of a barge, installation of truss members, and a deadweight lift of the MESQUITE hull for transport to a preselected site for sinking. Upon receipt of funding via reference (b) a barge was placed on retainer and is now being rigged with the truss members and winches to accomplish the lift and transport of the hulk.

2. To finalize the truss load out a resurvey of the hulk is planned as noted in the time table. In the interest of saving money, request the Coast Guard provide transport from the Houghton/Hancock area to the wreck site during the week of 21 May.

3. The initial proposal for a lift and sink method of removal requested the USCG designate the disposal site. Implicit in the choice of a site is the requirement to obtain the appropriate permits for open water disposal of the vessel. The permission required from the state of Michigan, Environmental Protection Agency, and the Canadian government should authorize the disposal in an area with a water depth of 120 to 130 feet. This will allow the disconnecting of the lift rigging in a slacked condition once the hulk is placed on the bottom.

4. The same operational task organization is recommended with CDR Marsh serving as the Salvage Officer reporting directly to the Coast Guard MLC Liaison Officer. A USCG detail, consisting of one officer and three to five enlisted personnel, should be assigned as liaison and salvage support throughout the duration of the on-site work. The officer assigned should be familiar with the 180-foot buoy tender class. His detail should be able to take custody and make on-scene decisions concerning the salvage of equipment and personal belongings from the vessel.

5. The salvage effort will include extensive efforts to mitigate

Figure A-6. SUPSALV Letter to Coast Guard with Permit Requirements, 19 Apr 1990.

Subj: WRECK REMOVAL OF USCGC MESQUITE (WLB-305)

the environmental impact through the use of floating booms, vacuum equipment, and removal of any pollutant that is reasonably accessable. Safety of the salvage crew will remain the controlling factor in the effort to recover equipment and prevent pollution.

6. Our point of contact remains CDR Bert Marsh on commercial number 202-697-7403 or AUTOVON 227-7403.

R. C. ASHER
Acting Director of Ocean Engineering
Supervisor of Salvage and Diving

Copy to:
COMDT COGARD (G-ELM)
CCGDNINE Cleveland OH (o)
COMCOGARDGRU Sault Ste Marie MI

Figure A-6 (Continued). SUPSALV Letter to Coast Guard with Permit Requirements, 19 Apr 1990.

TIME TABLE
FOR MESQUITE SALVAGE

	TASK	DURATION	FROM	TO
1)	Lease Lift Barge with 5000 LT displacement	4 months	1 Apr	31 July
2)	USCG obtain permits for disposal	1 1/2 months	12 Apr	28 May
3)	Modify Barge place truss/winch accommodations trailer on deck	1 month	20 Apr	20 May
4)	Resurvey MESQUITE by SUPSALV Rep and DONJON	5 days	21 May	25 May
5)	Transport Barge from New Jersey to Michigan	20 days	28 May	16 June
6)	Rig the lifting pennants on MESQUITE	12 days	17 June	28 June

Enclosure (1)

Figure A-6 (Continued). SUPSALV Letter to Coast Guard with Permit Requirements, 19 Apr 1990.

Region I, Frank Opolka
Region I, Ron Raisenin, SWQD
Scott Peters, Michigan Museum - Exhibits

Michigan Bottomlands Preserve Council
c/o Steve Harrington
P.O. Box 275
Mason MI 48854

Keweenaw Bay Indian Community
Keweenaw Bay Tribal Center
Baraga MI 49908
ATTN: Howard Reynolds

U.S. Coast Guard
Ship Repair Detachment
1240 E. Ninth Street #2171
Cleveland OH 44199-2060
ATTN: Lt. Allan Coates

Mr. Richard Lautz
Keweenaw Tourism Council
P.O. Box 336
Houghton, MI 49931

Commander Dennis Egan
Maintenance and Logistics Command-
Atlantic (vr)
Governor's Island
New York, NY 10004-5000

Pete Ratu
DMB- Federal Surplus

Figure A-7. Attendees at Salvage Debrief (Houghton), 3 May 1990.

EX-MESQUITE SALVAGE PLAN
OUTLINE

Phase I - The EX-MESQUITE will be "deadlifted" from her present stranded position utilizing two matched cantilevered truss/winch combinations secured to the deck of a modified pipe laying barge. Each truss/winch will be attached through running blocks to four lifting slings, which will be directly attached to the EX-MESQUITE. The rigging will consist of a total of eight slings (four per truss/winch) distributing the load as equally as possible.

From the initial arrival on scene of the salvage barge, an 18 inch oil boom will be deployed to surround the site and prevent release of any residential oil disturbed during the rigging and scrap removal portions of Phase I. Pollution control assistance from outside agencies is not anticipated, any emergency requirements will be coordinated through the U.S. Coast Guard.

Additionally, Phase I will include the removal of paint, thinner, solvents, and any other pollutants from all accessible spaces to eliminate them as possible sources of pollution.

In an effort to lighten the EX-MESQUITE, topside deck equipment and superstructure will be removed. Additionally, some of the tank capacity of EX-MESQUITE will be rigged to receive low pressure air to displace entrained water and provide some buoyance to the hull. A vacuum system with a 1500 gallon capacity receiving tank will be employed to strip floating oil from interior compartments. This portable system can be pumped to waste oil tanks to allow continued cleaning beyond the initial 1500 gallons.

Phase II - Once lifted, just clear of the bottom, the EX-MESQUITE will be "hogged" into the stern of the lifting barge. The barge will be towed around the point past Keystone harbor along the 100 foot curve with the intention of reaching the primary site at Bete Griese Bay.

Phase III - Once at the proposed site, the EX-MESQUITE will be lowered to the bottom. The eight lifting slings will be detached by divers once the load is slacked. U.S. Coast Guard representatives, a tending vessel with oil boom, and the lift barge, will remain in the immediate area for a period of 48 hours after the EX-MESQUITE is lowered to the bottom. This will provide an immediate response to any pollution release.

Phase IV - The EX-MESQUITE's location, condition, and the depth of water above the vessel will be recorded by the U.S. Coast Guard to ensure appropriate navigational chart notation of the wreck site is documented. Additionally, the stranding location on Kennenaw Point will be swept to remove any significant hazard to navigation.

Figure A-8. Salvage Plan (00C – NRWM), 16 May 1990.

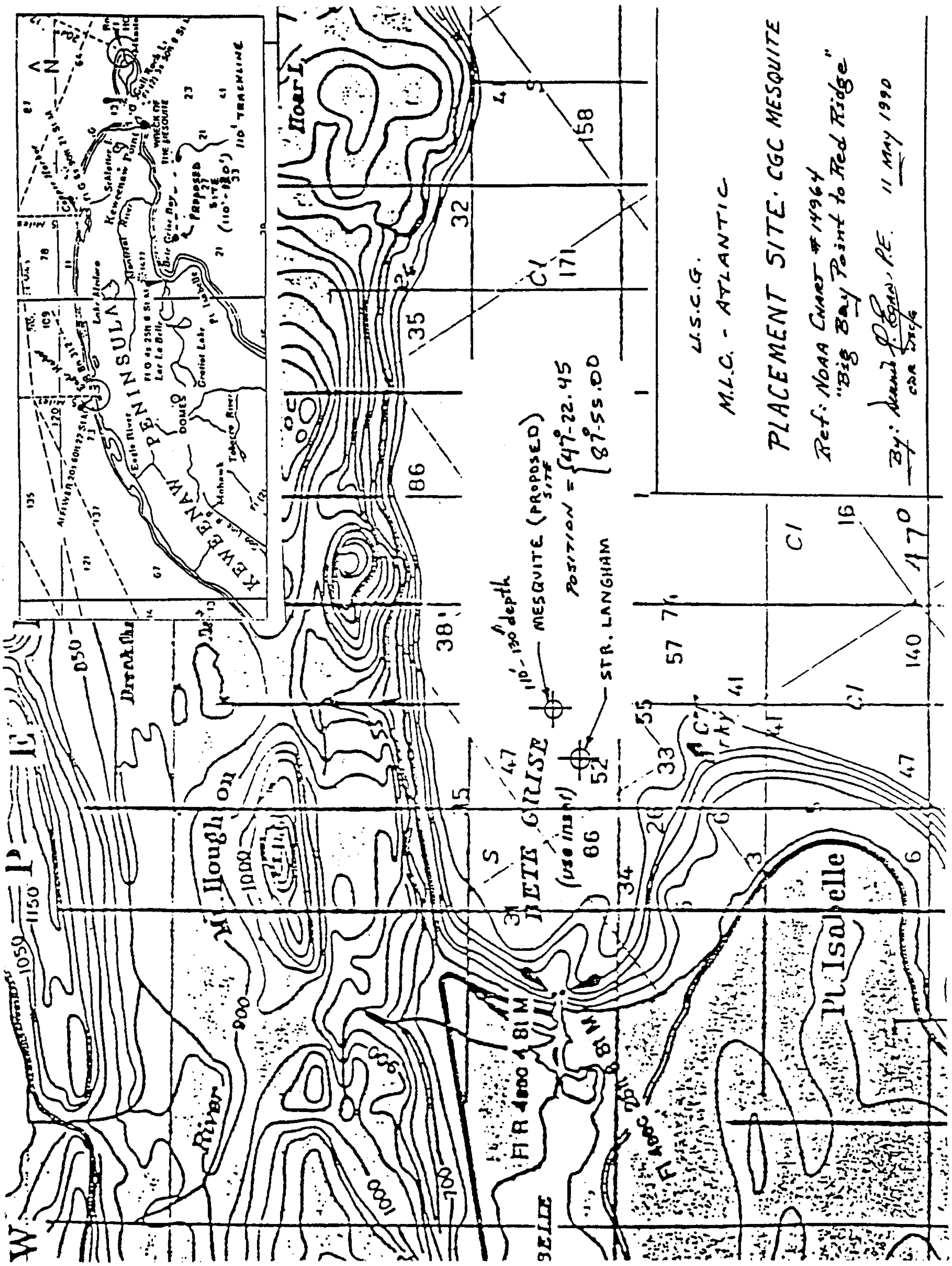


Figure A-8 (Continued). Salvage Plan (00C – NRWM), 16 May 1990.

Proposed Site for Deposition of Mesquite
04/30/90

It is proposed that the Mesquite be sank within the confines of Bete Gries, Lake Superior. This area is ideal for a number of reasons and should meet with the approval of all interested parties.

The proposed site, Latitude 47 22.45 and Longitude 87 55.00 is approximately 0.5 nautical miles from the wreck of the Steamer Langham and is approximately 120 feet of water. The Langham sits upright in 100 feet of water. The Langham is the only known wreck in this area.

The depth of the proposed site is necessary to protect the wreck from damage by the winter ice pack. Pressure ridges in the ice can scour as deep as 50 to 70 feet. The safe sport diving limit is 130 feet for a certified diver established by most certifying agencies such a PADI. Note that a non-certified diver cannot purchase air fills at commercial dive establishments.

The proposed site is approximately 2.2 nautical miles from the entrance to Lac LaBelle thus providing easy access and more important close shelter in case of bad weather. Proximity to the Langham also provides the possibility that divers over the Langham could provide ready assistance to divers on the Mesquite and vice-versa

The bottom is primarily sand and is known by the commercial fisherman as a mud flat and not desirable for fishing.

As the Langham has survived 70 years in good shape with little deposition of sediments or interference to shipping. It is reasonable to assume the proposed site for the Mesquite is equivalent. There is some evidence of currents around the Langham (scouring of sand near the rudder) but the sediment movement is minimal.

The site has been used in the recent past as an sheltered anchorage for ships waiting out the weather. This could pose a threat to the wrecks. It is proposed that information about the position of both wrecks be made available to mariners as the Langham currently needs this protection.

The proposed site will make an excellent safe dive site for both intermediate and advanced divers.

Figure A-8 (Continued). Salvage Plan (00C – NRWM), 16 May 1990.

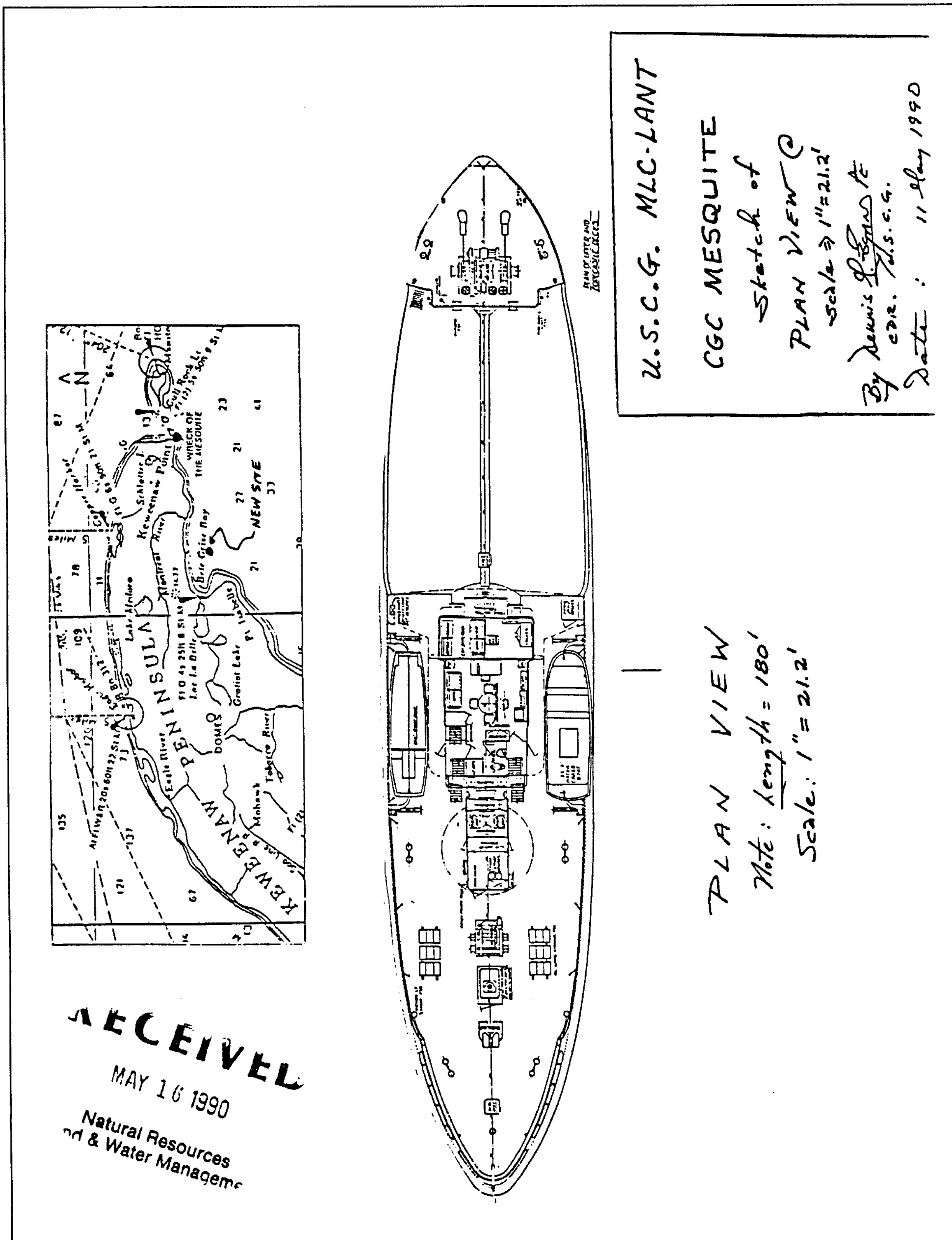


Figure A-8 (Continued). Salvage Plan (00C – NRWM), 16 May 1990.

Land and Water Management Supervisor
P.O. Box 30028
Lansing, Michigan 48909 -9258
(517) 373-1950

File No. 90-1-52G

Date: May 17, 1990

PUBLIC NOTICE

Maintenance & Logistics Command (vr), Building 400, Sec M, Room 300M, Governors Island, New York, New York 10004, has applied to this office for a permit under authority of Act 247, Public Act of 1955, as amended, to intentionally sink the decommissioned U.S. Coast Guard Cutter "Mesquite" in 110'-130' of water in Lake Superior near the Keweenaw Peninsula. The commerical marine salvage company under contract with the U.S. Navy will perform all necessary work with the guidance of the U.S. Navy Supervisor of Salvage. This work will include removal of all lube oil, paint, thinner, solvents, and any other pollutants from accessible spaces. Also, a vacuum system with a 1,500 gallon capacity receiving tank will be used to strip floating oil and fuel from the interior compartments. The Coast Guard estimates approximately 200 gallons of fuel remain on the vessel after the initial removal in December 1989. The contractor, with direction from the Coast Guard, will remove various pieces of equipment, barrels, buoys, rigging, cables, masts, etc. that the Coast Guard wishes to recover, that will eliminate pollution sources, and that may entangle divers. The ship will be lifted by a barge and moved to the selected drop site in Bete Grise Bay. It will then be lowered to the bottom in depths deep enough to avoid fish spawning reefs. The contractor will remain on-site for 48 hours to respond to any pollution release from the vessel. Project located in T58N, R29W, Grant Township, Keweenaw County, Michigan, in accordance with plans attached to this notice.

THIS NOTICE IS NOT A PERMIT

When an application is received for a permit to authorize work in or over Great Lakes Waters of the State of Michigan, the GREAT LAKES SUBMERGED LANDS ACT provides that copies of the application shall be mailed to the Department of Public Health, Clerks of the County, City, Village and Township, and Drain Commissioner of the County in which the project or body of water affected is located and to adjacent riparian owners.

Those persons wishing to make comments on the proposed project shall furnish this office with their comments in writing no later than 20 days from the date of mailing this notice. Unless a written objection is filed with the Department within 20 days after the mailing of this notice, the Department may take action to grant the application. The determination as to whether a permit will be issued or a public hearing held will be based on an evaluation of all relevant factors including the effect of the proposed work on the public trust or interest, including navigation, fish and wildlife, pollution, and the general public interest. Written comments on these factors will be made part of the file and will be considered in determining if it is in the public interest to grant a permit. Objections must be factual and specific and fully describe the reasons upon which any objection is founded.

c: LWMD, Region I
Great Lakes Section
Dist. 1 Fisheries
Dist. 1 Wildlife
Recreation Div.
Dist. 1 Law
Marine Safety
SWQD, Red Evans
Public Health

History Division
Soil Conservation Dist.
Keweenaw County Clerk
Grant Township Clerk
Keweenaw Co. Drain Comm.
USCOE USFWS
U.S. EPA MUCC
National Marine Fisheries

Maintenance & Logistics Command, applicant
Naval Sea Systems Command
see attached list

Figure A-9. Application for Disposal Permit, State of Michigan, 17 May 1990.

APPLICATION FOR PERMIT

FOR OFFICIAL USE

Corps of Engineers Department of the Army	Corps File No.	State of Michigan Department of Natural Resources Land Resource Programs	DNR File No. 90-1-526

PLEASE READ INSTRUCTIONS *BEFORE* FILLING OUT THIS APPLICATION — PRINT OR TYPE

APPLICANT (individual or corporate name)			AGENT-CONTRACTOR (firm name, if known)		
Maintenance & Logistics Command (vr)			NAVAL SEA SYSTEMS COMMAND		
ADDRESS: BLDG 400 SEC M RM 300M			ADDRESS: US NAVY SUPERVISOR OF SALVAGE		
CITY: GOVERNORS ISLAND, NY,	STATE: NY	ZIP: 10004	CITY: WASHINGTON,	STATE: D.C.	ZIP: 20362-5101
TELEPHONE (Work) (212)668-6409	SOC. SECURITY or FED. ID. No: N/A		TELEPHONE: (202) 697-7403 (ATTN: CDR MARSH)		

2. If applicant is not owner of the property where the proposed activity will be conducted, provide name and address of owner and include letter of authorization from owner:

OWNER'S NAME	MAILING ADDRESS	CITY	STATE	ZIP
N/A				

3. PROJECT LOCATION

Street/Road	Village/City	BODY OF WATER (Lake, stream, creek, pond or drain)
BETE GRISE BAY - KEWEENAW PENNISULA		LAKE SUPERIOR

County: Keweenaw Township: Grant Town: 58N Range: 31W Section(s) Subdivision or Plat Lot No. Private Claim

COORDINATES 47° - 22.45'N, 87° - 55.00'W; DEPTH 110'-130'

4. PROJECT INFORMATION

(a) Describe proposed activity

MOVE WRECK OF CGC MESQUITE FROM PRESENT LOCATION OFF KEWEENAW POINT TO DESIGNATED SITE IN BETE GRISE BAY TO PROVIDE RECREATIONAL DIVING ATTRACTION.

PLANS AS ATTACHED

(b) Attach drawings of the proposed activity prepared in accordance with the *DRAWING REQUIREMENTS* on pages 1 & 2 of Instructions

(c) Check appropriate Project Type (below) — See Samples of Drawings Required

1) [X] Dredging, Filling, Draining or Construction Work in Inland Lakes or Streams, Great Lakes Bottomlands or Wetland Areas .... 1, 2, 3, 4, or 5
2) [ ] Work in Riverine Flood Plain ....(See SPECIAL INSTRUCTIONS, Section 1, on back of this form) 6
3) [ ] New or Replacement Bridge or Culvert ..(See SPECIAL INSTRUCTIONS, Section 2, on back of this form) ...... 7, 8, 9 and 10
4) [ ] Dam Construction or Reconstruction .....(See SPECIAL INSTRUCTIONS, Section 3, on back of this form) 11

NOTE: If boxes 2, 3 and/or 4, above, are checked provide appropriate additional information on the back under "SPECIAL INSTRUCTIONS"

(d) PROPOSED USE: (Check appropriate box) 1. [X] Public; [ ] Private; [ ] Commercial; [ ] Other (specify) ____
2. Will the project site be served by a new on-site Sewage Disposal System (Septic Tank) [ ] No [ ] Yes

(e) Location of Source of Fill if more the 50 cubic yards are required for other than commercial source:

County	Township	Town	Range	Section	¼ Section
N/A					

Further Description (provide vicinity map of Source Site (Sample Drawing 5) if more than 50 cubic yards and source is other than commercial)

(f) Dredge Spoils Disposal Location Site (if required)

County	Township	Town	Range	Section	¼ Section
N/A					

Further Description (provide vicinity map for Disposal Site (Sample Drawing 3))

RECEIVED
MAY 16 1990
Natural Resources
Land & Water Management

(g) Describe any project alternatives considered.

RAISE AND REPAIR VESSEL; DISMANTLE AND SCRAP WRECK ON SITE

If fill is required, is project water dependent? [ ] No [ ] Yes N/A

(h) Date activity will commence if permit is issued 16 JUNE 1990 ; be completed 15 JULY 1990

(i) Is any portion of the requested project now complete? [X] No [ ] Yes. If yes, identify the completed portion on the drawings you submit and give the date activity was completed. ____

DO NOT WRITE IN THIS SPACE — FOR CASHIER USE ONLY

APPLICATION CONTINUED ON REVERSE SIDE.

REMOVE INSTRUCTIONS BEFORE MAILING — PR 2731 Rev. 9-8

DO NOT REMOVE THIS STUB

APPLICATION FOR PERMIT
LAND RESOURCE PROGRAMS

(APPLICANT COMPLETE THE FOLLOWING)

NAME OF REMITTOR: COMMANDER, MAINTENANCE & LOGISTICS COMMAND(vr)

ADDRESS: BLDG 400 SEC M, RM 300M GOVERNORS ISLAND, NY, NY 10004-5000

[ ] 1972 P.A. 346 Permit Application Fee [ ] 1979 P.A. 203 Permit Application Fee

NOTE: U.S. GOV. FEDERAL AGENCY FEE WAIVER REQUESTED

Figure A-9 (Continued). Application for Disposal Permit, State of Michigan, 17 May 1990.

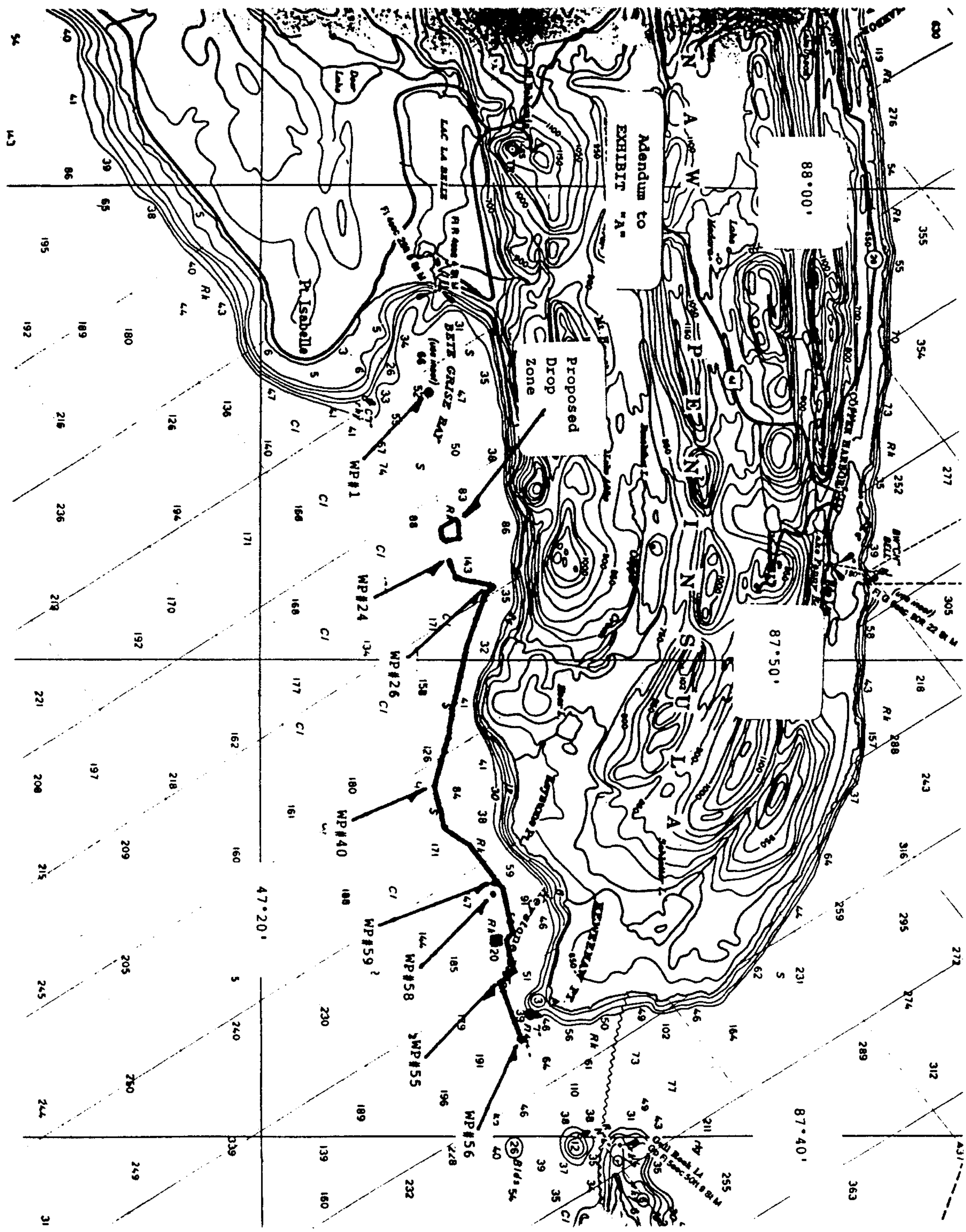


Figure A-9 (Continued). Application for Disposal Permit, State of Michigan, 17 May 1990.

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON DC 20362-5101

IN REPLY REFER TO

4740
OPR: 00C2
Ser: 00C2/2262
7 June 1990

From: Commander, Naval Sea Systems Command
To: Commander, Coast Guard Maintenance and Logistics Command, Atlantic

Subj: WRECK REMOVAL OF EX-MESQUITE (WLB 305)

Ref: (a) COMNAVSEASYSCOM ltr 4740 Ser 00C2/0144 of 14 Mar 90

Encl: (1) Revised Salvage Plan
(2) Updated Cost Estimate
(3) Schedule On-Scene

1. As stated in reference (a), a resurvey of the EX-MESQUITE hulk was conducted this spring by NAVSEA and salvage contractor personnel. The results of the survey have enabled us to finalize the salvage plan and revisit our prior estimates of cost and schedule. Enclosures (1) through (3) provide updates to the salvage plan, cost, and schedule respectively.

2. The increased list of the vessel (approximately thirty degrees), plus additional damage in the vicinity of the starboard sheer strake below the buoy deck gunwale necessitate significant changes to the salvage plan, most notably wreck attachment methods and parbuckling of the entire hulk. After first removing the deck equipment, an alternative method of attachment forward, with one padeye set into a large plate welded directly to the buoy deck, will be utilized to eliminate the multiple sling arrangement and provide a direct method of attachment of the lifting truss running block to the EX-MESQUITE. This is a much safer rigging arrangement. A similar single point lift aft is not feasible due to the weakness of the deck structure aft, but we will double each of the 3 1/2 inch slings to provide a greater factor of safety should the hulk render in trim or list during the lift or lowering phases. This change in lifting attachments will delay departure of the lifting barge from Newark, New Jersey until the 14th or 15th of June. Even more significantly, the drastic increase in list to 30 degrees will require the additional effort of parbuckling the vessel to something less than 5 degrees. Personnel safety and efficiency concerns plus accessibility of the port side aft to weld padeyes dictate this requirement.

3. Predicated upon changes in the scope of work required to safely lift the hulk with minimum acceptable risk, revised cost and schedule estimates have been prepared. The changes in scope include:

Figure A-10. SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

a. An increase in the cost to modify the lifting barge to accept the truss/winch combinations and to safely withstand the anticipated lift stress. The original estimate was provided prior to lease of a specific barge and was based on our best knowledge at the time. Current projected costs for the modifications are based on work completed to date and detailed engineering drawings developed specifically for this project.

b. An increase in the estimated time on scene to parbuckle, cannibalize and sanitize the wreck, prepare and conduct the lift, and to transport, deposit and baby-sit the hulk. Parbuckling must precede the weight/salvage removal and lift rigging phases of the salvage plan. The emergent requirement to remain at the disposal site for a period of 48 hours after the hulk is lowered to the lake bottom was not included in the initial cost estimate.

4. As shown in enclosure (2), the increase in cost of the salvage has consumed the reference (a) proposed contingency. We request therefore, that the initial Military Interdepartmental Purchase Request (MIPR) be amended by $500K to provide full funding for the predicted end cost of the operation with a 15 percent contingency. Should the permit process require a delay or should severe weather or other unforeseen events impact operations, total daily costs will be tracked on-scene and your representative will be kept fully appraised.

5. The funding increase is requested now to avoid potential on-scene crisis during the operation and allow the latitude to react to changing conditions at the salvage site. The on-scene cost of the modified lift barge, plus daily per diem/labor will total $25K per day. Funding above the contractor's estimate will not be placed on the contract unless actually required and unused funds will be returned upon final contractor billing. My point of contact remains CDR Bert Marsh, who can be reached at AUTOVON 227-7403 or Commercial 202-697-7403.

C. A. BARTHOLOMEW
Director of Ocean Engineering
Supervisor of Salvage and Diving, USN

Copy to:
COMDT COGARD (G-ELM)
CCGDNINE Cleveland Oh (o)
COMCOGARDGRU Sault Ste Marie MI

Figure A-10 (Continued). SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

EX-"MESQUITE" SALVAGE PLAN
OUTLINE

Phase I - From the initial arrival on scene of the salvage barge, an 18 inch oil boom will be deployed to surround the site and prevent release of any residual oil disturbed during the rigging and scrap removal portions of Phase I. Pollution control assistance from outside agencies is not anticipated, any emergency requirements will be coordinated through the U.S. Coast Guard. For safety reasons, one of the first non-pollution related activities will be to rig the EX-"MESQUITE" with two (2) rolling slings (one forward and one aft), so we can roll or "parbuckle" the EX-"MESQUITE" from her present angle (approximately 30 degrees to port) to as close to horizontal as possible. Once this occurs, all other activities can be accomplished without the added problem of attempting to work on an extreme incline.

The EX-"MESQUITE" will be "deadlifted" from her present stranded position utilizing two matched cantilevered truss/winch combinations secured to the deck of a modified pipe laying barge. One truss/winch will be attached to the forward section of the EX-"MESQUITE" by a lifting block schackled directly into an installed lifting saddle. The other truss/winch will be attached to the stern section of the EX-"MESQUITE" by a lifting block schackled into eight lifting slings which will be attached to two installed lifting saddles on the port and starboard side shell of the EX-"MESQUITE". The rigging aft will consist of eight slings to distribute the load as equally as possible. Phase I will include the removal of paint, thinner, solvents, and any other pollutants from all accessible spaces to eliminate them as possible sources of pollution.

In an effort to lighten the EX-"MESQUITE", topside deck equipment and superstructure will be removed. Additionally, some of the tank capacity of the Ex-"MESQUITE" will be rigged to receive low pressure air to displace entrained water and provide some buoyancy to the hull. A vacuum system with a 1500 gallon capacity receiving tank will be employed to strip floating oil from interior compartments. This portable system can be pumped to waste oil tanks to allow continued cleaning beyond the initial 1500 gallons.

Phase II - Once lifted and just clear of the bottom, the EX-"MESQUITE" will be "hogged" into the stern of the lifting barge. The barge will be towed around the point past Keystone Harbor along the 100 foot curve with the intention of reaching the primary site at Bate Grieise Bay.

Enclosure (1)

Figure A-10 (Continued). SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

Subj: EX-"MESQUITE" SALVAGE PLAN OUTLINE

Phase III - Once at the proposed site, the EX-"MESQUITE" will be lowered to the bottom. The lifting slings aft and the single lifting point forward will be detached by divers once the load is slacked. U.S. Coast Guard representatives, a tending vessel with oil boom, and the lift barge will remain in the immediate area for a period of 48 hours after the EX-"MESQUITE" is lowered to the bottom to provide an immediate response should any pollutants release.

Phase IV - The EX-"MESQUITE's" location, condition, and the depth of water above the vessel will be recorded by the U.S. Coast Guard to ensure appropriate navigational chart notation of the wreck site is documented. Additionally, the stranding location on Kennenaw Point will be swept to remove any significant hazards to navigation.

Figure A-10 (Continued). SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

COST ESTIMATE SYNOPSIS

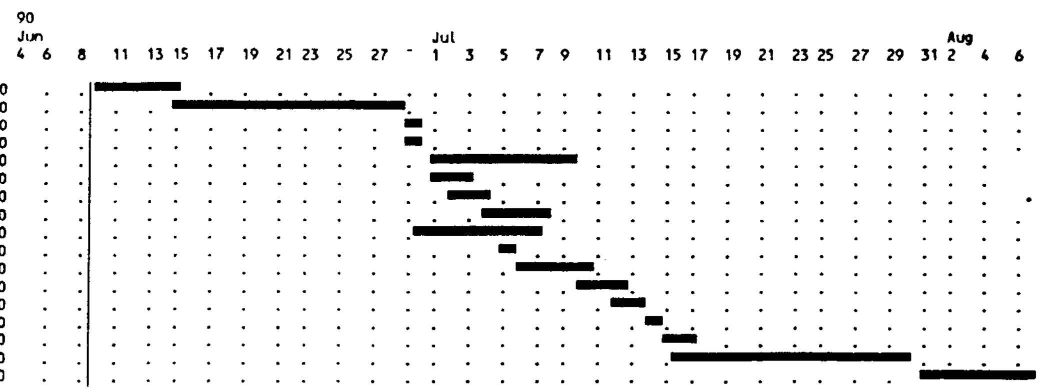
WORK/TASK DESCRIPTION	TIME DAYS	DAYRATE LABOR & MATERIALS		SUBTOTAL
Modify Week's 297 Barge to lift configuration	40	Varied		$590K
Transit to Keweenaw Pt	15	$13.7K		$205K
Parabuckle/Lift/Transport/ dispose/clean and monitor site	17	$25K		$425K
Transit to Newark, N.J.	15	$13.7K		$205K
Demobilize barge	11			$80K
Report/Insurance				$100K
Fee (set aside)				$150K
U.S. Navy				$20K
Cost w/o contingency			Sum	$1775K
Contingency				$225K
TOTAL COST				$2.0M
Received to date				$1.5M
Required amount to amend MIPR				$500K

Enclosure (2)

Figure A-10 (Continued). SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

Schedule Name : MESQUITE SALVAGE
Responsible : CDR BERT MARSH
As-of Date : 8-Jun-90 Schedule File : MESQUITE

Task Name	Start Date	Duration	End Date
COMPLETE MOB/TEST LIFT	10-Jun-90	75.0 h	15-Jun-90
TRANSIT TO SITE KEWEENA	15-Jun-90	15.0 d	29-Jun-90
MOOR TO MESQUITE/RIG WE	29-Jun-90	12.0 h	29-Jun-90
I' G OIL BOOM/RIG CUTTIN	29-Jun-90	15.0 h	30-Jun-90
REMOVAL OF POLLUTANTS	1-Jul-90	9.0 d	9-Jul-90
RIG FWD PARBUCKLE SLING	1-Jul-90	2.0 d	2-Jul-90
RIG AFT PARBUCKLE SLING	2-Jul-90	2.0 d	3-Jul-90
ATTACH FWD SINGLE LIFT	4-Jul-90	4.0 d	7-Jul-90
REMOVE DECKHOUSE/TOPSID	30-Jun-90	8.0 d	7-Jul-90
COMP RIGGING/PARBUCKLE	5-Jul-90	1.0 d	5-Jul-90
ATTACH AFT (PORT) LIFT	6-Jul-90	5.0 d	10-Jul-90
RIG TRUSS TO LIFT FWD/A	10-Jul-90	3.0 d	12-Jul-90
COMMENCE LIFT/TRANSPORT	12-Jul-90	2.0 d	13-Jul-90
LOWER MESQUITE/DETACH L	14-Jul-90	12.0 h	14-Jul-90
POLICE AREA/DEMOB/PREP/	15-Jul-90	2.0 d	16-Jul-90
TRANSIT TO NEWARK N.J.	16-Jul-90	15.0 d	30-Jul-90
DEMOB BARGE REMOVE EQP	31-Jul-90	11.0 d	10-Aug-90



Detail Task ■■■■■ Summary Task ••••• Baseline
(Progress) ==■■■ (Progress) ►►► Conflict
(Slack) ■■■— (Slack) ..■■■ Resource delay
Progress shows Percent Achieved on Actual ▲ Milestone
------------------ Scale: 8 hours per character ------------------

TIME LINE Gantt Chart Report, Strip 1

Figure A-10 (Continued). SUPSALV Letter to Coast Guard – Wreck Removal Proposal, 7 Jun 1990.

U.S. Department of Transportation
United States Coast Guard

Ship Repair Detachment Cleveland
U. S. Coast Guard
1240 East Ninth Street
Cleveland, Ohio 44199
Phone: (216) 522-3959
(FTS) 942-3959

4700
13 June 1990

From: MLCLANT MESQUITE Salvage Liaison Officer
To: Commander, Naval Sea Systems Command, (NAV SUP SALV)

Subj: Equipment Removals from the former CGC MESQUITE

Ref: (a) NAVSEASYSCOM 4740 ltr dtd 7 JUN 90

1. As discussed during our planning meetings 3 May and 21-23 May 1990 in Houghton, MI, the Coast Guard would like to recover the equipment listed in Enclosure (1) from the former MESQUITE. These removals are to be made commensurate with the removal of topside weight from the vessel prior to its relocation to Bete Grise Bay.

2. The feasibility of removing personal articles from the crew lockers in the two main berthing compartments will be determined on sight, after joint evaluation of accessibility, manpower and safety.

3. Recovery of the listed equipment, other easily removable items of value and personal articles will be attempted only if the schedule outlined in reference (a) will not be adversely effected, nor unnecessarily endanger personnel.

4. Inquiries concerning the removal and subsequent handling of equipment from the wreck of the MESQUITE may be addressed to me at the above address or via TELECOM at COM. (216) 522-3959 or FTS 942-3959.

A. J. COATES LT, USCG

Encl: (1) LIST OF DESIRED EQUIPMENT

Copy: MLCLANT (vr)
CCG GRU SAULT STE. MARIE, MI
CCGDNINE (oan)

Figure A-11. Coast Guard Letter to SUPSALV – List of High-value Items to be Removed and Saved from MESQUITE, 13 Jun 1990.

LIST OF DESIRED EQUIPMENT
FROM THE WRECK OF THE FORMER
CGC MESQUITE

Stock Number	Noun Name	QUAN.
3010-01-198-5834	Gear Box, Hoister	6 ea.
4820-01-107-9570	Valve, Hyd. Control	1 ea.
3950-00-G05-7368	Anchor Windlass	1 ea.
4320-01-157-6923	Pump, Radial Piston, Hyd.	1 ea.
	Winch, aft.	1 ea.
2010-00-385-7693	Propeller	1 ea.
	Cargo Boom Assembly	1 ea.
	Cargo Boom Sheaves	u/k
	3 puchase block	1 ea.
	5 purchase block	1 ea.
	Single point davit, Hyd.	1 ea.

Figure A-11 (Continued). Coast Guard Letter to SUPSALV – List of High-value Items to be Removed and Saved from MESQUITE, 13 Jun 1990.

APPENDIX B

USCGC MESQUITE DAMAGE ASSESSMENTS

B-1 GROUNDING DAMAGE

B-1.1 General Notes

Portions of the hull plating are upset throughout the length of the hull. Most damage is along the keel, starboard and port sides, approximately 8 to 10 feet off centerline.

Unless cited below, the keel is supported intermittently along its length. Approximately 75 percent of the hull is unsupported. The starboard side is supported periodically by the rock ledge at Frame 116. The port side is supported by the rock ledge between Frames 44 to 62.

The rock ledge, both port and starboard, prevents the stranded ship from heeling to starboard more than 3 to 5 degrees. The port side heel is limited to 7 to 10 degrees.

B-1.2 Specific Damage

B-1.2.1 Bow Thruster Room, Frames 14-30. There are significant upsets between Frames 16 and 23, along the keel at the baseline. No openings were visible to the divers. Minor contact and smaller upsets are visible between Frames 23 and 30.

The ship is bearing hard along its keel between Frames 15 and 24.

B-1.2.2 Fresh Water Tanks, Frames 30-44. There is no significant distortion of the hull plate and no bottom contact.

B-1.2.3. Main Cargo Hold, Frames 44-56. There are no significant openings or distortion visible to the divers along the keel or to starboard.

There is no keel contact.

A rock ledge exists 8 to 10 feet to port of the centerline. The rock ledge is 6 to 8 feet wide and 2 to 3 high. Significant upsets are visible in way of the rock ledge. The diver could not gain access to the ledge bearing area to ascertain whether the hull had been holed.

B-1.2.4. Sewage Space, Frames 56-68. No significant openings or distortion along the keel and to starboard are visible to the divers.

There is no keel contact in this area.

The rock ledge continues aft to approximately Frame 66. Upset and access are the same as those in way of the cargo hold.

B-1.2.5. Engineering Stores, Frames 68-74. An area 2 feet wide by 5 feet long is severely upset and cracked in three locations. Cracks are approximately 24 inches by 2½ inches, 8 inches by ¼-inch, and 4 inches by ¼-inch. This area is centered around Frame 72, approximately 1 to 2 feet to starboard of the centerline.

No contact exists in this area.

B-1.2.6. Cold and Dry Storage Rooms, Frames 74-92. No significant upsets or hull damage.

No bottom contact exists between Frames 74 to 92.

B-1.2.7. Generator Room, Frames 92-116. No significant upsets or hull damage from Frames 92 to 110.

No bottom contact is visible between Frames 92 and 116. Contact is relieved by seven degree heel to port.

An 8 by 3-foot oval-shaped heavy upset begins aft of the sea chest at Frame 115 and extends aft. The upset is centered approximately 5 to 6 feet to starboard of the centerline.

The upset are contains three cracks. One crack is 20 inches long by 2 inches wide just aft of the sea chest. The second crack is 7 feet long by 3 inches wide and tapers at each end. A third 4 by 2 inch crack exists aft and to starboard of the sea chest.

B-1.2.8. Fuel Tanks, Frames 116-126. The upset and long crack discussed above extend into the centerline fuel tank and aft to the bulkhead at Frame 126.

The ship makes contact with the rock ledge between Frames 121 and 126 in the area of the upset.

B-1.2.9. Motor Room, Frames 126-140. No significant upsets or other hull damage are visible to the diver.

No hull bearing exists in this area.

B-1.2.10. Fresh Water Tanks, Frames 140-147. The conditions in this area are the same as those cited above for the motor room.

B-1.2.11. Aft Peak and Skeg, Frames 147-168. Light contact exists between Frames 147 and 154.

The skeg is cracked through the area aft of Frame 161.

The skeg is bearing heavily on the rock ledge from Frames 154 going aft. The keel is dug into the rock approximately 4 inches.

The transverse framing in the aft peak tank is tripped.

B-2 STORM DAMAGE ASSESSMENT

B-2.1 General Notes. This report is the result of a topside and underwater survey of the MESQUITE after the storm on 8 – 9 December 1989.

Conditions stated are in addition to, and amplification of, the report submitted following the 6 December survey.

The hull is now making contact along 80 percent of its length.

There are now numerous cracks of various sizes throughout the underwater hull. This report discusses only major discontinuities.

B-2.2 Specific Comments, Underwater Hull Survey. The following comments follow the hull from the stem, down the starboard side, around the stern, and up the port side.

B-2.2.1 Keel, Frames 13-44. The keel has been driven up into the hull approximately 12 inches to 18 inches. The plating is bowed outboard, port and starboard (P/S) about 6 to 8 inches, with the keel shifted to starboard.

On both port and starboard sides, holes 8 to 10 inches high by 1 to 3 inches wide are pushed through the hull at each frame.

Various sized pieces of metal are lying on the bottom.

B-2.2.2 Cargo Hold. At Frame 54, a crack at least 7 feet long by ½ to ¾ inches wide runs from the transducer, transversely under the hull.

A large area of heavy longitudinal deformation about 12 feet long by 4 feet wide is centered about the crack.

Numerous pieces of metal lie on the bottom outboard to starboard of the deformed area and crack.

B-2.2.3 Store Rooms and Engine Room. Starting at approximately Frame 80 and running aft to about Frame 98; the bottom is littered with engineering parts, equipment, some clothing. A fire hose leads from under the stranding.

Broken and pulverized rock is found from about Frame 80 aft to the stern.

The large cracks extending from the aft end of the engine room into the fuel tank are exposed.

B-2.2.4 Stern. The rudder palm bolts have been sheared.

The rudder is lying to port.

The skeg has broken free aft of Frame 161, and a piece of the gudgeon is lying on the bottom, along with other large pieces of broken steel.

The keel is beaten into the bottom from Frame 161 to about Frame 154.

Starting at approximately Frame 154 and running forward to about Frame 133, the hull is pushed up and mushroomed in a manner similar to the stem.

B-2.2.5 Motor Room and Port Fuel Tank. The port side from about Frame 133 to approximately Frame 121 is severely upset and fractured. There is heavy contact of the hull with the bottom from Frame 121 forward into the engine room.

There is a significant amount of broken rock along this area and forward into the engine room.

B-2.2.6 Engine Room. The hull is bearing heavily along the bottom throughout the length of the engine room. Broken and pulverized rock lies along the hull in this area.

At about Frame 104, there is a large upset 2 to 2½ feet wide that goes inboard and turns up into the engine room in the form of a 2½-foot diameter hole.

There is significant flushing through the hole.

B-2.2.7 Midships. The hull is making contact along the port bottom and side from about Frame 92 forward to about Frame 50.

B-2.2.8 Forward. The hull is 6 to 12 inches above the bottom from Frame 50 to Frame 44.

B-2.3 Additional Observations. The mast is broken and is fouled in the stays, electrical cables, and port boat davit.

The centerline water tank aft (C-1) is holed and blowing. The port fuel tank is under pressure.

Berthing compartment A-203-L is now full of water, and A-202-L is flooding.

The status of compartments forward of A-202-L is unknown, but they are assumed to be dry.

The hawser locker under the aft steering space is flooded to the line pallets. It is not full.

Fuel is slowly leaking from the hull, creating a sheen along the port side.

The starboard fuel tank may be tidal, but this could not be determined conclusively.

All accessible tank valves are closed or expected to be closed.

The ship has a 19-degree heel to port, and a 3½-degree trim by the stern. T_f is 10 feet. T_a is 14½ feet.

APPENDIX C

HYDROSTATIC PROPERTIES

Hydrostatics - Part I Trim .000 feet

	Draft	Volume	Displacement	LCB	KB	Wetted Surface	Prismatic Coef	WPlane Coef	WPlane I Coef
	8.00	17678.	505.1	-.09	4.79	4481.	.514	.611	.432
	8.25	18499.	528.5	-.06	4.94	4587.	.518	.620	.439
	8.50	19337.	552.5	-.05	5.09	4693.	.522	.628	.446
	8.75	20193.	576.9	-.04	5.24	4799.	.525	.637	.453
	9.00	21066.	601.9	-.04	5.39	4904.	.529	.645	.461
	9.25	21955.	627.3	-.06	5.54	5010.	.533	.653	.468
	9.50	22862.	653.2	-.07	5.69	5116.	.537	.661	.476
	9.75	23785.	679.6	-.10	5.85	5222.	.541	.669	.483
	10.00	24725.	706.4	-.13	6.00	5330.	.546	.677	.491
	10.25	25682.	733.8	-.17	6.15	5438.	.550	.685	.499
	10.50	26655.	761.6	-.21	6.31	5547.	.554	.693	.506
	10.75	27645.	789.9	-.25	6.46	5657.	.558	.701	.514
	11.00	28652.	818.6	-.30	6.62	5770.	.562	.709	.522
	11.25	29676.	847.9	-.36	6.77	5886.	.566	.717	.530
DWL	11.50	30719.	877.7	-.43	6.93	6007.	.570	.726	.538
	11.75	31778.	907.9	-.50	7.09	6123.	.575	.735	.546
	12.00	32853.	938.7	-.57	7.24	6238.	.579	.744	.554
	12.25	33945.	969.9	-.65	7.40	6347.	.583	.751	.561
	12.50	35053.	1001.5	-.73	7.56	6455.	.587	.758	.569
	12.75	36174.	1033.6	-.82	7.71	6561.	.591	.765	.577
	13.00	37311.	1066.0	-.90	7.87	6667.	.596	.772	.584

Hydrostatics - Part II Trim .000 feet

	Draft	WPlane Area	LCF	TPI	CIDOFTS	Long. BM	Trnsv BM	Long KM	Trnsv KM	MT1
	8.00	3251.	.67	7.74	-.38	208.8	11.01	213.5	15.80	52.7
	8.25	3320.	.44	7.91	-.25	208.5	10.93	213.5	15.87	55.1
	8.50	3389.	.21	8.07	-.12	208.3	10.85	213.3	15.94	57.5
	8.75	3457.	-.01	8.23	.00	208.0	10.78	213.2	16.02	60.0
	9.00	3525.	-.22	8.39	.14	207.6	10.71	213.0	16.10	62.5
	9.25	3593.	-.43	8.55	.26	207.2	10.64	212.8	16.18	65.0
	9.50	3659.	-.63	8.71	.39	206.8	10.58	212.5	16.27	67.5
	9.75	3726.	-.82	8.87	.53	206.4	10.52	212.2	16.37	70.1
	10.00	3793.	-1.01	9.03	.66	206.0	10.46	212.0	16.46	72.7
	10.25	3859.	-1.20	9.19	.79	205.7	10.40	211.8	16.56	75.4
	10.50	3925.	-1.39	9.34	.93	205.4	10.35	211.7	16.65	78.2
	10.75	3991.	-1.58	9.50	1.08	205.2	10.29	211.6	16.75	81.0
	11.00	4058.	-1.79	9.66	1.25	205.2	10.23	211.8	16.85	84.0
	11.25	4126.	-2.04	9.82	1.44	205.6	10.18	212.4	16.95	87.1
DWL	11.50	4198.	-2.35	10.00	1.69	206.6	10.12	213.6	17.05	90.6
	11.75	4268.	-2.64	10.16	1.93	207.4	10.07	214.5	17.16	94.1
	12.00	4338.	-2.91	10.33	2.16	208.0	10.02	215.3	17.26	97.6
	12.25	4400.	-3.10	10.48	2.33	207.5	9.96	214.9	17.36	100.6
	12.50	4460.	-3.25	10.62	2.49	206.6	9.90	214.2	17.45	103.4
	12.75	4518.	-3.39	10.76	2.62	205.6	9.83	213.3	17.55	106.2
	13.00	4574.	-3.50	10.89	2.74	204.3	9.77	212.2	17.64	108.8

Figure C-1. Hydrostatics – Part I and Part II.

Hydrostatics - Part I   Trim .000 feet

	Draft	Volume	Displacement	LCB	KB	Wetted Surface	Prismatic Coef	WPlane Coef	WPlane I Coef
DWL	11.50	30719.	877.7	-.43	6.93	6007.	.570	.726	.538
	13.00	37311.	1066.0	-.90	7.87	6667.	.596	.772	.584
	13.25	38461.	1098.9	-.98	8.03	6772.	.600	.778	.591
	13.50	39624.	1132.1	-1.05	8.18	6875.	.604	.784	.598
	13.75	40800.	1165.7	-1.13	8.34	6977.	.608	.789	.605
	14.00	41988.	1199.7	-1.20	8.50	7077.	.612	.795	.612
	14.25	43187.	1233.9	-1.27	8.65	7176.	.616	.800	.618
	14.50	44397.	1268.5	-1.34	8.81	7275.	.620	.804	.624
	14.75	45618.	1303.4	-1.41	8.97	7372.	.624	.809	.630
	15.00	46849.	1338.5	-1.47	9.12	7468.	.628	.813	.636
	15.25	48089.	1374.0	-1.53	9.28	7562.	.631	.817	.641
	15.50	49338.	1409.7	-1.59	9.43	7656.	.635	.821	.646
	15.75	50595.	1445.6	-1.64	9.58	7748.	.639	.824	.651
	16.00	51861.	1481.7	-1.69	9.74	7839.	.642	.828	.655
	16.25	53134.	1518.1	-1.73	9.89	7930.	.646	.831	.661
	16.50	54414.	1554.7	-1.77	10.04	8019.	.649	.834	.666
	16.75	55700.	1591.4	-1.81	10.20	8107.	.652	.838	.670
	17.00	56993.	1628.4	-1.84	10.35	8194.	.656	.840	.675

Hydrostatics - Part II   Trim .000 feet

	Draft	WPlane Area	LCF	TPI	CIDOFTS	Long BM	Trnsv BM	Long KM	Trnsv KM	MT1
DWL	11.50	4198.	-2.35	10.00	1.69	206.6	10.12	213.6	17.05	90.6
	13.00	4574.	-3.50	10.89	2.74	204.3	9.77	212.2	17.64	108.8
	13.25	4627.	-3.59	11.02	2.85	202.9	9.70	210.9	17.72	111.4
	13.50	4679.	-3.66	11.14	2.93	201.3	9.63	209.4	17.81	113.9
	13.75	4728.	-3.71	11.26	3.01	199.5	9.55	207.8	17.89	116.2
	14.00	4775.	-3.74	11.37	3.06	197.6	9.47	206.1	17.97	118.5
	14.25	4820.	-3.77	11.48	3.12	195.6	9.39	204.2	18.05	120.6
	14.50	4862.	-3.79	11.58	3.16	193.5	9.31	202.3	18.12	122.7
	14.75	4903.	-3.79	11.67	3.19	191.3	9.22	200.3	18.19	124.6
	15.00	4942.	-3.78	11.77	3.20	189.1	9.13	198.2	18.25	126.5
	15.25	4979.	-3.75	11.85	3.20	186.8	9.04	196.1	18.31	128.3
	15.50	5013.	-3.72	11.94	3.19	184.5	8.94	193.9	18.37	130.0
	15.75	5046.	-3.66	12.01	3.17	182.1	8.84	191.7	18.43	131.6
	16.00	5076.	-3.60	12.09	3.13	179.7	8.74	189.5	18.48	133.1
	16.25	5106.	-3.52	12.16	3.08	177.3	8.64	187.2	18.53	134.5
	16.50	5133.	-3.43	12.22	3.02	174.8	8.53	184.8	18.58	135.8
	16.75	5159.	-3.33	12.28	2.95	172.3	8.43	182.5	18.62	137.0
	17.00	5182.	-3.22	12.34	2.86	169.8	8.32	180.1	18.67	138.1

Figure C-1 (Continued). Hydrostatics – Part I and Part II.

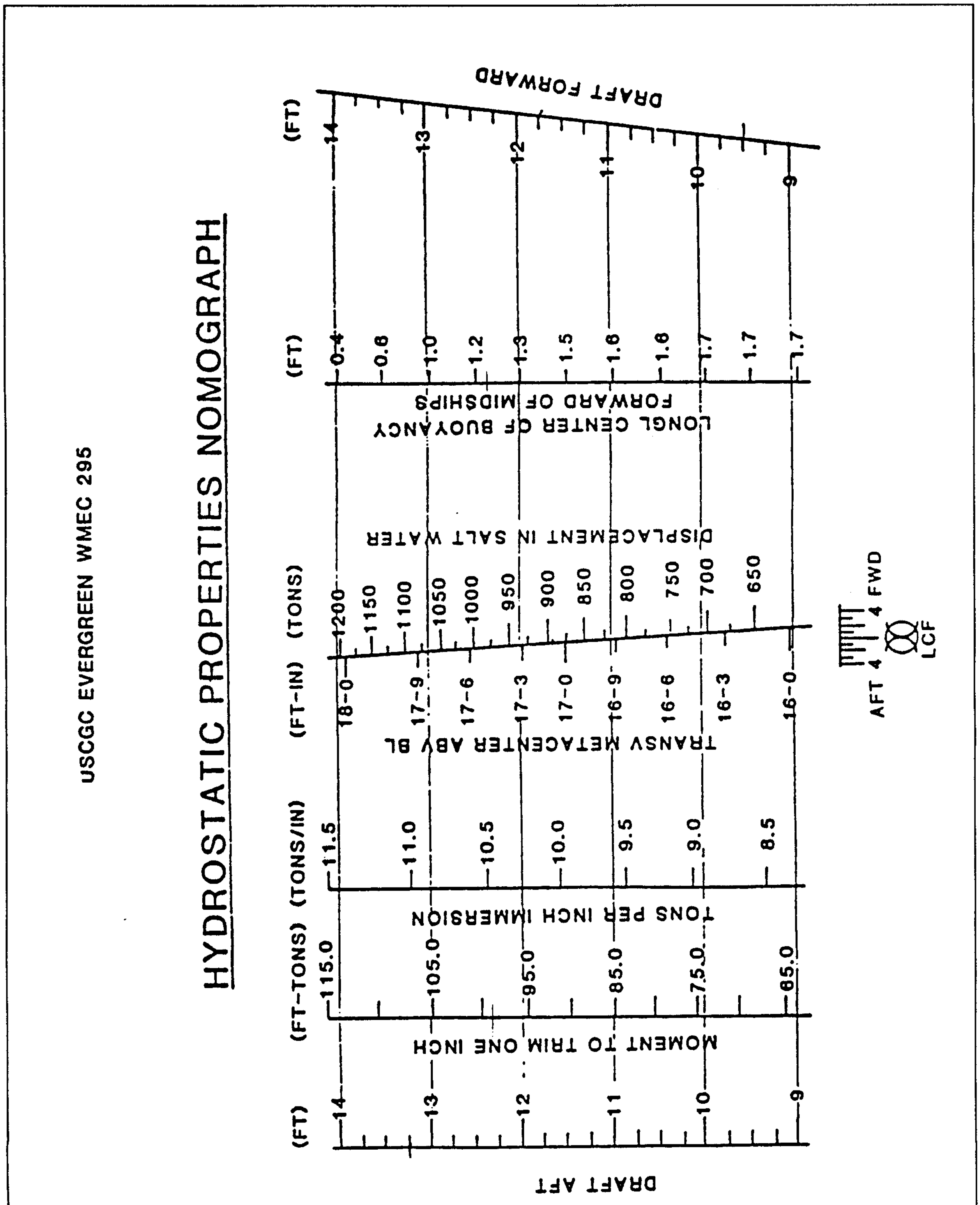


Figure C-2. USCGC EVERGREEN (WMEC-295) – Hydrostatic Properties Nomograph.

LOAD CONDITION SHEET LIGHT SHIP

ITEMS	WEIGHT	VCG		LCG			
	TONS	FT-ABV BL	VERT MOMENT	FEET AFT	AFT MOMENT FT-TONS	FEET FWD	FWD MOMENT FT-TONS
LIGHT SHIP	795.99	15.776	12557.62			0.183	145.45
PROVISION & STORES							
GENERAL STORES							
CREW & EFFECTS							
AMMO							
3-C-0-SW BALLAST ( )							
3-30-0-F ( )							
3-30-1-F ( )							
3-30-2-F ( )							
3-116-0-F ( )							
3-116-1-F ( )							
3-116-2-F ( )							
LUBE OIL ( )							
2-140-1-FW ( )							
2-140-2-FW ( )							
3-140-0-FW ( )							
3-147-0-V ( )							
SOLID BALLAST	8.00	7.5	60.0			60.0	480.0
TOTAL	803.99	15.69	12617.62			0.778	625.45

Figure C-3. USCGC EVERGREEN (WMEC-295) – Load Condition Sheet (Light Ship).

APPENDIX D

SALVAGE CALCULATIONS

VESSEL NAME : USCGC MESQUITE FIXED WEIGHT
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	LIGHT SHIP	0.0	804.0	0.8	625.5	15.7	12614.6	0.0	0.0
2	PROVISIONS & STORES	0.0	3.7	1.1	4.2	5.2	19.2	0.0	0.0
3	GENERAL STORES	0.0	6.6	17.9	118.5	19.8	131.5	0.0	0.0
4	CREW & EFFECTS	0.0	7.5	2.6	19.3	15.2	113.5	0.0	0.0
5	AMMO	0.0	0.9	-0.9	-0.8	4.1	3.7	0.0	0.0
	PAGE TOTAL	0.0	822.7	0.9	766.7	15.7	12882.6	0.0	0.0

TOTAL WEIGHT = 822.66 LONG TONS
OVERALL LCG = .9320138 FEET
OVERALL VCG = 15.65968 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 0 FOOT-TONS
OVERALL FS CORRECTION = 0 FEET

Figure D-1. USCGC MESQUITE (WLB-305) – Weight and Moment Summary – Fixed Weight, Tankage, Added Weight, as Sailed and As Grounded.

VESSEL NAME : USCGC MESQUITE TANKAGE
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	FOREPEAKE	43.1	15.5	80.4	1245.9	15.0	232.0	0.0	0.0
2	A-3-W	31.4	31.4	47.8	1497.4	4.4	137.0	0.0	0.0
3	A-4-W	11.9	9.4	47.1	442.0	8.6	80.8	6.5	61.0
4	A-5-W	11.9	9.4	47.1	442.0	8.6	80.8	-6.5	-61.0
5	C-201-W	16.2	10.8	-58.3	-630.8	13.8	149.2	-6.8	-73.0
6	C-202-W	16.2	9.8	-58.3	-573.0	13.5	132.3	6.8	66.3
7	C-1	18.8	2.4	-58.4	-140.7	2.6	6.4	0.0	0.0
8	AFT PEAK	18.7	7.6	-67.3	-511.9	4.4	33.6	0.0	0.0
9	B-2-F	22.4	19.2	-35.8	-688.1	4.6	89.2	0.0	0.0
10	B-3-F	38.8	20.7	-35.8	-739.6	10.3	211.8	-6.7	-138.4
11	B-4-F	38.8	23.0	-35.8	-823.4	10.9	249.8	6.7	154.1
12	CHT	1.4	3.7	23.0	85.3	5.5	20.4	0.0	0.0
13	LUBE OIL	0.1	0.7	-16.0	-11.0	14.7	10.1	0.0	0.0
	PAGE TOTAL	269.6	163.6	-2.5	-405.8	8.8	1433.4	0.1	9.0

TOTAL WEIGHT = 163.56 LONG TONS
OVERALL LCG = -2.481201 FEET
OVERALL VCG = 8.764011 FEET
OVERALL TCG = 5.499806E-02 FEET
OVERALL FSF = 269.6 FOOT-TONS
OVERALL FS CORRECTION = 1.648325 FEET

Figure D-1 (Continued). USCGC MESQUITE (WLB-305) – Weight and Moment Summary – Fixed Weight, Tankage, Added Weight, as Sailed and As Grounded.

VESSEL NAME : USCGC MESQUITE ADDED WEIGHT
DC JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	NOAA BUOYS	0.0	7.1	29.0	207.1	23.0	164.2	0.0	0.0
2	DUNNAGE & MISC JEWELRY	0.0	0.7	60.0	40.2	22.0	14.7	0.0	0.0
3	CLUMP	0.0	3.6	35.0	124.9	5.0	17.9	0.0	0.0
	PAGE TOTAL	0.0	11.4	32.7	372.2	17.3	196.8	0.0	0.0

TOTAL WEIGHT = 11.38 LONG TONS
OVERALL LCG = 32.70738 FEET
OVERALL VCG = 17.29438 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 0 FOOT-TONS
OVERALL FS CORRECTION = 0 FEET

Figure D-1 (Continued). USCGC MESQUITE (WLB-305) – Weight and Moment Summary – Fixed Weight, Tankage, Added Weight, as Sailed and As Grounded.

```
VESSEL NAME : USCGC MESQUITE SAILING CONDITION
Dt JOB NO.  : F1103
DATE        : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET
```

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	FIXED WEIGHT	0.0	822.7	0.9	766.7	15.7	12882.6	0.0	0.0
2	TANKAGE	269.6	163.6	-2.5	-405.8	8.8	1433.4	0.1	9.0
3	ADDED WEIGHT	0.0	11.4	32.7	372.2	17.3	196.8	0.0	0.0
	PAGE TOTAL	269.6	997.6	0.7	733.1	14.5	14512.8	0.0	9.0

```
TOTAL WEIGHT =  997.6 LONG TONS
OVERALL LCG  =  .7348633 FEET
OVERALL VCG  =  14.54775 FEET
OVERALL TCG  =  9.017278E-03 FEET
OVERALL FSF  =  269.6 FOOT-TONS
OVERALL FS CORRECTION =  .2702486 FEET
```

Figure D-1 (Continued). USCGC MESQUITE (WLB-305) – Weight and Moment Summary – Fixed Weight, Tankage, Added Weight, as Sailed and As Grounded.

FREE SURFACE EFFECT

$$FSF = \frac{c * i_t}{36}$$

where:

c = Transference factor

i_t = Moment of inertia of the free surface about its centerline

36 = density of fresh water in cubic feet per ton

For the Motor Room where l = 14 feet, b = 24 feet, d = 14 feet.
Angle of inclination = 6 degrees, use 10 degree table.
Aspect ratio = b/d = 24/14 = 1.7, use 2.0:
With 50% Full Table, c = 0.18

$$i_t = \frac{l * b^3}{12}$$

$$i_t = \frac{14 * (24)^3}{12}$$

$$i_t = 16{,}128$$

$$FSF = \frac{0.18 * 16128}{36}$$

$$FSF = 80.64$$

$$\text{Free Surface Effect} = \frac{FSF}{W}$$

$$\text{Free Surface Effect} = \frac{80.64}{997.7}$$

Free Surface Effect = 0.08 feet (reduction in righting arm)

Figure D-2. Sample Calculations – Free Surface Effect.

VESSEL NAME : USCGC MESQUITE STAGE A
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	NOAA BUOYS	0.0	-7.1	29.0	-207.1	23.0	-164.2	0.0	0.0
2	CREWS BERTHING	1497.4	-27.8	2.0	-55.5	11.5	-319.1	0.0	0.0
3	B-3-F	38.8	-20.3	-35.8	725.3	10.3	-207.7	-6.7	135.7
4	B-4-F	38.8	-23.0	-35.8	823.4	10.9	-249.8	6.7	-154.1
5	SALVAGE PUMPS	0.0	3.3	-71.0	-237.8	28.0	93.8	0.0	0.0
	PAGE TOTAL	1574.9	-74.8	-14.0	1048.3	11.3	-847.0	0.2	-18.4

TOTAL WEIGHT = -74.8 LONG TONS
OVERALL LCG = -14.01468 FEET
OVERALL VCG = 11.3234 FEET
OVERALL TCG = .2454276 FEET
OVERALL FSF = 1574.92 FOOT-TONS
OVERALL FS CORRECTION = -21.05508 FEET

Figure D-3. Dewatering Weight and Moment Study – Stage A Through F.

VESSEL NAME : USCGC MESQUITE STAGE B
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1 MOTOR ROOM	80.6	-51.7	48.0	-2482.1	7.0	-362.0	0.0	0.0
PAGE TOTAL	80.6	-51.7	48.0	-2482.1	7.0	-362.0	0.0	0.0

TOTAL WEIGHT = -51.71 LONG TONS
OVERALL LCG = 48 FEET
OVERALL VCG = 7 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 80.64 FOOT-TONS
OVERALL FS CORRECTION = -1.559466 FEET

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

VESSEL NAME : USCGC MESQUITE STAGE C
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	C-201-W	16.2	-10.8	-58.3	630.8	13.8	-149.2	-6.8	73.5
2	C-202-W	16.2	-9.8	-58.3	573.0	13.5	-132.3	6.8	-66.8
3	ENGINEERING STORES	30.0	-34.7	15.0	-520.8	4.9	-169.4	0.0	0.0
	PAGE TOTAL	62.4	-55.4	-12.3	683.0	8.1	-450.9	-0.1	6.7

TOTAL WEIGHT = -55.35 LONG TONS
OVERALL LCG = -12.33894 FEET
OVERALL VCG = 8.146107 FEET
OVERALL TCG = -.121626 FEET
OVERALL FSF = 62.35 FOOT-TONS
OVERALL FS CORRECTION = -1.126468 FEET

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

VESSEL NAME : USCGC MESQUITE STAGE D
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	FORE PEAK	43.1	-15.5	80.4	-1245.9	15.0	-232.0	0.0	0.0
2	A-3-W	31.4	-31.4	47.8	-1497.4	4.4	-137.0	0.0	0.0
3	A-4-W	11.9	-9.4	47.1	-442.0	8.6	-80.8	6.5	-61.0
4	A-5-W	11.9	-9.4	47.1	-442.0	8.6	-80.8	-6.5	61.0
	PAGE TOTAL	98.3	-65.6	55.3	-3627.3	8.1	-530.8	0.0	0.0

TOTAL WEIGHT = -65.64 LONG TONS
OVERALL LCG = 55.26058 FEET
OVERALL VCG = 8.086137 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 98.31001 FOOT-TONS
OVERALL FS CORRECTION = -1.497715 FEET

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

VESSEL NAME : USCGC MESQUITE STAGE E
Dt JOB NO. : F1103
DATE : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM	DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1	ENGINE ROOM	327.7	-163.4	-19.0	3104.0	6.5	-1061.9	0.0	0.0
2	COLD STORAGE	11.0	-104.8	2.0	-209.5	4.8	-497.7	0.0	0.0
	PAGE TOTAL	338.7	-268.1	-10.8	2894.5	5.8	-1559.6	0.0	0.0

TOTAL WEIGHT = -268.14 LONG TONS
OVERALL LCG = -10.7947 FEET
OVERALL VCG = 5.816225 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 338.66 FOOT-TONS
OVERALL FS CORRECTION = -1.262997 FEET

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

VESSEL NAME : USCGC MESQUITE STAGE F
Dt JOB NO. : F1103
DATE   : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET

ITEM DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1 BOW THRUSTER	133.1	-22.5	67.0	-1505.5	4.5	-101.1	0.0	0.0
PAGE TOTAL	133.1	-22.5	67.0	-1505.5	4.5	-101.1	0.0	0.0

TOTAL WEIGHT = -22.47 LONG TONS
OVERALL LCG = 67 FEET
OVERALL VCG = 4.5 FEET
OVERALL TCG = 0 FEET
OVERALL FSF = 133.1 FOOT-TONS
OVERALL FS CORRECTION = -5.923454 FEET

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

```
VESSEL NAME : USCGC MESQUITE REFLOATED CONDITION
Dt JOB NO.  : F1103
DATE        : 9 DEC 89
COMPUTER PROGRAM USED: WEIGHT2

NOTES :
L.C.G. IS REFERRED TO MIDSHIPS (-VE AFT)
WEIGHTS ARE IN LONG TONS
DISTANCES ARE IN FEET
```

ITEM DESCRIPTION	F.S.	WEIGHT	L.C.G.	LONG MOM	V.C.G.	VERT MOM	T.C.G.	TR.MOM.
1 GROUNDED CONDITION	2458.9	1501.8	0.2	318.4	11.6	17400.2	0.0	8.9
2 WEIGHT REMOVED	-2416.3	-538.1	5.6	-2990.3	7.2	-3850.7	0.0	0.0
PAGE TOTAL	42.6	963.7	-2.8	-2671.9	14.1	13549.5	0.0	8.9

```
TOTAL WEIGHT =  963.72 LONG TONS
OVERALL LCG  = -2.772475 FEET
OVERALL VCG  =  14.05957 FEET
OVERALL TCG  =  9.194369E-03 FEET
OVERALL FSF  =  42.61987 FOOT-TONS
OVERALL FS CORRECTION =  4.422433E-02 FEET
```

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (GC)

INITIAL CONDITION:

```
DRAFT FWD. IN FEET        =     9.00
DRAFT AFT  IN FEET        =    14.00

BUOYANCY IN LONG TONS     =   872.52
WEIGHT OF VESSEL IN LT    =  1501.83

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT                        = 629.31
CENTROID OF GROUND REACTION FROM MIDSHIP=      0.28

GMt CORRECTED FOR GROUND REACTION IN FT =    -2.95
GMt CORRECTED FOR GR AND FS IN FT       =    -5.77
```

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (A)

INITIAL CONDITION:

```
DRAFT FWD. IN FEET        =     9.00
DRAFT AFT  IN FEET        =    14.00

BUOYANCY IN LONG TONS     =   872.52
WEIGHT OF VESSEL IN LT    =  1501.83
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        = 629.31
CENTROID OF GROUND REACTION FROM MIDSHIP=   0.28

GMt CORRECTED FOR GROUND REACTION IN FT =  -2.95
GMt CORRECTED FOR GR AND FS IN FT       =  -5.77
```

CONDITION OF VESSEL AFTER WEIGHT CHANGES:

```
DRAFT FWD. IN FEET        =     9.00
DRAFT AFT  IN FEET        =    14.00

BUOYANCY IN LONG TONS     =   872.52
WEIGHT OF VESSEL IN LT    =  1427.03
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        = 554.51
CENTROID OF GROUND REACTION FROM MIDSHIP=   3.94

GMt CORRECTED FOR GROUND REACTION IN FT =  -1.98
GMt CORRECTED FOR GR AND FS IN FT       =  -3.00
```

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (B)

INITIAL CONDITION:

DRAFT FWD. IN FEET	=	9.00
DRAFT AFT IN FEET	=	14.00
BUOYANCY IN LONG TONS	=	872.52
WEIGHT OF VESSEL IN LT	=	1501.83

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT	=	629.31
CENTROID OF GROUND REACTION FROM MIDSHIP	=	0.28
GMt CORRECTED FOR GROUND REACTION IN FT	=	-2.95
GMt CORRECTED FOR GR AND FS IN FT	=	-5.77

CONDITION OF VESSEL AFTER cumulative WEIGHT CHANGES: A+B

DRAFT FWD. IN FEET	=	9.00
DRAFT AFT IN FEET	=	14.00
BUOYANCY IN LONG TONS	=	872.52
WEIGHT OF VESSEL IN LT	=	1375.32

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT	=	502.80
CENTROID OF GROUND REACTION FROM MIDSHIP	=	-0.59
GMt CORRECTED FOR GROUND REACTION IN FT	=	-1.57
GMt CORRECTED FOR GR AND FS IN FT	=	-2.49

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (C)

INITIAL CONDITION:

```
DRAFT FWD. IN FEET          =     9.00
DRAFT AFT  IN FEET          =    14.00

BUOYANCY IN LONG TONS       =   872.52
WEIGHT OF VESSEL IN LT      =  1501.83
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        = 629.31
CENTROID OF GROUND REACTION FROM MIDSHIP=   0.28

GMt CORRECTED FOR GROUND REACTION IN FT =  -2.95
GMt CORRECTED FOR GR AND FS IN FT        =  -5.77
```

CONDITION OF VESSEL AFTER cummulative WEIGHT CHANGES: A,B+C

```
DRAFT FWD. IN FEET          =     9.00
DRAFT AFT  IN FEET          =    14.00

BUOYANCY IN LONG TONS       =   872.52
WEIGHT OF VESSEL IN LT      =  1319.97
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        = 447.45
CENTROID OF GROUND REACTION FROM MIDSHIP=   0.86

GMt CORRECTED FOR GROUND REACTION IN FT =  -1.05
GMt CORRECTED FOR GR AND FS IN FT        =  -1.90
```

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (D)

INITIAL CONDITION:

DRAFT FWD. IN FEET	=	9.00
DRAFT AFT IN FEET	=	14.00
BUOYANCY IN LONG TONS	=	872.52
WEIGHT OF VESSEL IN LT	=	1501.83

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT	=	629.31
CENTROID OF GROUND REACTION FROM MIDSHIP	=	0.28
GMt CORRECTED FOR GROUND REACTION IN FT	=	-2.95
GMt CORRECTED FOR GR AND FS IN FT	=	-5.77

CONDITION OF VESSEL AFTER Cumulative WEIGHT CHANGES: A,B,C + D

DRAFT FWD. IN FEET	=	9.00
DRAFT AFT IN FEET	=	14.00
BUOYANCY IN LONG TONS	=	872.52
WEIGHT OF VESSEL IN LT	=	1254.33

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT	=	381.81
CENTROID OF GROUND REACTION FROM MIDSHIP	=	-8.49
GMt CORRECTED FOR GROUND REACTION IN FT	=	-0.44
GMt CORRECTED FOR GR AND FS IN FT	=	-1.18

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (E)

INITIAL CONDITION:

DRAFT FWD. IN FEET = 9.00
DRAFT AFT IN FEET = 14.00

BUOYANCY IN LONG TONS = 872.52
WEIGHT OF VESSEL IN LT = 1501.83

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT = 629.31
CENTROID OF GROUND REACTION FROM MIDSHIP= 0.28

GMt CORRECTED FOR GROUND REACTION IN FT = -2.95
GMt CORRECTED FOR GR AND FS IN FT = -5.77

CONDITION OF VESSEL AFTER cummulative WEIGHT CHANGES: A,B,C,D & E

DRAFT FWD. IN FEET = 9.00
DRAFT AFT IN FEET = 14.00

BUOYANCY IN LONG TONS = 872.52
WEIGHT OF VESSEL IN LT = 986.19

FOR THE VESSEL IN THIS CONDITION -

GROUND REACTION IN LT = 113.67
CENTROID OF GROUND REACTION FROM MIDSHIP= -3.06

GMt CORRECTED FOR GROUND REACTION IN FT = 1.35
GMt CORRECTED FOR GR AND FS IN FT = 1.00

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

GROUND REACTION CALCULATIONS FOR USCGC MESQUITE (F)

INITIAL CONDITION:

```
DRAFT FWD. IN FEET          =     9.00
DRAFT AFT  IN FEET          =    14.00

BUOYANCY IN LONG TONS       =   872.52
WEIGHT OF VESSEL IN LT      =  1501.83
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        = 629.31
CENTROID OF GROUND REACTION FROM MIDSHIP=   0.28

GMt CORRECTED FOR GROUND REACTION IN FT =  -2.95
GMt CORRECTED FOR GR AND FS IN FT       =  -5.77
```

CONDITION OF VESSEL AFTER cumulative WEIGHT CHANGES: A,B,C,D,E & F

```
DRAFT FWD. IN FEET          =     9.00
DRAFT AFT  IN FEET          =    14.00

BUOYANCY IN LONG TONS       =   872.52
WEIGHT OF VESSEL IN LT      =   963.72
```

FOR THE VESSEL IN THIS CONDITION -

```
GROUND REACTION IN LT                        =  91.20
CENTROID OF GROUND REACTION FROM MIDSHIP= -20.32

GMt CORRECTED FOR GROUND REACTION IN FT =   1.46
GMt CORRECTED FOR GR AND FS IN FT       =   1.26
```

Figure D-3 (Continued). Dewatering Weight and Moment Study – Stage A Through F.

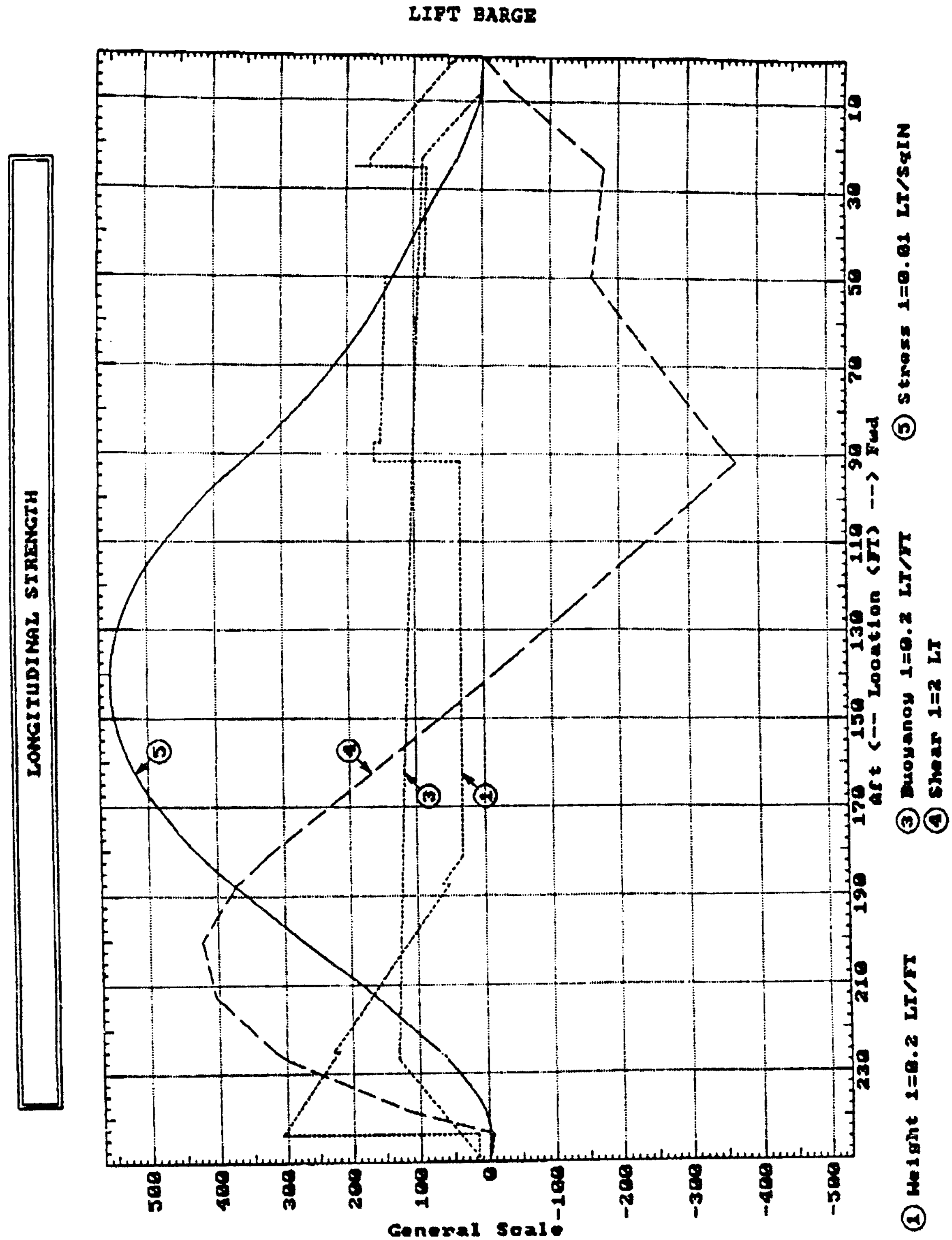


Figure D-4. Lift Barge Longitudinal Strength Analysis.

LIFT BARGE

WEIGHT and DISPLACEMENT STATUS

Baseline draft: 7.900 @ Origin, Trim: Aft 1.16 deg., Heel: zero

Part	Load	SpGr	Weight(LT)	LCG	TCG	VCG	Ref Ht
LIGHT SHIP			1,032.14	134.72a	0.00	0.00	
OUTFIT			200.00	137.50a	0.00	0.00	
TRUSS			1,822.15	222.88a	0.00	0.00	
Total Fixed--------->			3,054.30	187.50a	0.00	0.00	
TANK1.C	0.980	1.000	264.32	15.20a	0.00	10.12	-15.54
TANK1.S	0.980	1.000	132.16	15.20a	28.13s	10.12	-15.54
TANK1.P	0.980	1.000	132.16	15.20a	28.13p	10.12	-15.54
TANK2DB.C	1.000	1.000	102.94	37.50a	0.00	2.00	
TANK2.C	0.980	1.000	672.29	71.01a	0.00	7.84	-14.24
TANK2.S	0.500	1.000	274.51	59.27a	28.13s	4.01	-6.82
TANK2.P	0.500	1.000	274.51	59.27a	28.13p	4.01	-6.82
Total Tanks--------->			1,852.89	49.75a	0.00	7.03	
Total Weight-------->			4,907.19	135.49a	0.00	2.65	
			Displ(LT)	LCB	TCB	VCB	
HULL		1.000	4,907.18	135.43a	0.00	5.52	-7.90
Righting Arms:				0.00	0.00		

Distances in FEET.

Figure D-4 (Continued). Lift Barge Longitudinal Strength Analysis.

LIFT BARGE

LONGITUDINAL STRENGTH

LOCATION Ft	WEIGHT LT/Ft	BUOYANCY LT/Ft	SHEAR LT	SECT.MOD SqIn-Ft	STRESS LT/SqIn
0.00	0.00			9,674.0	
0.00	7.29		-0.0	9,674.0	0.000
7.56a	15.73	0.00	-87.0	9,674.0	0.031
11.50a	20.11	4.46	-148.8	9,674.0	0.079
22.70a	32.62	17.15	-323.2	9,674.0	0.354
22.70a	32.62	17.15	-323.2	9,674.0	0.354
22.71a	32.62	17.16	-323.3	9,674.0	0.354
23.00a	32.93	17.48	-327.7	9,674.0	0.364
25.00a	32.93	17.57	-358.5	9,674.0	0.435
25.00a	36.23	17.57	-358.5	9,674.0	0.435
25.00a	37.57	17.57	-358.6	9,674.0	0.435
25.00a	16.29	17.57	-358.6	9,674.0	0.435
37.50a	16.56	18.10	-341.0	9,674.0	0.889
50.00a	16.84	18.63	-320.2	9,674.0	1.318
50.00a	28.42	18.63	-320.2	9,674.0	1.318
62.50a	28.96	19.16	-442.7	9,674.0	1.812
75.00a	29.50	19.69	-565.3	9,674.0	2.465
86.63a	29.99	20.18	-679.4	9,674.0	3.214
87.50a	30.01	20.21	-688.0	9,674.0	3.276
87.50a	32.01	20.21	-688.0	9,674.0	3.276
91.67a	32.10	20.39	-737.0	9,674.0	3.583
91.67a	6.71	20.39	-737.0	9,674.0	3.584
100.00a	6.72	20.74	-621.5	9,674.0	4.170
112.50a	6.73	21.27	-443.0	9,674.0	4.860
125.00a	6.75	21.80	-258.0	9,674.0	5.315
137.50a	6.76	22.33	-66.6	9,674.0	5.527
150.00a	6.78	22.86	131.2	9,674.0	5.487
162.50a	6.79	23.39	335.5	9,674.0	5.188
175.00a	6.80	23.92	546.2	9,674.0	4.620
181.25a	6.81	24.18	654.0	9,674.0	4.233
181.25a	6.91	24.18	654.0	9,674.0	4.233
187.50a	12.73	24.45	744.6	9,674.0	3.780
187.50a	10.73	24.45	744.6	9,674.0	3.780
200.00a	22.36	24.98	846.7	9,674.0	2.739
212.50a	34.00	25.51	810.0	9,674.0	1.655
225.00a	45.63	26.04	634.5	9,674.0	0.708
225.00a	44.06	26.04	634.5	9,674.0	0.708
227.00a	45.92	26.12	596.6	9,674.0	0.581
238.50a	56.61	14.07	238.2	9,674.0	0.061
243.75a	61.49	8.57	-12.5	9,674.0	-0.003
243.75a	3.30	8.57	-12.5	9,674.0	-0.003
250.00a	3.30	2.02	-0.0	9,674.0	-0.000
250.00a	0.00			9,674.0	

LIFT BARGE

LONGITUDINAL STRENGTH SUMMARY

Max. Shear:	846.7 LT	at	200.00a	
Max. Bending Moment:	53,465 LT-Ft	at	137.50a	(Hogging)
Max. Stress:	5.527 LT/SqIn	at	137.50a	(Tension)

Figure D-4 (Continued). Lift Barge Longitudinal Strength Analysis.

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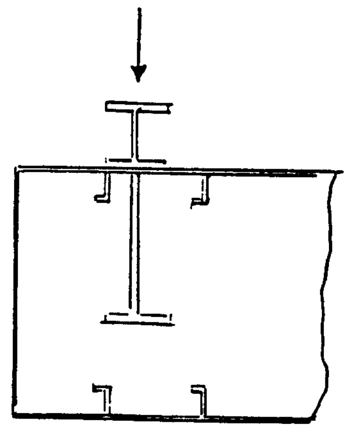
MAY-7-90
AS-DESIGNED STRESSES
1 OF 2



CALCULATE SM AT SECTION

SIDE → INBOARD 44.5" FOR PANEL

ITEM	SCANT	a	d	ad	ad²	i₀
DECK	1 x 44.5	44.5	7.208	320.8	2,312.0	-
DK LONG (FLG)	2(4x.38)	3.04	6.75	20.5	138.5	—
DK LONG (W)	2(6x.38)	4.56	7.0	31.9	223.4	—
BOT. LONG (FLG)	2(4x.38)	3.04	.54	1.6	0.9	-
BOT LONG (W)	2(6x.38)	4.56	.33	1.5	0.5	—
SIDE SHELL	.5x 87	43.5	3.625	157.7	571.6	190.5
BOTTOM	.5x44.5	22.5	0.02	0.5	0.0	—
DP WEB	1.0 x 48	48.0	5.25	252.0	1,323.0	64.0
WEB FLG	1.0 x 12	12.0	3.25	39.0	126.8	—
		185.45		825.5	4696.7	254.5

$C = \Sigma ad / \Sigma a$

$= 825.5 / 185.45$

$C = 4.451$ Ft

$I = 4{,}696.7 + 254.5 - 185.45(4.451)^2$

$I = 1276.62$

$SM = I/C$

$SM = 286.82\ in^2 \cdot Ft.$

Figure D-5. Barge Structural Reinforcement Calculations Drawing F1125-001 "WEEKS BARGE 297 Heavy Lift Modifications"

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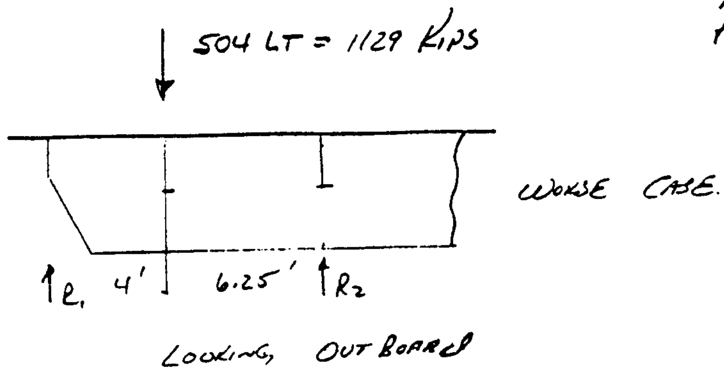
MAY-7-90
PAGE 2 OF 2



$R_1 + R_2 = 1129$ KIPS

$R_2 = (1129 \times 4)/10.25$

$R_2 = 440.6$ KIPS

$\therefore R_1 = 688.4$ KIPS

$BM_{max} = 688.4 \times 4$

$= 2753.6$ KIP-FT

$\sigma = BM/SM$

$= 2{,}753.6/286.72$

$\sigma = 9.60$ KSI $\therefore$ OK

$\therefore$ MEETS ABS RULES, NO RESTRICTION.

Figure D-5 (Continued). Barge Structural Reinforcement Calculations Drawing F1125-001 "WEEKS BARGE 297 Heavy Lift Modifications"

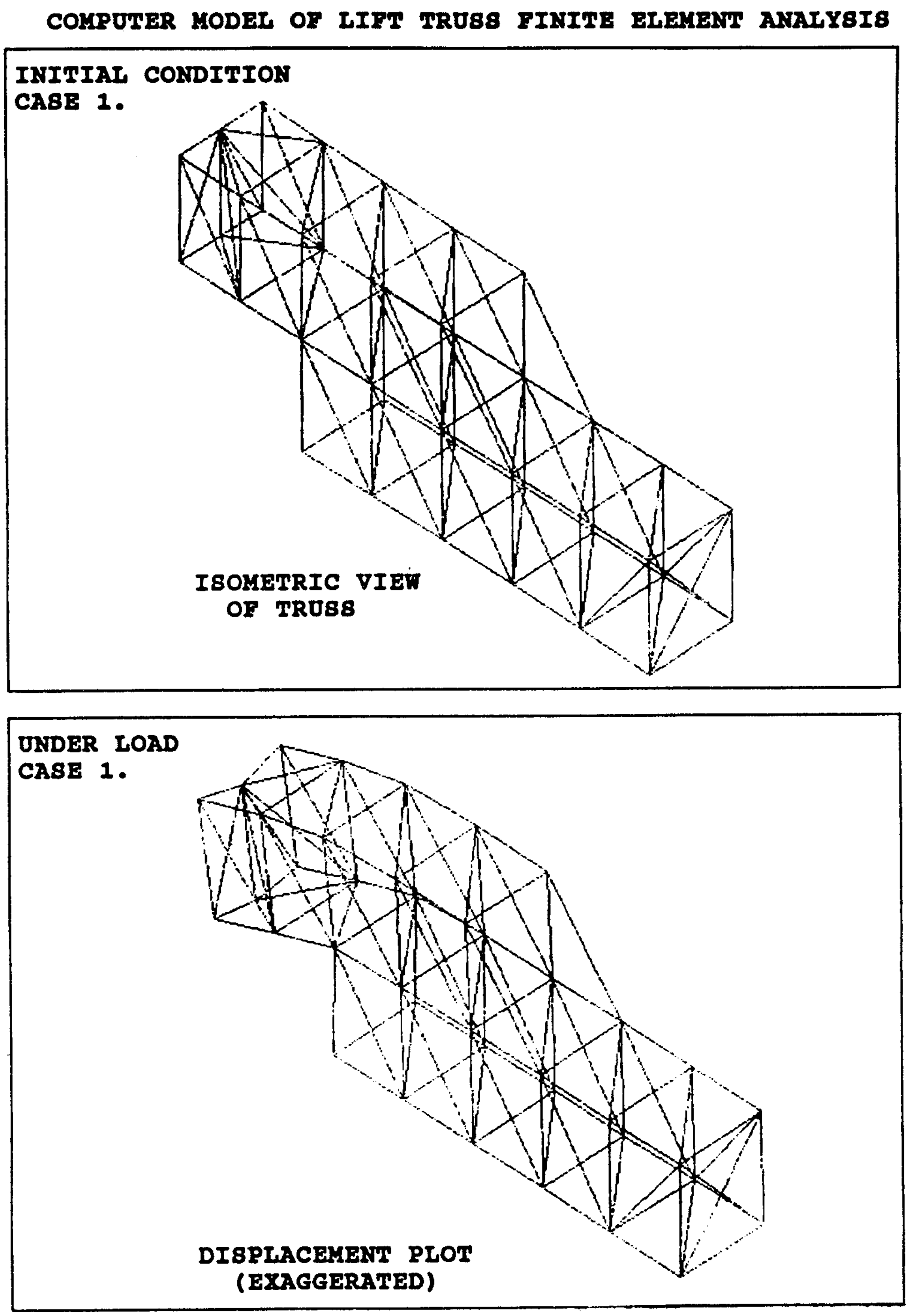


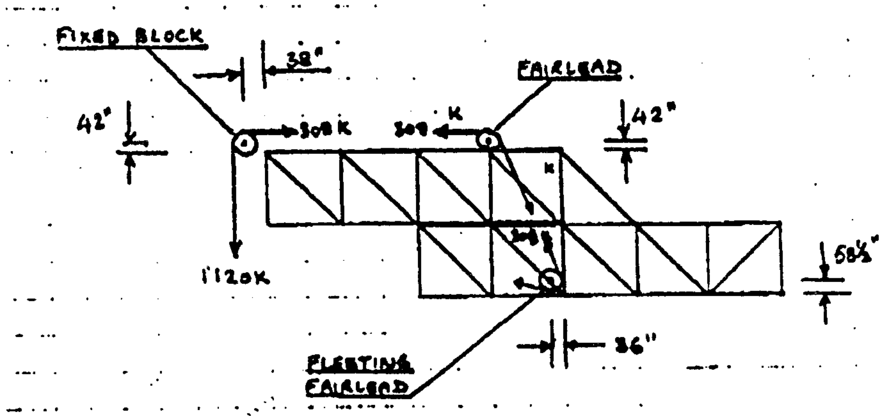
Figure D-6. Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

TRUSS STRESS ANALYSIS.

LOADS:

500 LT. per truss at fixed block.

425 LT. weight of truss.



LOAD ON CENTER VERTICAL SUPPORT FROM FIXED BLOCK

Fx = 308 K
FY = −1120 K
MZ = 29624 K-INS

LOAD ON TRANSVERSE BRACE; 3RD BAY OF UPPER TRUSS FROM FAIRLEAD:

Fx = −308 K
FY = −309. K
MZ = 2418.2 K-INS.

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Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

LOAD ON TRANSVERSE BRACE, 2ND BAY LOWER TRUSS FROM FLEETING FAIRLEAD:

F_x = − 106.7 K.
F_y = + 321.8 K

THE EXACT WT. DISTRIBUTION OF THE TRUSS IS NOT KNOWN.

ASSUMING THAT IT IS DISTRIBUTED OVER THE LENGTH.

LOAD FROM UPPER TRUSS ON VERTICAL MEMBERS OF 1ST BAY OF LOWER TRUSS:

$$F_Y = -\frac{2}{9}(425 \times 2.24) = 211.86 \text{ K}$$

PRESSURE ON LOWER LONGITUDINAL TRUSS ELEMENTS

EPY = 307.5 lbs/in.

TRUSS MEMBER PROPERTIES

ALL MEMBERS IN THE LONGITUDINAL PLANE ARE ASSUMED TO BE 20" ø APE W/ 1" WALL THICKNESS

O.D. = 20.0"
I.D. = 17.938"

AREA = 61.44 IN^2
I = 2771.62 IN^4
DEPTH = 20.0 INS.

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Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

ALL TRANSVERSE MEMBERS ARE 16"ø PIPE w/1" WALL THICKNESS.

OD = 6.0"
ID = 13.938"

AREA = 48.48 IN^2
I = 1364.43 IN^4
Depth = 16.0 INS.

CENTER POST UNDER FIXED BLOCK IS 48"ø PIPE w/1" WALL THICKNESS.

OD = 48.0"
ID = 46.0"

AREA = 147.65 IN^2
I = 40789.65 IN^4
depth = 48.0 INS.

BOTTOM MEMBERS ARE WF I BEAMS 14x311

AREA = 91.4 IN^2
I = 4330 IN^4
depth = 17.12 INS.

The above information with the TRUSS Geometry was fed into the COSMOS/M FINITE ELEMENT PROGRAM. THE MAXIMUM STRESS IN ANY ELEMENT IS 21.8 KSI IN THE UPPER TRANSVERSE BRACE OF 1ST BAY OF THE UPPER TRUSS. YIELD STRESS FOR THE PIPES IS 35 KSI. HENCE THE STRESSES ARE SATISFACTORILY LOW.

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Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

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**************************************************************************
*                                                                        *
*                                                                        *
*                         C O S M O S / M                                *
*                                                                        *
*                       VERSION:    1.52A                                *
*                                                                        *
*                        DISTRIBUTED BY:                                 *
*                                                                        *
*        STRUCTURAL  RESEARCH  AND  ANALYSIS  CORPORATION                *
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*                                                                        *
*                  COPYRIGHT  1988   S. R. A. C.                         *
*                                                                        *
**************************************************************************
                 DATE:    4/27/1990    TIME:    10:44: 7

 TITLE :


 C O N T R O L   I N F O R M A T I O N
  NUMBER OF LOAD CASES . . . . . . . . . . . . (NLCASE)  =        1
  SOLUTION MODE . . . . . . . . . . . . . . . . (MODEX)   =        0
     EQ. 0, STATIC ANALYSIS
     EQ. 1, BUCKLING ANALYSIS
     EQ. 2, DYNAMIC ANALYSIS
  THERMAL LOADING FLAG . . . . . . . . . . . . .(ITHERM)  =        0
     EQ. 0, NO THERMAL EFFECTS CONSIDERED
     EQ. 1, ADD TEMPERATURE EFFECT
  GRAVITY LOADING FLAG . . . . . . . . . . . . .(IGRAV)   =        0
     EQ. 0, NO GRAVITY LOADING CONSIDERED
     EQ. 1, ADD GRAVITY LOADING EFFECT
  CENTRIFUGAL LOADING FLAG . . . . . . . . . . .(ICNTRF)  =        0
     EQ. 0, NO CENTRIFUGAL LOADING CONSIDERED
     EQ. 1, ADD CENTRIFUGAL LOADING EFFECT
  IN-PLANE STIFFENING FLAG . . . . . . . . . . .(INPLN)   =        0
     EQ. 0, NO IN-PLANE EFFECTS CONSIDERED
     EQ. 1, IN-PLANE EFFECTS CONSIDERED
  SOFT SPRING ADDITION FLAG . . . . . . . . . . (ISOFT)   =        1
     EQ. 0, NO SOFT SPRING OPTION
     EQ. 1, SOFT SPRING ADDED

  SAVE DECOMPOSED STIFFNESS MATRIX FLAG . . . . (ISAVK)   =        0
     EQ. 0, DO NOT SAVE DECOMPOSED K
     EQ. 1, SAVE DECOMPOSED K
  FORM STIFFNESS MATRIX FLAG . . . . . . . . . .(IFORMK)  =        0
     EQ. 0, FORM STIFFNESS MATRIX
     EQ. 1, USE EXIST DECOMPOSED STIFFNESS MATRIX

  T O T A L   S Y S T E M   D A T A
   NUMBER OF EQUATIONS . . . . . . . . . . . . . . .(NEQ)   =       90
   NUMBER OF MATRIX ELEMENTS . . . . . . . . . . . .(NWK)   =     1188
   MAXIMUM HALF BANDWIDTH . . . . . . . . . . . . . (MK )   =       24
   MEAN HALF BANDWIDTH . . . . . . . . . . . . . . .(MM )   =       13
   NUMBER OF ELEMENTS. . . . . . . . . . . . . . . .(NUME)  =      325
   NUMBER OF NODAL POINTS. . . . . . . . . . . . . .(NUMNP) =      237
   NUMBER OF BLOCKS. . . . . . . . . . . . . . . .  (NBLK)  =        1
```

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

MAXIMUM DIAGONAL STIFFNESS MATRIX VALUE = .301868E+11
MINIMUM DIAGONAL STIFFNESS MATRIX VALUE = .100000E-05
TOTAL STRAIN ENERGY . . . . = .152258E+18

D I S P L A C E M E N T S

NODE	X-DISPL.	Y-DISPL.	Z-DISPL.	XX-ROT.	YY-ROT.	ZZ-ROT.
1	.00000	.00000	.00000	.00000	.00000	.00000
2	.00000	.00000	.00000	.00000	.00000	.00000
4	.00000	.00000	.00000	.00000	.00000	.00000
6	.00000	.00000	.00000	.00000	.00000	.00000
8	.00000	.00000	.00000	.00000	.00000	.00000
10	.00000	.00000	.00000	.00000	.00000	.00000
11	4.18527E-02	-7.02719E-02	.00000	.00000	.00000	8.07655E-04
12	2.97194E-03	-2.85108E-03	.00000	.00000	.00000	1.85541E-04
14	-2.00704E-02	-2.74785E-03	.00000	.00000	.00000	1.40271E-04
16	-2.70150E-02	1.38046E-02	.00000	.00000	.00000	1.01347E-04
18	-2.40354E-02	4.95998E-04	.00000	.00000	.00000	-1.50516E-05
20	-2.06655E-02	4.41518E-03	.00000	.00000	.00000	6.65594E-05
34	6.31505E-02	-.42362	.00000	.00000	.00000	2.40762E-03
36	6.34405E-02	-.81250	.00000	.00000	.00000	1.54458E-03
38	-.25546	-.75657	.00000	.00000	.00000	1.37107E-03
40	-.22767	-.37219	.00000	.00000	.00000	1.94758E-03
42	-.18109	-9.87307E-02	.00000	.00000	.00000	9.29736E-04
44	-.14092	-3.40628E-02	.00000	.00000	.00000	1.66826E-04
46	-.11982	-3.12100E-02	.00000	.00000	.00000	2.78993E-04
75	.00000	.00000	.00000	.00000	.00000	.00000
76	.00000	.00000	.00000	.00000	.00000	.00000
78	.00000	.00000	.00000	.00000	.00000	.00000
80	.00000	.00000	.00000	.00000	.00000	.00000
82	.00000	.00000	.00000	.00000	.00000	.00000
84	.00000	.00000	.00000	.00000	.00000	.00000
85	3.26625E-02	-7.21043E-02	.00000	.00000	.00000	7.90054E-04
86	-5.11859E-03	-5.87811E-03	.00000	.00000	.00000	1.67073E-04
88	-2.37225E-02	-4.57639E-03	.00000	.00000	.00000	1.27402E-04
90	-2.70040E-02	1.04095E-02	.00000	.00000	.00000	8.75541E-05
92	-2.27937E-02	3.49528E-04	.00000	.00000	.00000	-1.90695E-06
94	-1.92456E-02	4.12250E-03	.00000	.00000	.00000	6.55990E-05
108	5.58281E-02	-.42076	.00000	.00000	.00000	2.27412E-03
110	5.62157E-02	-.80564	.00000	.00000	.00000	1.52708E-03
112	-.24425	-.74621	.00000	.00000	.00000	1.34290E-03
114	-.21460	-.36561	.00000	.00000	.00000	1.80848E-03
116	-.16364	-9.48830E-02	.00000	.00000	.00000	8.82900E-04
118	-.12460	-3.17564E-02	.00000	.00000	.00000	1.36627E-04
120	-.10615	-2.84891E-02	.00000	.00000	.00000	2.60720E-04
150	-.20120	-.91993	.00000	.00000	.00000	2.38504E-03
172	6.71608E-02	-.91909	.00000	.00000	.00000	7.22780E-04
173	-3.08000E+11	-3.08000E+11	.00000	.00000	.00000	2.81903E-04
174	-1.06770E+11	3.21540E+11	.00000	.00000	.00000	.00000

S O L U T I O N   T I M E   L O G   I N   S E C
FOR PROBLEM

TIME FOR INPUT PHASE . . . . = 18
TIME FOR CALCULATION OF STRUCTURE STIFFNESS MATRIX= 12
TRIANGULARIZATION OF STIFFNESS MATRIX . . . . = 1
TIME FOR LOAD CASE SOLUTIONS . . . . = 1
TIME FOR UPDATING DATA BASE . . . . = 7
T O T A L   S O L U T I O N   T I M E . . . . . = 39

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

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S T R E S S   E V A L U A T I O N   FOR   S T A T I C   A N A L Y S I S

STRESS OUTPUT FOR BEAM ELEMENT GROUP  1     CASE NO.   1

ELEMENT            FORCES                          MOMENTS                           STRESSES
NUMBER       NODE1       NODE2                 NODE1       NODE2                  NODE1       NODE2

   1 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   2 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   3 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   4 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   5 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   6 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   7 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   8 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04

   9 Fr= .0000E+00  .0000E+00  Tr= .0000E+00  .0000E+00   (P/A)  = .0000E+00  .0000E+00
     Vs= .2645E+05  .2645E+05  Ms= .0000E+00  .0000E+00   (Ms/Ss)= .0000E+00  .0000E+00
     Vt= .0000E+00  .0000E+00  Mt= .7581E+06 -.7581E+06   (Mt/St)= .1499E+04 -.1499E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00     Smax  = .1499E+04  .1499E+04
                                                           Smin  =-.1499E+04 -.1499E+04
```

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

ELEMENT NUMBERS 10 THROUGH 120
OMITTED FOR BREVITY

```
121 Fr= .1750E+05 -.1750E+05  Tr= .0000E+00  .0000E+00   (P/A) = .1185E+03 -.1185E+03
    Vs= .8132E+05 -.8132E+05  Ms= .0000E+00  .0000E+00  (Ms/Ss)= .0000E+00  .0000E+00
    Vt= .0000E+00  .0000E+00  Mt= .1793E+08 -.1344E+07  (Mt/St)= .1055E+05 -.7906E+03
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00    Smax  = .1067E+05  .6720E+03
                                                          Smin  =-.1043E+05 -.9091E+03

122 Fr= .0000E+00  .0000E+00  Tr= .8806E+05 -.8806E+05   (P/A) = .0000E+00  .0000E+00
    Vs= .1940E+05 -.1940E+05  Ms= .0000E+00  .0000E+00  (Ms/Ss)= .0000E+00  .0000E+00
    Vt= .0000E+00  .0000E+00  Mt= .1104E+07  .8749E+06  (Mt/St)= .3983E+04  .3157E+04
                    (Tr*CTOR/Jp)= .0000E+00  .0000E+00    Smax  = .3983E+04  .3157E+04
                                                          Smin  =-.3983E+04 -.3157E+04

S O L U T I O N   T I M E   L O G   I N   S E C   FOR  STRESS CALCULATIONS

   READING GENERAL INFORMATION AND ELEMENT DATA. . . =    21
   STRESS CALCULATION AND PRINTOUT . . . . . . . . . =    14
   UPDATING DATABASE . . . . . . . . . . . . . . . . =     1
   T O T A L   S O L U T I O N   T I M E . . . . . . =    36
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Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

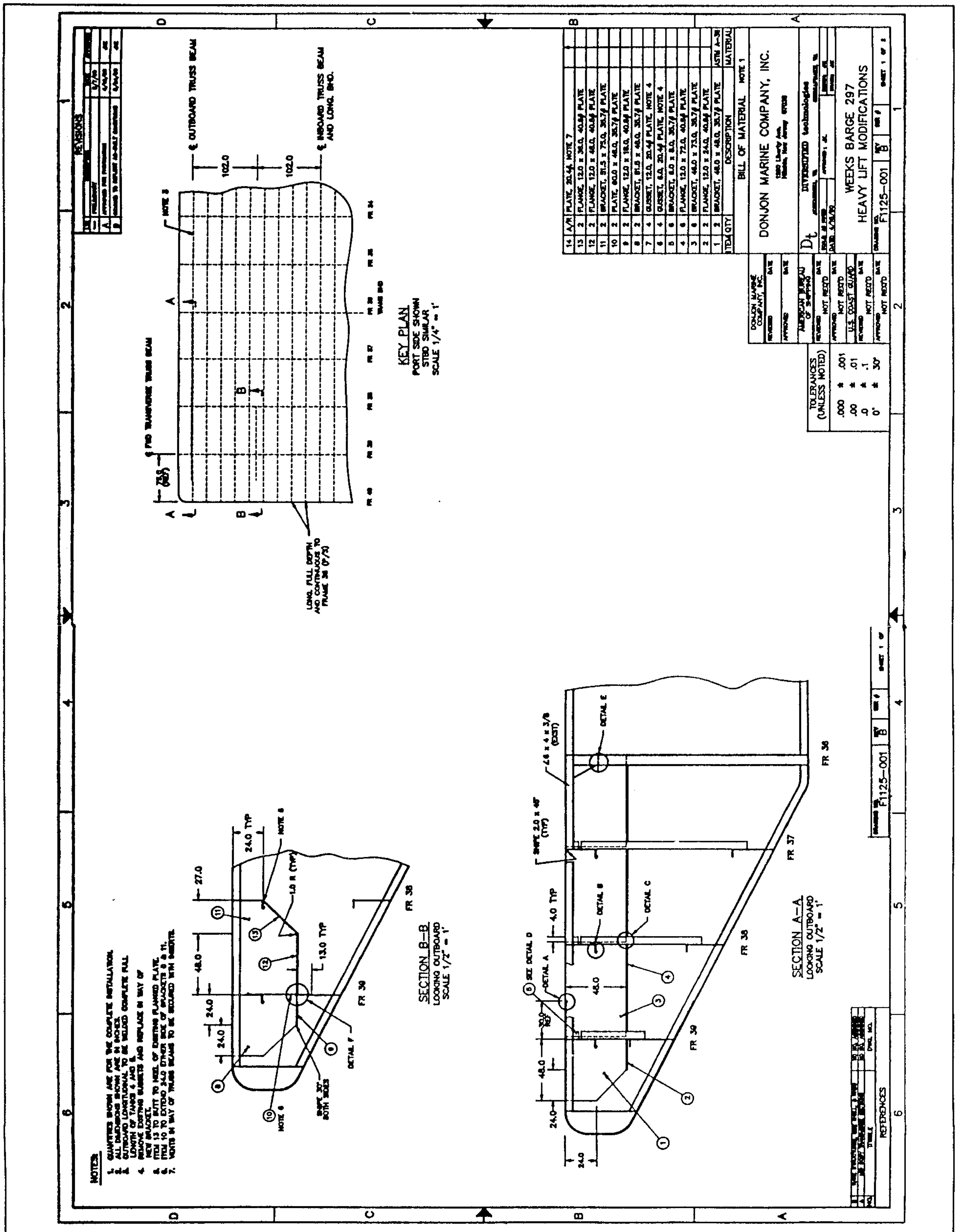

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

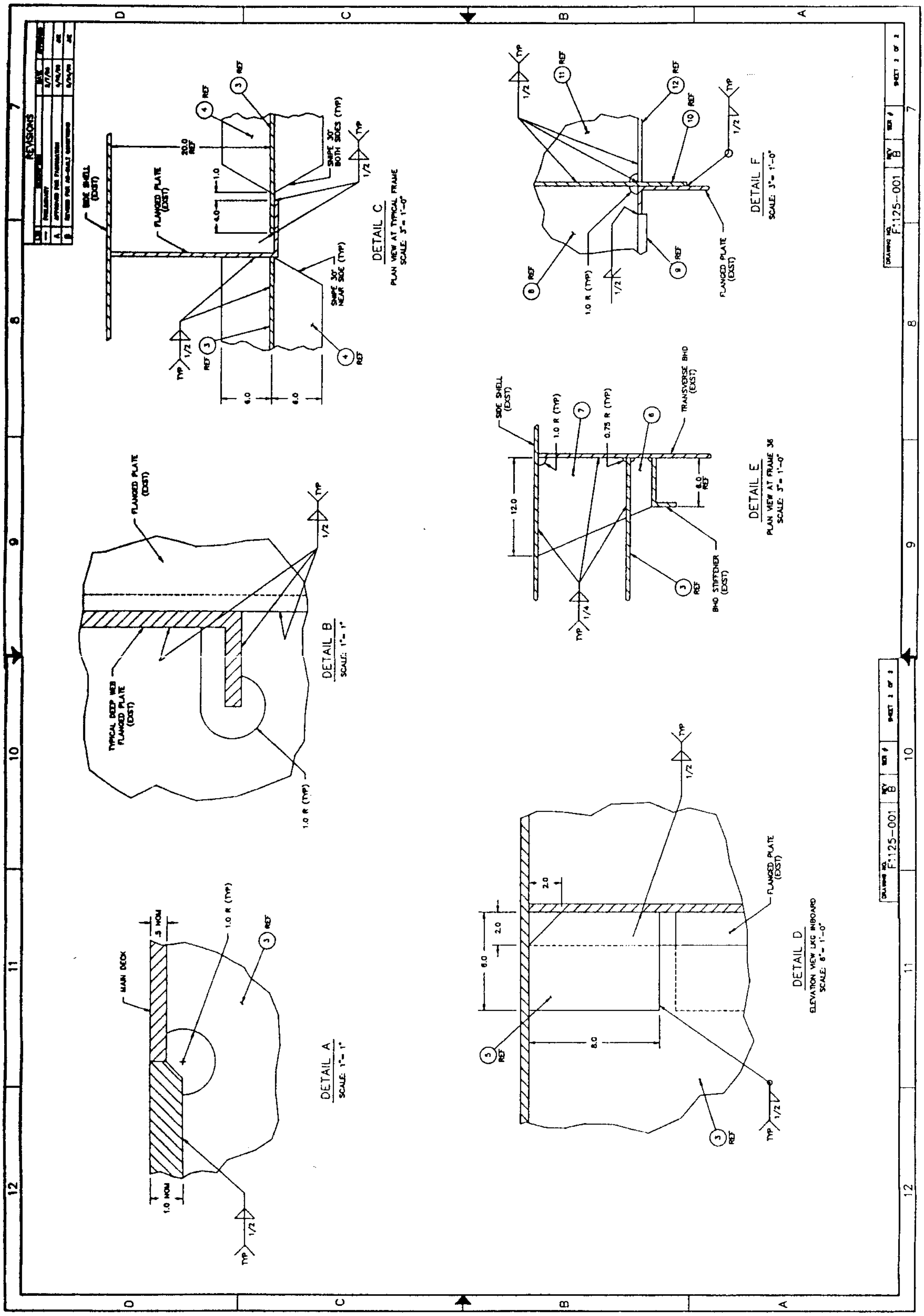

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

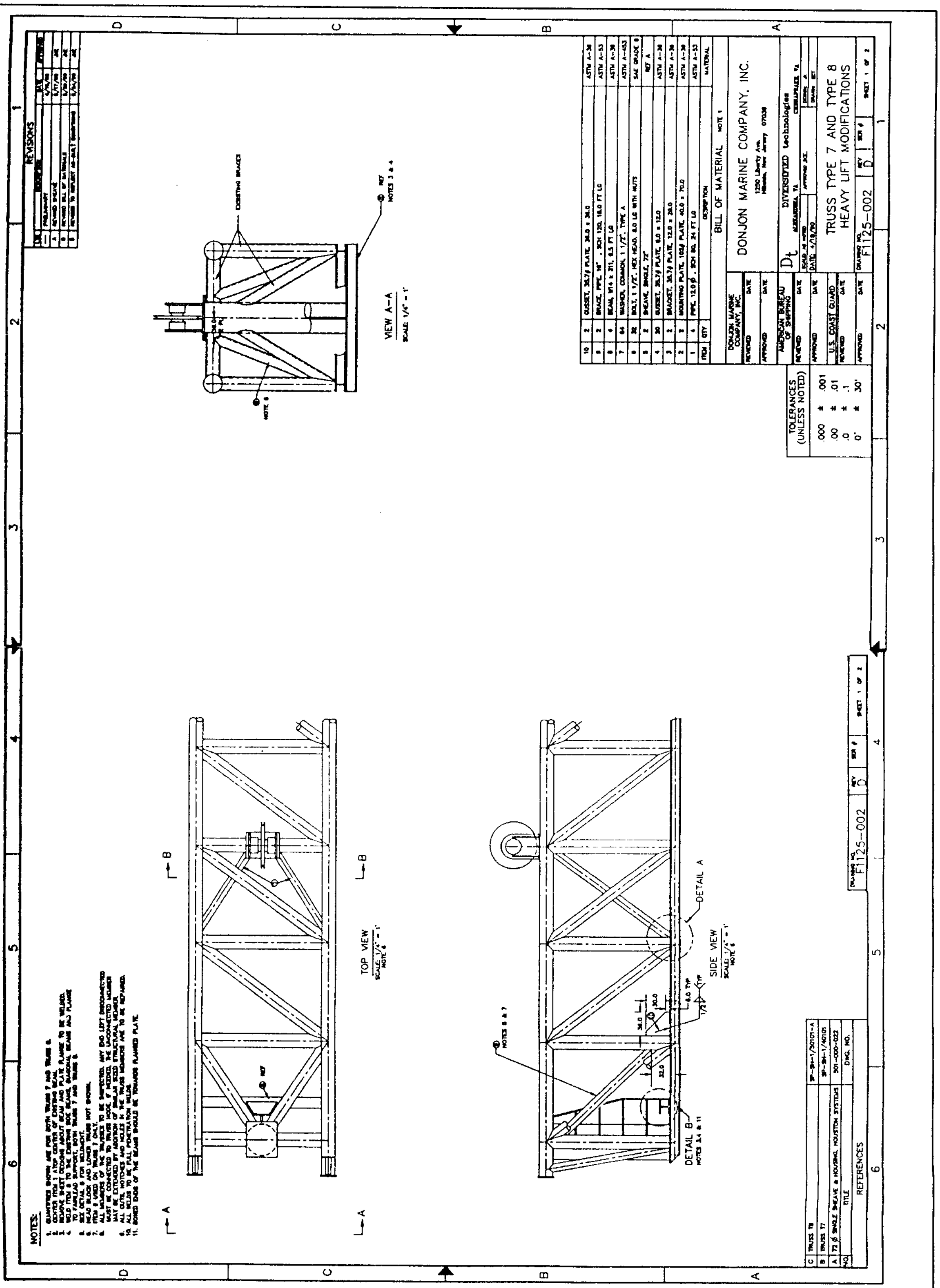

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

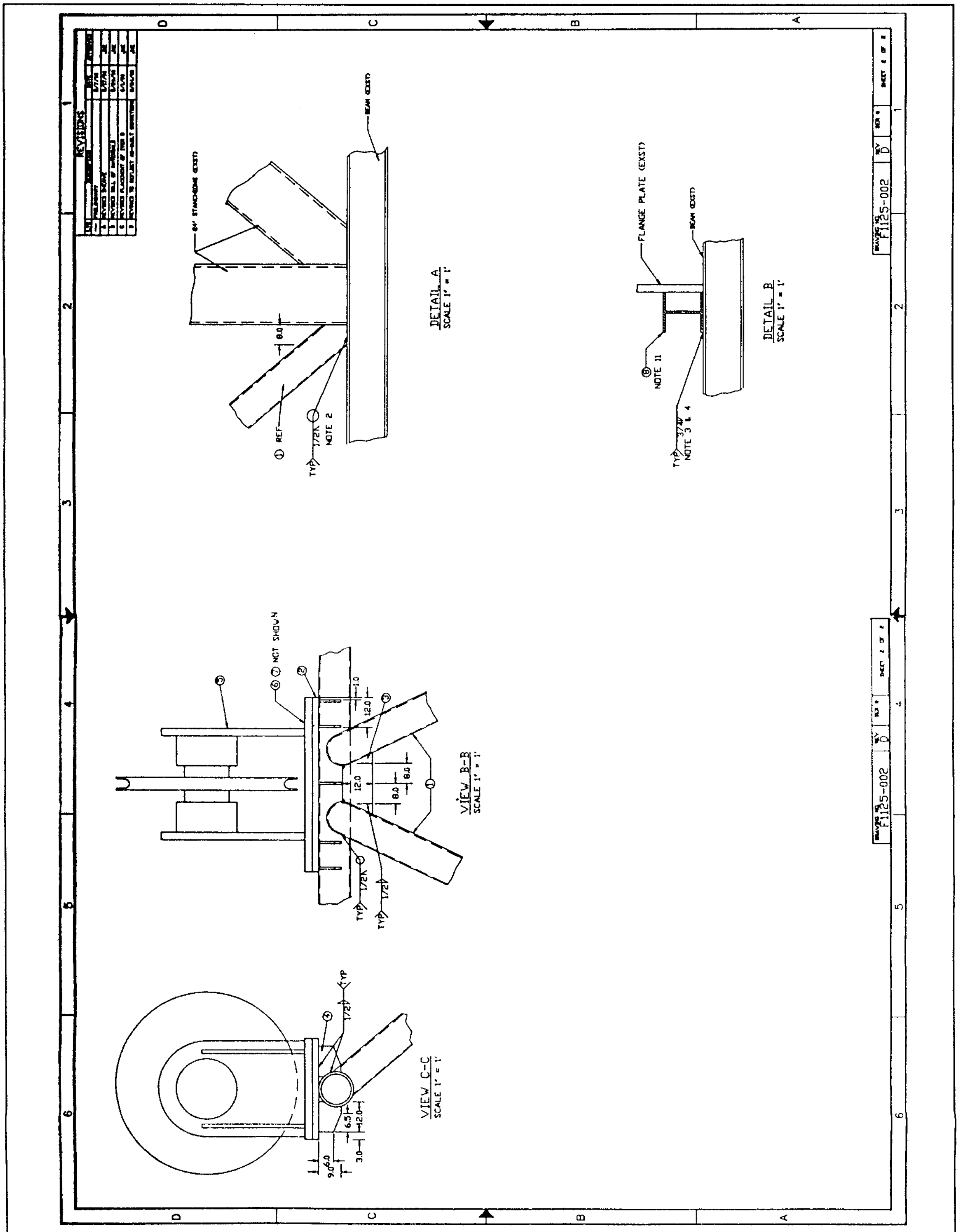

Figure D-6 (Continued). Lift Truss Load Analysis – Drawing F1125-002 "Truss Type 7 and Type 8 Heavy Lift Modifications"

APPENDIX E

SALVAGE DRAWINGS

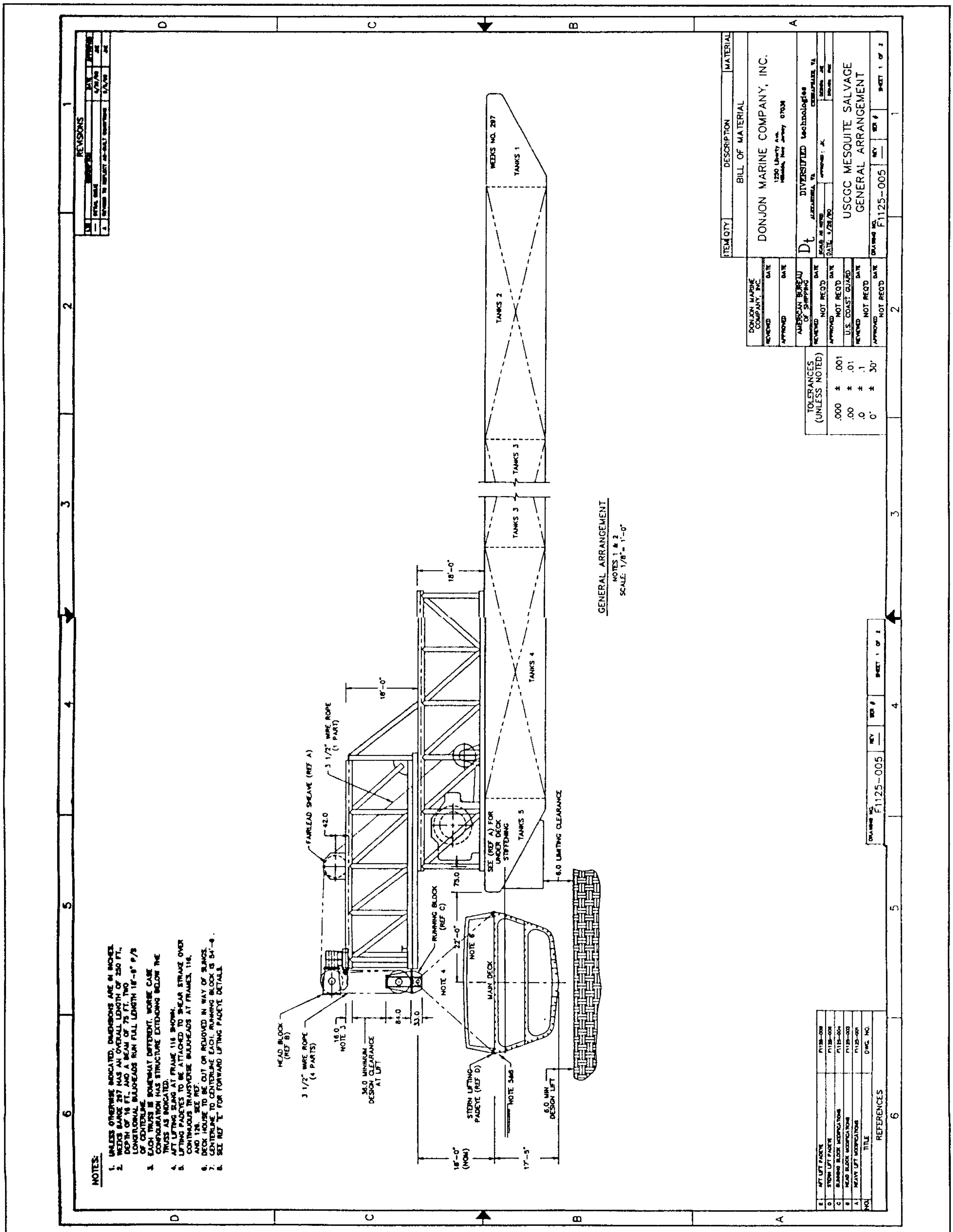

Figure E-1. Intermediate Fairleads – Drawing F1125-005 "General Arrangement."

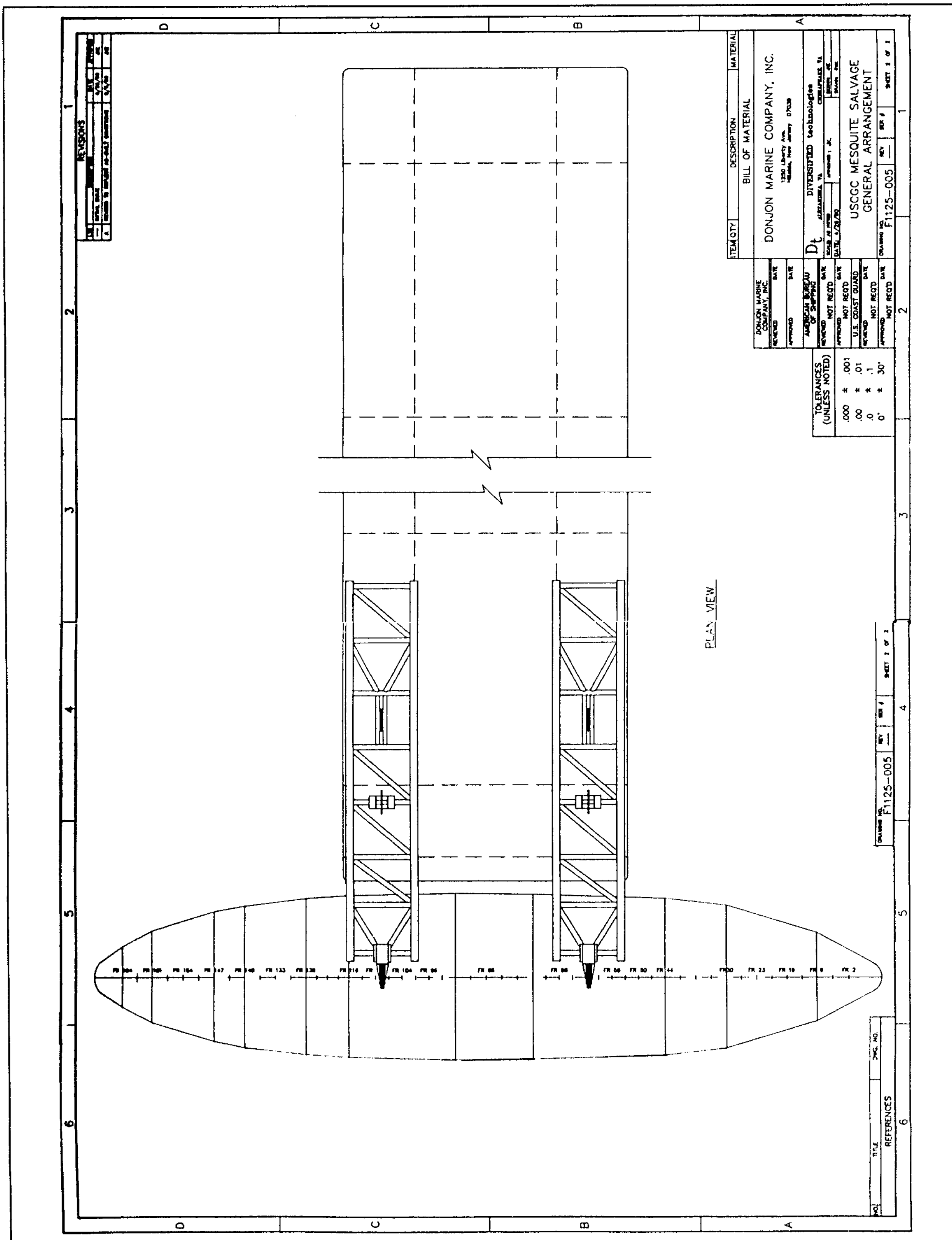

Figure E-1 (Continued). Intermediate Fairleads – Drawing F1125-005 "General Arrangement."

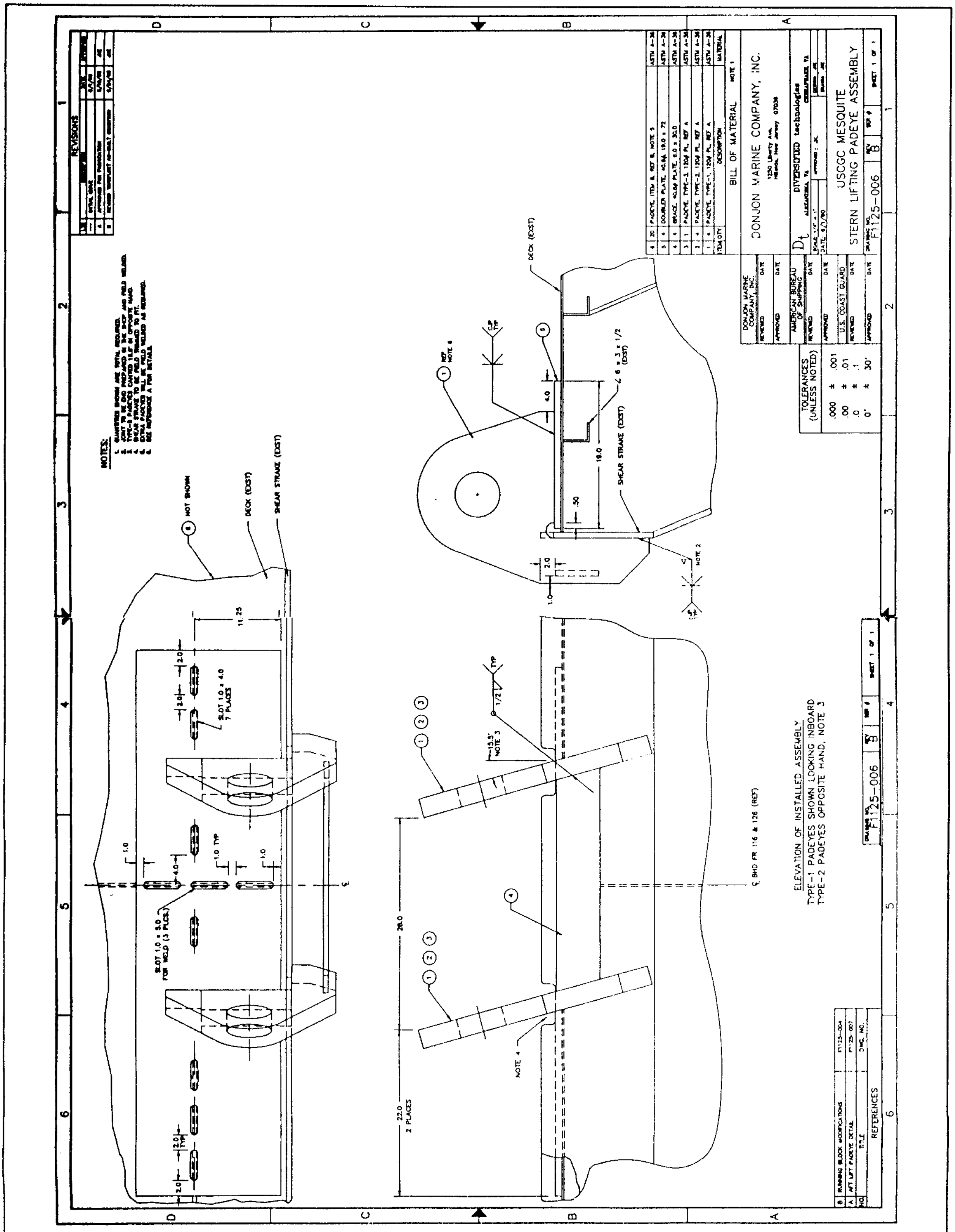

Figure E-2. Lift Pad Details – Drawing F1125-006 "Stern Lifting Padeye Assembly."

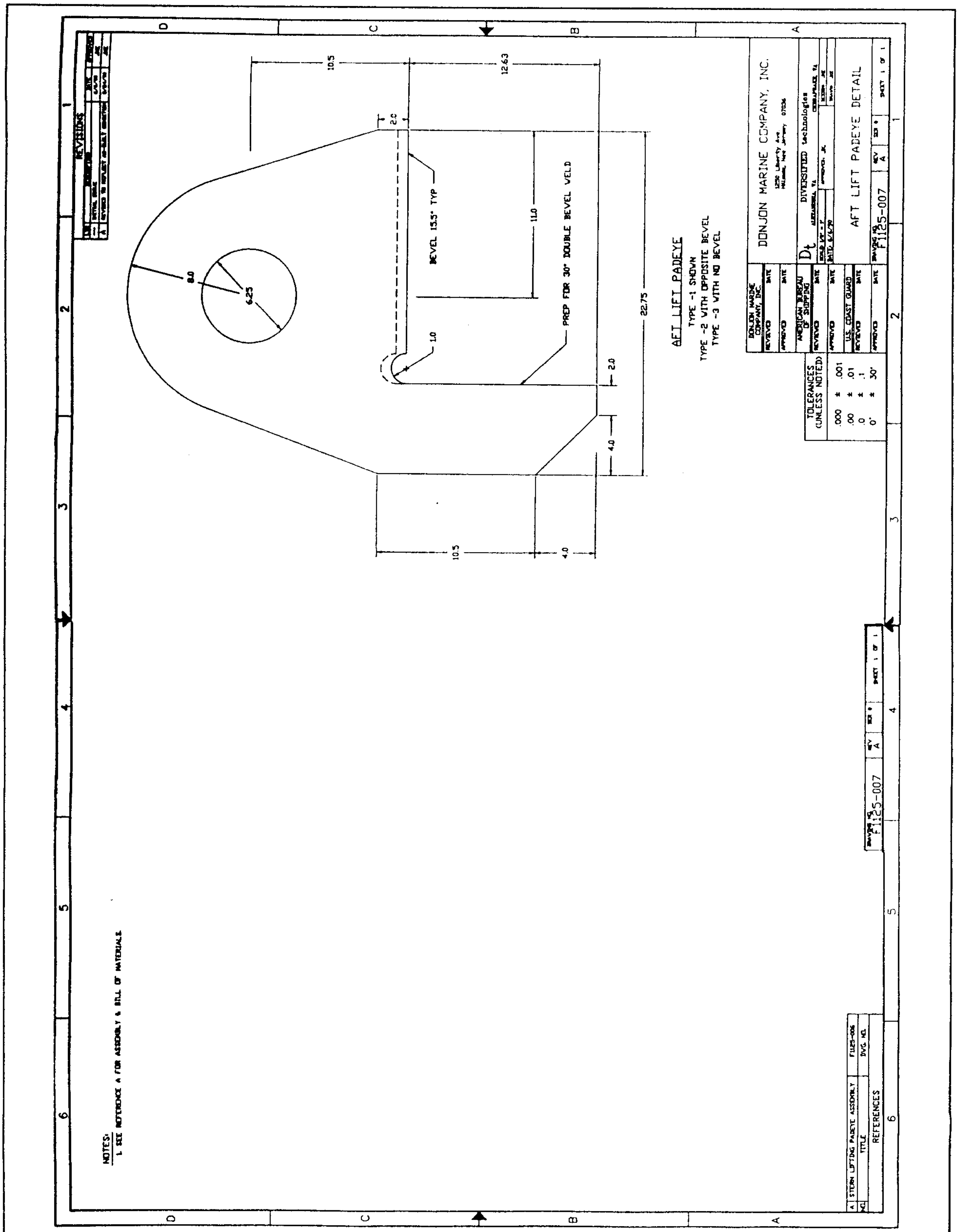

Figure E-2 (Continued). Lift Pad Details – Drawing F1125-006 "Stern Lifting Padeye Assembly."

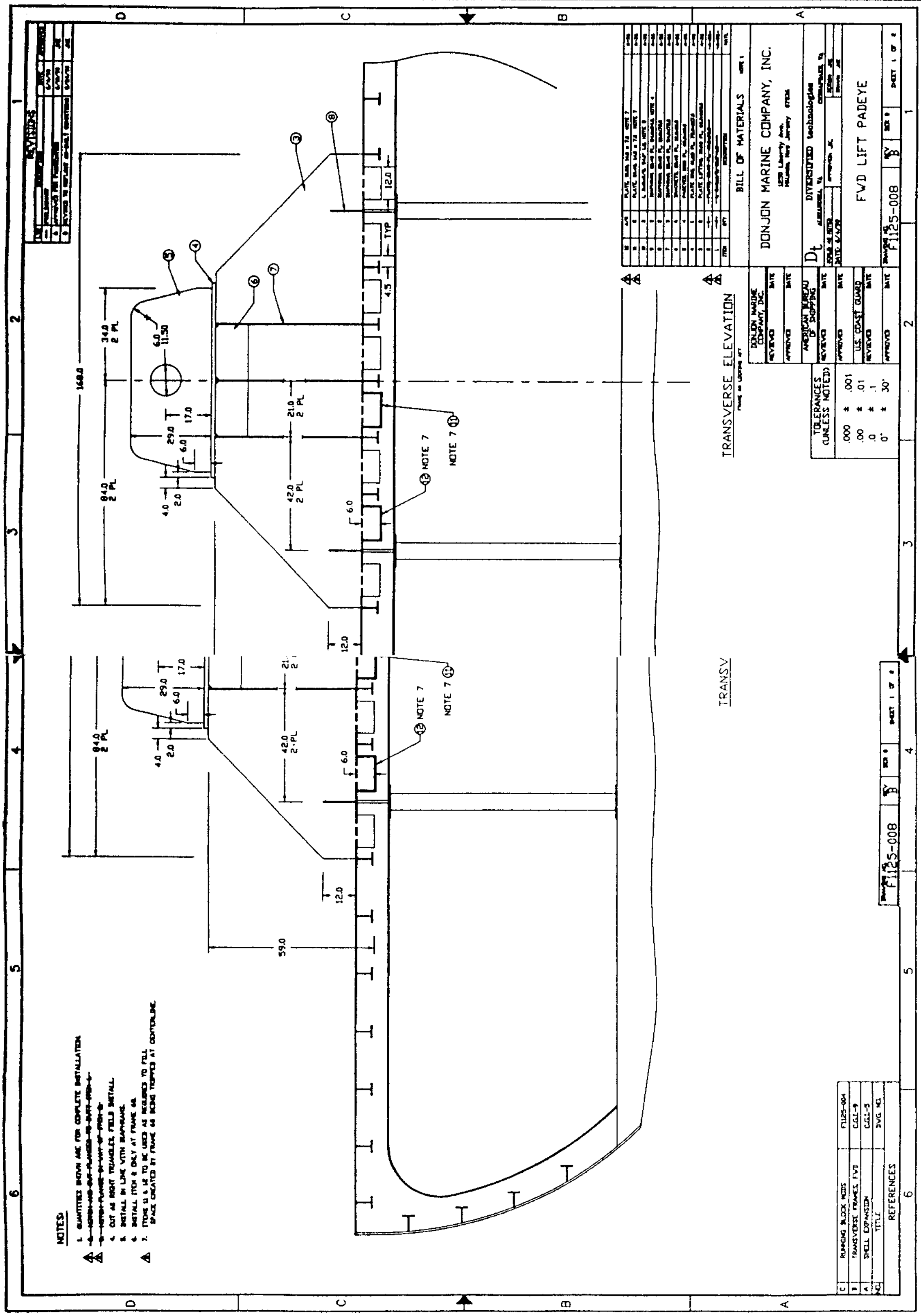

Figure E-3. Lift Pad Structural Modifications – Drawing F1125-007 "Forward Lift Padeye Detail."

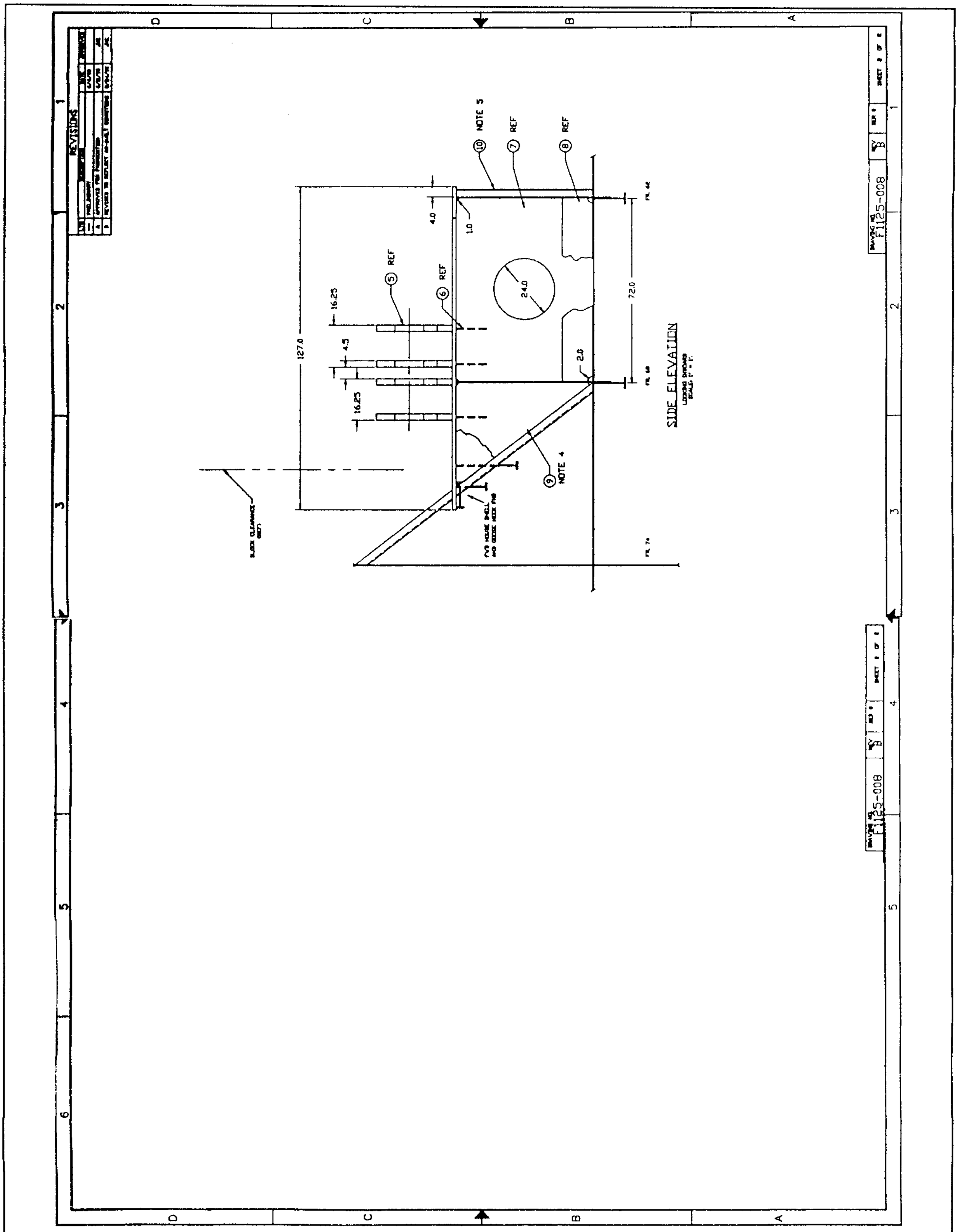

Figure E-3 (Continued). Lift Pad Structural Modifications – Drawing F1125-007 "Forward Lift Padeye Detail."

APPNEDIX F

LIFT BARGE HYDROSTATIC ANALYSIS

LIFT BARGE

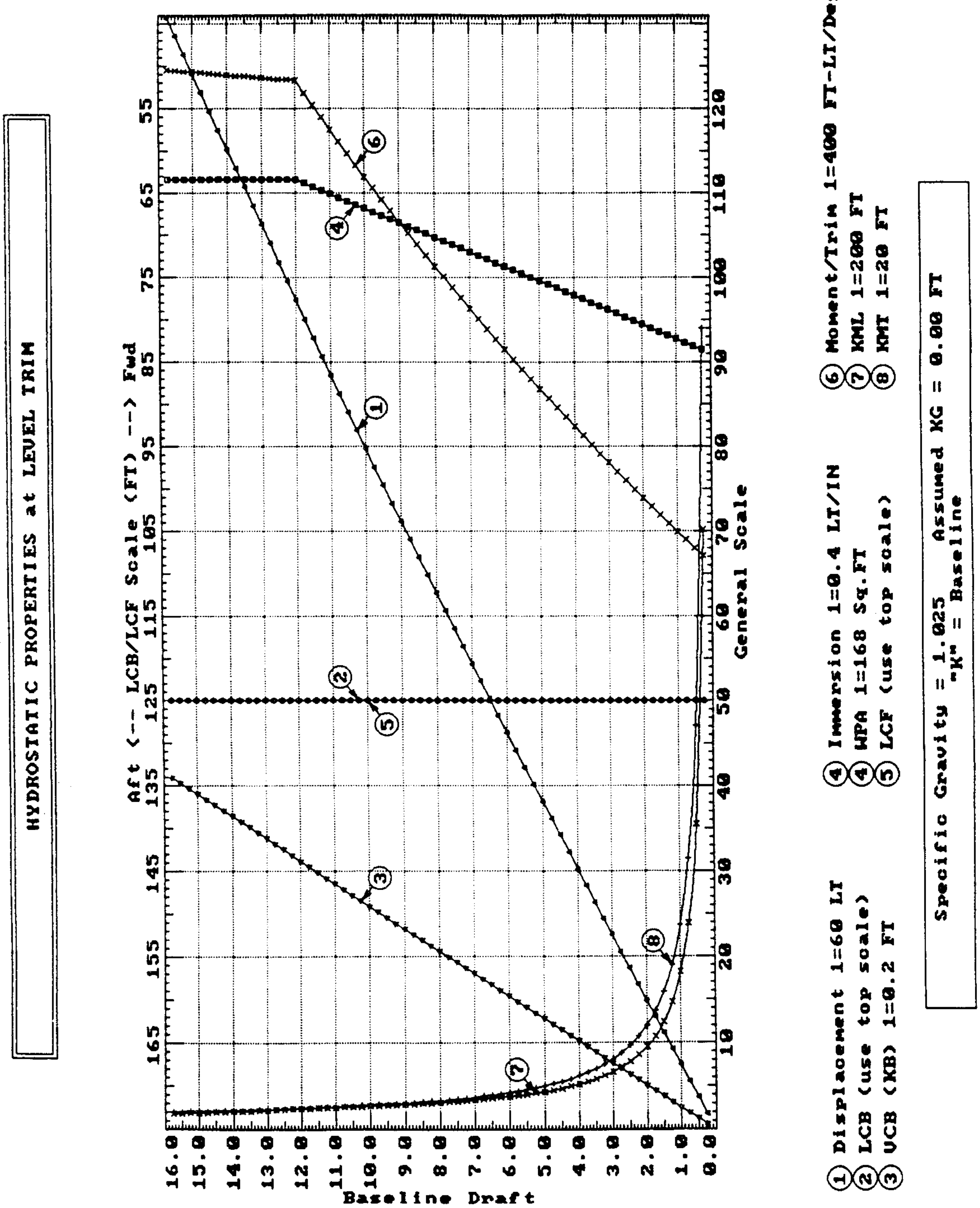

Figure F-1. Hydrostatic Properties at Level Trim.

APPENDIX G

EQUIPMENT SELECTION

Table G-1. Equipment Selection.			
Miscellaneous Equipment			
Item	**Number**	**Item**	**Number**
Bow Winch, wire, anchors		6-inch hydra heads	2
Trailers (housing)	2	3,000-gal fuel tank	1
Oil vacuum	1	Oxygen tank truck	1
Waste container	1	Truss winches	2
Air compressor	1	Lima crane, 10-ft spare boom section	1
Hydra units with hoses	2		
Dive Gear			
Dive hoses, one 600-ft., one 300-ft.	2	Ground lead	1
Diver's helmet, white	1	SCUBA tanks	3
DUI suit	2	Double tank backpack	1
300 ft^3 air bottles	2	Single tank backpack	1
Spare BA 4 filter	1	Volume tank with hoses	1
Dive gear miscellaneous box	1	Delmonox filter	1
Weight belts	2	Bail-out bottle	1
30 pounds spare weight	1	Diver's tool box	1
Knife switch	1	Communication box	1
Boxes Broco rods	4	Kit epoxy with assorted wedges	1
Broco regulator	1	SCUBA regulators	4
Burning torch	1		
In Container			
55-gal oil wioe containment drums	9	Hydraulic hose machine with assorted hoses and fittings	1
700 ft air hose, 24 O-rings	1	Torch set-ups	5
Orange oil boom		Spare torch	1
Bags of oil wioe	10	Spare oxygen and gas gages	2
Containment oil SNARS	10	Miscellaneous brass torch fittings	
White booms	2	Cable connectors	
Dozen oil gloves	6	Spare welding handles and ground clamps	
Oil coveralls	50	Welding machines	4
Oil bags for 55-gal drums	400	600 ft burning hose	
Cases of headliners	2	Oxygen Y-fitting	1
Bags of Speedy Dry	18	Gas Y-fitting	1
Bail (150 lbs) rags	1	3-way oxygen manifold	1
Box, filters and hoses		Spare filter and clear lens	1

APPENDIX H

POLLUTION ABATEMENT PLAN

Figure H-1. Pollution Abatement Plan.

DONJON MARINE CO., INC.

1250 LIBERTY AVE.

HILLSIDE N. J. 07205

PHONE
(201) 964-8812

FACSIMILE
(201) 964-7426
TELEX
WU 138251

April 17, 1990

U.S. Coast Guard VIA: Fax 212-668-6417

Governors Island

ATTN: LCDR Eric Nicolaus

RE: Removal Plan, USCG "Mesquite" (WLB-305)

Dear Sir,

In accordance with your request to Commander Naval Sea Systems Command Supervisor of Salvage and Diving, below please find an outline of how we plan on removing the residual free floating oil pollutants and other U.S. Coast Guard property presently aboard the USCG "Mesquite" (WLB-305). Our plan does not include removal of any oil or pollutants which are presently encased in any submerged machinery or below water line spaces.

Once on-site, our lifting barge will approach and moor itself perpendicular to the "Mesquite". We will drop two stern anchors on the way into the "Mesquite" and once alongside tie our bow directly into the "Mesquite". As soon as we are in position we will deploy enough pollution boom to encircle the "Mesquite" to insure that no pollutants escape into Lake Superior as a result of our removal operations. We will also have on-board the lift barge sufficient oil pads, sweeps, and other absorbents to deal with any potential spills. Once we are in place, we will begin to weld our lifting pads and rig our lifting gear. At the same time we will begin to remove the deck gear and cargo from the "Mesquite" which the USCG requires. We will also begin to remove the residual oil and pollutants from the hull in preparation for dumping the "Mesquite" in deep water.

As part of the lifting barge we will have on deck a 90 ton Lima Truck Crane with 90' of boom. Based upon our last conversation with the U.S. Coast Guard on-site, they may want the NOAA Buoys, Buoy Boom and other miscellaneous gear removed for reuse before the "Mesquite" is dumped. We will use the Lima Truck Crane to facilitate this operation. The truck crane will also be used to handle the slings and lifting gear onto the "Mesquite" itself.

Figure H-1. Pollution Abatement Statement.

LCDR Eric Nicolaus
April 17, 1990
Page 2

We will also have an oil vacuum system on board the lifting barge which will be used to remove whatever oil remains in the hull after the winter season. This vacuum system will be portable and will have a 1500 gallon capacity. If more than 1500 gallons of oil/water is found on the "Mesquite", once the tank is filled, it can be pumped off into another container. We can then continue to remove oil until the "Mesquite" is clean enough for dumping.

We hope this brief description of our removal operations answers your questions. If not, please feel free to give either myself or Mr. J. Arnold Witte a call with any additional specific question or comments you may have.

Very truly yours,

DONJON MARINE CO., INC.

John A. Witte, Jr.
Executive Vice President

JAW JR/dr

Figure H-1 (Continued). Pollution Abatement Statement.